MAYFIELD WEST PHASE 2, STAGE 2 SECONDARY PLAN LANDS

LOCAL OFFICIAL PLAN AMENDMENT (LOPA)

PART C: COMPREHENSIVE IMPLEMENTATION PLAN

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1.0 Introduction

The Mayfield West Phase 2 (MWPh2) Secondary Plan Area is a new settlement area in the southern portion of the Town of Caledon planned as a complete, mixed-use residential, commercial and institutional community that is compact, pedestrian and cyclist-friendly and transit-oriented. This Part C Report has been prepared specifically in support of the Secondary Land Use Planning Process for the MWPh2, Stage 2 lands and the associated Local Official Plan Amendment (LOPA). The MWPh2, Stage 2 study area is generally bounded by Mayfield Road to the south and Etobicoke Creek to the north. Chinguacousy Road provides the western boundary and Hurontario Street is the eastern boundary of the subject lands (See Figure 1).

1.1 Purpose

The purpose of this Part C LOPA Report is to identify a final implementation plan to support the Town of Caledon's Local Official Plan Amendment (LOPA) to include the MWPh2, Stage 2 lands immediately south of Etobicoke Creek as settlement area. This Part C Report should be read in conjunction with the three reports prepared in support of the Regional Official Plan Amendment (ROPA) prepared for this same area - Part A: Existing Conditions and Characteristics (Hensel Design Group Inc., March 2019), Part B: Proposed Land Use Impact Assessment, Submission 4 (Crozier & Associates, January 2020) and Part C: Preliminary Implementation Plan, Submission 2 (Crozier & Associates, January 2020).

1.2 Mayfield West Phase 2 Planning Process

As part of the previous Regional Official Plan Amendment process (ROPA 29) and subsequent Local Official Plan Amendment (OPA 222) to establish the Mayfield West Phase 2 Secondary Plan Area, in September 2013, the Town of Caledon endorsed a Land Use Framework Plan (August 29, 2013) for the purpose of informing various background and technical studies as well as the Secondary Plan Land Use Schedule (See Figure 2). While the Endorsed Framework Plan encompassed and depicted land uses for both the Stage 1 and the majority of the Stage 2 area, only the Stage 1 lands were subject to the Local and Regional Official Plan Amendments. In order to address the population and employment density targets for Designated Greenfield Areas in accordance with the 2019 Growth Plan (A Place to Grow), the Stage 2 area is now proposed to accommodate a minimum of approximately 71 people and jobs per hectare.

The Land Use Planning Process for the whole of the Mayfield West Phase 2 Area was initiated in late 2008. At that time, an initial characterization of the environmental features within the study area had been completed, as well a baseline assessment for the agricultural impacts, a characterization of the transportation systems, and an opportunities and constraints assessment for servicing the study area. Since 2008 the Town of Caledon Council has endorsed a Framework Plan for the Mayfield West Phase 2 Secondary Plan dated August 29, 2013, which includes both lands within the existing settlement area (Stage 1) and lands located outside the settlement area (Stage 2) (See Figure 1). Following the approval of the (Endorsed) Framework Plan by Caledon Town Council, the Mayfield West Landowners Group engaged in an exercise to prepare their own (Preferred) Framework Plan which is an amalgamation of the Draft Plan of Subdivisions prepared by each of the participating landowners. The most recent Preferred Framework Plan, dated August 8, 2019, is an evolution of the Endorsed Framework Plan and is intended to conform to the council approved MWPh2 Secondary Plan (See Figure 3). The plan has consideration for the approved MWPh2 Comprehensive Environmental Impact Study and Management Plan as prepared by AMEC Environment and Infrastructure dated December 2014 and the recommendations of the Community-wide Functional Servicing Report (FSR) prepared under separate covers.

1.3 CEISMP Study Process

In 2014, the Town of Caledon approved the Mayfield West Phase 2 Secondary Plan Comprehensive Environmental Impact Study and Management Plan (CEISMP) prepared by AMEC Foster Wheeler (formerly AMEC Environment and Infrastructure). Hensel Design Group Inc. (HDG), now Crozier & Associates, was retained by the Town to provide a gap analysis and CEISMP update to provide the necessary background information to support the Regional Official Plan Amendment (ROPA) required to permit a settlement area expansion for the Mayfield West Phase 2 "Stage 2" Secondary Plan Area. The Mayfield West Phase 2, Stage 2 ROPA CEISMP is comprised of three (3) Parts; Part A: Existing Conditions and Characterization, Part B: Subwatershed Impact Assessment and Part C: Detailed Analysis and Implementation. A ROPA CEISMP Part A Report was completed (HDG December 2017) which provides updated characterization of the existing conditions. The ROPA CEISMP Part B Report completed by Crozier & Associates (January 2020) represents the impacts assessment component of proposed development required to support the Mayfield West Phase 2 Stage 2 Settlement Area boundary expansion. A ROPA CEISMP Preliminary Part C Report was prepared to provide a preliminary strategy to implement the environmental goals, objectives, targets and other related recommendations and management measures during the design/development and approvals process. To support a settlement area expansion for the Mayfield West Phase 2 Stage 2 lands a Local Official Plan Amendment (LOPA) is also required. In addition to the ROPA CEISMP Parts A, B and Preliminary C reports, a more comprehensive LOPA CEISMP Part C report is required. The report herein builds upon the information provided in the ROPA CEISMP Preliminary Part C report and provides additional details related to the overall implementation plan for the Mayfield West Phase 2, Stage 2 lands.

2.0 Part A Summary

The Mayfield West Phase 2, Stage 2 ROPA CEISMP Part A Characterization assessment summarized the value, function, and sensitivity of the area resources associated with the respective Subwatersheds by study discipline (i.e. hydrology/ hydraulics, hydrogeology, water quality, stream morphology, aquatic and terrestrial ecology). Background and supplemental field data were assessed to establish the form, function and linkages of the environmental resources. From this work, preliminary constraints and objectives were developed relevant to the respective Subwatersheds under study.

3.0 Part B Summary

The Mayfield West Phase 2, Stage 2 ROPA CEISMP Part B Impact Assessment report included the full consideration of all previous work completed by AMEC and the updated constraints information which was then used to assess the potential impact of planned land use change on the area's resources. These impacts were assessed against a series of criteria which were established based upon conventional practice, as well as governing legislation, policies, and guidelines. The purpose of the Mayfield West Phase 2 Stage 2 Part B Impact Assessment was to conduct an analysis of the potential environmental impacts associated with proposed changes in land use conditions within the Mayfield West Phase 2 Stage 2 Area. The Part B Report evaluated potential land use scenarios, confirmed the Natural Heritage System (NHS) and proposed impacts mitigation and restoration opportunities. The report also described the results of the initial Impact Assessment as they related to the two (2) Framework Plans (Endorsed and Preferred) which have been provided for the Mayfield West Phase 2 Stage 2 Area. The results of the Part B Report confirmed the use of the Landowners Preferred Framework Plan as the ultimate preferred land use concept and identified the mitigation of environmental impacts resulting from proposed development.

4.0 Preliminary Part C Summary

The purpose of the preliminary Part C Report was to identify a preliminary implementation plan to support a Regional Official Plan Amendment (ROPA) to expand the Mayfield West Rural Service Centre. The settlement expansion includes all lands bounded by the Greenbelt along Etobicoke Creek to the north, Chinguacousy Road to the west, Mayfield Road to the south and the irregular boundary of the Mayfield West Phase 2, Stage 1 lands to the south. An additional parcel of land abutting the Greenbelt and Hurontario Street, which is the site of the Brampton Christian School, is also included. This Part C Report should be read in conjunction with the Part A: Existing Conditions and Characteristics (Hensel Design Group Inc., March 2019) and Part B: Proposed Land Use Impact Assessment (Crozier & Associates, January 2020). The ROPA CEISMP Part C Report (Crozier & Associates, January 2020) identified a preliminary strategy to implement the environmental goals, objectives, targets and other related recommendations and management measures during the design/development and approvals process. It was the intention that the final implementation plan would be further articulated during the completion of the Town of Caledon's Local Official Plan Amendment (LOPA, Part C Comprehensive Implementation Plan).

5.0 Background, Findings and Recommendations

The following background information summarizes the findings from previous study and analysis of the key considerations for design and implementation of the Preferred MWPh2, Stage 2 Framework Plan . The conclusions reached from the analysis provide recommendations for management approaches consistent with the environmental planning objectives noted below.

5.1 Environmental Planning Objectives

The environmental planning objectives for the Mayfield West Phase 2, Stage 2 lands are the same as those established for the Mayfield West Phase 2, Stage 1 planning area. The generalized environmental planning objectives address the following themes:

- Management of water resources including stormwater quality and quantity and protection/enhancement of fisheries resources
- Provision of both a site and feature based water balance that protects and maintains natural heritage features and aquatic resources
- Endeavour to create net increases in both wetland and woodland resources
- Maintain compliance with Federal and Provincial Species At Risk Acts
- Provide a Natural Heritage System that promotes connectivity between on site and off site natural heritage features for wildlife movement and community trail development

5.2 Hydrogeological Resources

5.2.1. Formation Overview

As described within the previous ROPA CEISMP Part A and B reports, the site is underlain by overburden soils dominated by clayey silt to silty clay Halton Till which range in thickness from 10 – 40 m. Fine grained glaciolacustrine sediments (silt and clay) were identified along the northern site boundary, immediately south of Etobicoke Creek. Modern alluvial deposits are present within the Etobicoke Creek valley and represent the only unconfined aquifer in the study area. Bedrock consists of red shale interbedded with grey to green limestone, known as the Queenston Formation.

The surficial geology of the study area is presented on Figure 4 and hydrostratigraphical cross

sections bisecting the subject properties are presented in Appendix A.

Within the study area, shallow groundwater flow within the analysis area is influenced by four (4) hydrostratigraphic units: the Halton Till Aquitard, Interstadial Sands and Silts, Alluvial Silt and Sand and Queenston Shale Bedrock. Each of these units are shown within the previously referenced cross sections, and are described below:

- The **Halton Till Aquitard** forms a regional aquitard limiting infiltration and groundwater flow within the study area. Groundwater flow through these soils is predominantly downwards (vertical), providing recharge (albeit limited) to deeper aquifers. Shallow groundwater flow is expected to mimic site topography and generally flow towards the south-southeast, with localized components flowing towards major creek valleys (i.e., Etobicoke Creek). Sand lenses are known to occur within the Halton Till, which can provide sufficient water for domestic supply and provide localized areas of groundwater discharge to support streams and wetlands.
    - The water table is expected to be shallow and perched water table conditions may form due to limited drainage through the overburden soils. Horizontal groundwater flow within both the shallow and perched groundwater systems is minor due to flat hydraulic gradients and low permeability clay till soils. Interflow occurring within the unsaturated zone of the shallow weathered soils/till is not considered significant and is typically limited to valley lands with steeper topography. Therefore, the aerial extent of this component of shallow groundwater flow is limited.

- The **Interstadial of Sands** and Silt deposits are occasionally present below the Halton Till. These unit is predominantly an unconfined silt and sand aquifer with hydraulic conductivities that range from 10-6 to 10-5 m/s. Locally, this unit may be interbedded with till soils as a result of deposition during multiple glacial advances and retreats. This unit is not expected to provide sufficient water to surface water features.

- **Modern Alluvial** deposits are present within the Etobicoke Creek valley and are located within the protected Greenbelt system. This unit primarily consists of unconsolidated deposits of sands and silts, with minor clay and gravel. While this unit is expected to be thin (1-3 m) it is considered a surficial or unconfined aquifer. Groundwater recharge is expected to be high within these soils and groundwater flow is expected to be towards discharge areas in Etobicoke Creek.

- The **Queenston Shale Bedrock**, which underlies the Halton Till Aquitard, acts as an aquitard unit that inhibits deep groundwater flow. Despite acting as an aquitard, the Queenston Shale contains zones near the bedrock/overburden interface that yields hydraulic conductivities with magnitudes great enough to permit conductance of significant volumes of water. These zones are typically found within the upper 5 m of the shale as weathered and fracture-rock layers.

5.2.2. Groundwater Levels and Flow

In 2017, WSP advanced a series of 8 boreholes and 16 monitoring wells for the Stage 1 and 2 lands in support of the below studies:

- Slope Stability and Streambank Erosion Analysis at Five Areas Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON (WSP 2017a)
- Geotechnical Investigation Sanitary Trunk Sewer on Mayfield West Phase 2, Caledon, ON (WSP 2017b)

Results of these investigations are presented in Tables 1 and 2 below. The investigations encountered between 3.31m and 16.7m of silty clay to silty clay/ clayey silt till underlying organic topsoil. Layers of silt to sandy silt were encountered in boreholes BH17-4, BH17-5, BH17-6, BH17-7, BH16-1, BH16-5, BH16-10, BH16-16, BH16-20, BH16-24, BH16-26, BH16-30 and BH16-35 ranging in thickness from 0.8 m to 5.3 m. These layers are interpreted to be lenses within the Halton Till unit. No significant aquifer units were identified.

Table 1: Groundwater Level Monitoring Summary – Slope Stability Study (WSP 2017a)

Well	Surface Elevation (masl)	Depth (m)	Groundwater Level – June 5, 2017 (mbgs)	Groundwater Level – June 5, 2017 (masl)
BH17-1	257.48	3.66	0.93	256.55
BH17-2	257.58	3.66	1.31	256.27
BH17-3	259.21	5.18	1.07	258.14
BH17-4	260.01	9.75	2.37	257.64
BH17-5	259.59	8.23	3.30	256.29
BH17-6	259.48	9.75	3.18	256.30
BH17-7	259.34	9.75	3.35	255.99
BH17-8	258.87	9.75	1.82	257.05

Table 2: Groundwater Level Monitoring Summary – Sanitary Trunk Sewer Study (WSP 2017b)

Well	Surface Elevation (masl)	Depth (m)	Groundwater Level – March 2016 (mbgs)	Groundwater Level – March 2016 (masl)
BH16-1	259.3	13.7	4.1	255.2
BH16-3	255.9	13.7	4.3	251.6
BH16-5	256.4	7.6	1.8	254.6
BH16-8	259.3	7.6	1.6	257.7
BH16-10	262.8	16.7	4.6	258.2
BH16-12	262.4	13.7	4.4	258.0
BH16-16	260.8	6.1	0.6	260.2
BH16-20	261.2	9.1	1.1	261.1
BH16-22	257.3	4.6	0.3	257.1
BH16-24	257.9	6.1	0.6	257.3
BH16-26	258.7	6.1	0.4	258.3
BH16-28	262.3	12.1	1.7	260.6
BH16-30	263.6	12.1	2.6	260.9
BH16-32	261.1	7.6	2.5	258.6
BH16-35	261.0	9.1	0.9	260.1
BH16-37	259.0	4.6	1.8	257.2
BH16-42	261.1	4.6	0.5	260.7
BH16-45	260.3	7.6	6.8	253.5
BH16-47	259.0	7.6	6.7	252.3

Water level elevations for the purpose of determining shallow groundwater flow direction were estimated from ground surface elevations from the site surveys.

In March 2017, the groundwater table for monitoring wells located within the Etobicoke Creek valley

were between 0.93 to 3.35 mbgs and are expected to represent the approximate seasonal high-water level. Additionally, groundwater monitoring wells located south of the Etobicoke Creek Valley and the Proposed Stage 2 lands were supplemented to understand the regional shallow groundwater flow within the study area. The groundwater table for monitoring wells located south of the Stage 2 lands (i.e., the Stage 1 Lands) ranged between 0.3 and 6.8 mbgs in June 2017. It is important to note however, that shallow groundwater levels change seasonally and in response to precipitation events.

Horizontal groundwater flow follows topography and is expected to flow north-west towards Etobicoke Creek, for lands to the north of the watershed drainage divide as shown in Figure 5. The lands located south of the drainage divide, the flow follows topography and is expected to flow south-east at the south-easterly most portion of the Stage 2 lands. Locally, the groundwater flow for areas south and east of the drainage divide will flow towards the east-northeast, towards the Etobicoke Creek located approximately 500 m to the east of the site. On the southern portion of the drainage divide, groundwater flow is towards the south within the Fletchers Creek Watershed. However, it is expected that due to the low permeability till soils, the dominant groundwater flow direction at the site is downwards towards the Queenston Formation Shale Aquifer, and not horizontally towards Etobicoke Creek.

Generally, it is expected that groundwater will enter the system through precipitation and snow melt events which slowly infiltrate surface soils. Horizontal groundwater flow follows topography and is expected to flow north-west towards Etobicoke Creek, for lands to the north of the watershed drainage divide as shown in Figure 5. For the lands located south of the drainage divide, the flow follows topography and is expected to flow south-east at the south-easterly most portion of the Stage 2 lands. Locally, the groundwater flow for areas south and east of the drainage divide will flow towards the east-northeast, towards the Etobicoke Creek located approximately 500 m to the east of the site. On the southern portion of the drainage divide, groundwater flow is towards the south within the Fletchers Creek Watershed. However, it is expected that due to the low permeability till soils, the dominant groundwater flow direction at the site is downwards towards the Queenston Formation Shale Aquifer, and not horizontally towards Etobicoke Creek.

5.2.3. Hydraulic Conductivity and Infiltration Estimates

To evaluate potential impacts to the groundwater regime, the hydraulic conductivity and associated infiltration rates of the underlying soils was estimated both through empirical single well response testing (slug tests), as well as through grain size analysis.

Single Well Response Tests

The hydraulic conductivity (K) of the geological material within the Mayfield West Phase 2 study was determined by completing single well response tests (i.e., slug tests) at BH6 (Terraprobe, 2009) and at MW11-2S, MW11-2D, MW11-3D, MW11-3S, MW11-4S and MW11-4D, by PECG staff in April 2018. Tests were completed by lowering a 1m long slug into each well to create a change in hydraulic head. Hydraulic conductivity vales were estimated by measuring the rate of change in recovery of the water level once the slug was inserted into the well (also known as a Falling Head Test). Once the Falling Head (FH) Test was terminated, the slug was removed and the subsequent rate of change in the water level was recovered (also known as a Rising Head (RH) Test).

Water levels in each well were recorded using a datalogger set to record water levels at 2 second intervals. Manual water levels measurements were also collected during the tests in order to gauge recovery. Tests were terminated once either 80% recovery had been attained, or 30-minute had elapsed, whichever occurred first. K values were then calculated from the displacement-time data using the Hvorslev (1951) method for confined aquifers, as modelled by Aqtesolv™ software

The measured K-values ranged from between $3.8x10^{-09}$ m/sec and $1.7x10^{-06}$ m/sec with a geometric mean $8.2x10^{-08}$ m/sec for the silty clay till and sandy silt units. A summary of the single well response tests performed, as well as descriptions of the stratigraphic units tested, are summarized in Table 3. A summary of the calculated hydraulic conductivity values is also provided in the table. The complete results from the Aqtesolv™ modelling are presented in PECG (2018).

Table 3: Single Well Response Test Results

Sampling Date	Borehole	Screened Zone (mbgs)	Soil Description	K (m/sec)
Apr-18	MW11-2D	7.6 to 10.1	Silty Clay Till	$2.2x10^{-07}$
Apr-18	MW11-2S	3.1 to 4.6	Silty Clay Till	$2.6x10^{-08}$
Apr-18	MW11-3D	7.6 to 9.1	Silty Clay	$3.8x10^{-09}$
Apr-18	MW11-3S	3.2 to 4.7	Clayey Silt	$2.5x10^{-07}$
Apr-18	MW11-4D	7.5 to 9	Sandy Silt Till	$2.1x10^{-07}$
Apr-18	MW11-4S	3 to 5.5	Clayey Silt	$1.7x10^{-06}$
Oct-09	BH6	5.8 to 8.8	Clayey Silt	$1.3x10^{-08}$
Geometric Mean				$8.2x10^{-08}$

Grain Size Analysis (Puckett et al. Method)

A supplementary method of determining hydraulic conductivity was completed using the Puckett et al. method of grain size analysis for clay dominant soils. The grain size samples were collected by Terraprobe (2014) and underwent sieve and hydrometer analysis and confirmed the field descriptions of the soils (Table 5). Pucketts method determined that the hydraulic conductivity of the soils on site range from $1.5x10^{-09}$ to $1.2x10^{-06}$ m/sec, with higher k-values typically noted for samples collect near the surface, where topsoil and fill are present. It is important to keep in mind that the shallow weathered zone likely has a much higher permeability than the deeper more competent till, with hydraulic conductivity values in the range of 10^{-06} to 10^{-07} m/sec.

Table 4: Grain Size Analysis Hydraulic Conductivity Results

Sampling Date	Borehole	Sample No	Sample Depth (mbgs)	Soil Description	% Clay	K (m/sec)
Nov-11	**MW11-4D**	9	9.15 to 9.6	Silt and Sand	20	$8.4x10^{-07}$
Nov-11	**MW11-2D**	7	3 to 3.5	Silty Clay Till	32	$7.8x10^{-08}$
Nov-11	**MW11-3D**	5	6.1 to 6.55	Silty Clay	52	$1.5x10^{-09}$
Nov-11	**MW11-1D**	2	0.75 to 1.22*	Clayey Silt	30	$1.2x10^{-07}$
Nov-11	**TP-17**	4	3.96	Clayey Silt	27	$2.1x10^{-07}$
Nov-11	**TP-14**	1	0.18*	Sandy Silt Till	18	$1.2x10^{-06}$
Nov-11	**TP-10**	3	0.91*	Silt Till	22	$5.7x10^{-07}$
Nov-11	**TP-2**	2	0.61*	Sandy Silt Till	29	$1.4x10^{-07}$
Geometric Mean						$1.5x10^{-07}$
Near Surface Geometric Mean						$3.3x10^{-07}$

Infiltration Estimates

Infiltration estimates were determined using empirical methods for converting between saturated

hydraulic conductivity and percolation from the Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA, 2010). Based on this method, the relationship between infiltration and hydraulic conductivity is expressed as $y = 6E^{-11x3.7363}$. Near surface hydraulic conductivities were obtained through single well response testing and Pucketts method for hydraulic conductivities of clay dominant soil samples. Based on the near surface samples collected between 0 to 1.5 mbgs, hydraulic conductivity values and k-values collected for soils at depth between 3 mbgs and 6 mbgs, it is conservatively estimated that near surface infiltration rates are between 12 mm/hr and 17 mm/hr for the pre-development (existing) conditions. Actual infiltration rates are expected to be higher as a result of near surface secondary porosity such as rootlets and cracks in the soil. Additional site-specific infiltration testing is recommended during the Site Plan Application stage of the development.

5.2.4. Water Balance Considerations

Site development leads to an increase in impervious area, which results in increased runoff and a decrease in infiltration volumes. Groundwater recharge supports local groundwater levels, natural features and aquifers. Groundwater discharge supports stream baseflow, which can occur both locally and within the greater watershed area. Changes to groundwater recharge and discharge have the potential to negatively impact groundwater resources and groundwater supported natural features such as watercourses, wetlands and shallow aquifers.

To evaluate potential impacts to the groundwater regime, a water balance was completed in both the pre- development and post-development conditions for the Preferred Framework Plan.

5.2.4.1. Pre-Development Water Balance – Preferred Framework Plan

As described within the ROPA CEISMP Part B Report, a pre-development water budget was calculated over the site area of the Preferred Framework Plan using a monthly soil-moisture balance approach as described in Thornthwaite and Mather (1957) to determine the average annual ET and surplus under a pre- and post-development condition. The 1981 – 2010 Climate Normals from the Toronto Lester B. Pearson International Airport Meteorological Station were used to obtain monthly precipitation and temperature data. A soil moisture storage value of 200 mm was determined based on the Ministry of the Environment (MOE) Stormwater Management Planning and Design Manual (MOE, 2003), and site-specific knowledge of soil and vegetation conditions.

The calculated actual evapotranspiration (AET) based on the Thornthwaite and Mather monthly water balance model is approximately 497 mm/year, or about 63% of the total precipitation. The actual evapotranspiration is calculated based on a potential evapotranspiration (PET) and soil-moisture storage withdrawal. Monthly PET is estimated using monthly temperature data and is defined as a water loss from a homogeneous vegetation-covered area that never lacks water (Thornthwaite, 1948; Mather, 1978). The calculated PET for the study area is 628 mm/year, or about 80% of the total precipitation.

The estimated water surplus for the site is about 289 mm/year (37% of total precipitation). The water surplus has two components: a runoff component which is the overland flow that occurs when soil moisture capacity is exceeded, and an infiltration component. Using the method in the MOE SWM manual and MOEE Hydrogeological Technical Information Requirements for Land Development Applications 1995) for guidance, and partitioning the site based on soil type and land use characteristics, it was estimated that the weighted average runoff was approximately 56% (162 mm/year) of the surplus with the remaining 44% (127 mm/year) infiltrating (Refer to Table 5A). Using a total site area of 160.1 ha, it is estimated that about 203,628 m3/year infiltrates and 259,162 m3/year runs off the site. The modern alluvial deposits in the Etobicoke Creek valley and protected greenlands systems enhance recharge and infiltration rates throughout the Mayfield West Phase 2

Stage 2 Lands, as opposed to the Mayfield West Phase 2 Stage 1 Lands.

The estimated infiltration rate of 127 mm/year (Table 5A) is higher than other values reported for sites with Halton Till soils, including 90 mm/year estimated by Kassenaar and Wexler (2008), and 50 – 100 mm/year for Halton Till soils provided in the Source Water Protection Plan for the area (TRCA, 2012). This higher value is a result of the flat site topography and site-specific vegetation type, including large areas of wetland and woodlot communities that promote infiltration. The value is also slightly higher than the value reported for the Mayfield West Phase 2 Stage 1 Lands, which was 118 mm/year (see EIR/EIS Report), which is also due to the large area of riparian wetland and alluvial soils associated with the Etobicoke Creek valley.

5.2.4.2. Post-Development Water Balance (Unmitigated) – Preferred Framework Plan

A post-development water budget for the Preferred Framework Plan area was completed using a soil-moisture balance approach (Thornthwaite and Mather, 1957) combined with the proposed land use for the plan. Each land use was assigned an impervious factor based on its percentage of imperviousness cover and TRCA guidelines. Over impervious surfaces, the available water for infiltration and runoff is considered to be precipitation minus evaporation (P-E).

Impervious surfaces prevent infiltration, and the absence of vegetation removes the Transpiration (T) component from the water balance. Evaporation is small compared with T and is estimated to be approximately 10% of annual precipitation. Therefore, on impervious surfaces the surplus is the 30-year average precipitation (786 mm/year) minus 10% for a total of 707 mm or 0.707 m.

Over retained pervious surfaces (i.e., Greenbelt Lands), the average annual water surplus was maintained at the pre-development rate of 289 mm/year. On pervious surfaces on developed lands, the annual water surplus was increased to 298 mm/year based on changes to soil moisture storage, as described in Part A. Infiltration and runoff estimates for the pervious surfaces were then calculated by multiplying the water surplus value by the infiltration factors determined for the pre-development conditions to account for the limitations of the natural soil types. Infiltration factors on pervious surfaces have also been slightly modified to account for fill placement, post-development vegetation growth and soil compaction.

Based on the Preferred Stage 2 Framework Plan, without mitigation the total infiltration and runoff volumes for the site following development are estimated to be 152,247 m3/year and 570,638 m3/year, respectively. The results of the calculations are provided in Table 5B. This represents a decrease in infiltration by approximately 25% from the pre-development scenario (51,381 m3/year), and an increase in runoff by approximately 220% from pre-development (311,475 m3/year). The 25% decrease in infiltration assumes no mitigation strategies are in place, and therefore represents a "worst case" scenario

5.2.4.3. Post Development Water Balance (Mitigated) – Preferred Framework Plan

To mitigate the increase in runoff in the Stage 2 lands under the Preferred Framework Plan, the implementation of Low Impact Development (LID) measures has been proposed. Due to the limited number of common element spaces in the study area, the LID strategy has focused on Private Lot (PL) LIDs to maintain the pre-development infiltration. These LIDs are focused on rear yards along one side of the property line and will be constructed as granular infiltration trenches or vegetative swales. The conceptual LID layout is presented on Figure 6 and focus on a 'treatment train' approach, with a particular emphasis on managing runoff at the source and increasing infiltration. Details on each Private Lot as well as two Common Element (CE) LID measures is provided in Table 6. A typical design schematic is also presented on Figure 6 for the PL LIDs. The LID design parameters are based on the WMM User's Guide (2010), Rawls et al. (1983), and the CVC and TRCA Planning and Design Guide (2010).

Tables 5A, B & C: Pre, Post and LID Mitigation-Development Water Balance – Preferred Framework Plan

A - STAGE 2 LANDS - PRE-DEVELOPMENT WATER BALANCE

Land Use	Total (ha)	Impervious Factor	Impervious area (ha)	Water Surplus on Impermeable Surfaces (m/a)	Run off from Impervious Area (m3/a)	Estimated Pervious Area (ha)	Water Surplus on Vegetated Pervious Areas (m/a)	Runoff Coefficient	Runoff Volume From Pervious Area (m3/a)	Infiltration Coefficient	Infiltration Volume from Pervious Area (m3/a)	Total Runoff Volume (m3/a)	Total Infiltration Volume (m3/a)
Agricultural Lands (Halton Till)	100.1	0	0	0.707	0	100.12	0.289	0.60	173,608	0.40	115,739	173,608	115,739
Forest/Wetland	1.0	0	0	0.707	0	1.01	0.289	0.50	1,459	0.50	1,459	1,459	1,459
Agricultural Lands (Glaciolacustrine Clay)	39.0	0	0	0.707	0	38.98	0.289	0.60	67,028	0.40	45,061	67,028	45,061
Valley Lands (Riparian)	20.0	0	0	0.707	0	20.01	0.289	0.30	17,067	0.70	41,369	17,067	41,369
Total	**160.1**		**0**		**0**	**160.12**		**56%**	**259,162**	**44%**	**203,628**	**259,162**	**203,628**

B - STAGE 2 LANDS - POST DEVELOPMENT WATER BALANCE WITH NO MITIGATION

Land Use	Total (ha)	Impervious Factor	Impervious area (ha)	Water Surplus on Impermeable Surfaces (m/a)	Run off from Impervious Area (m3/a)	Estimated Pervious Area (ha)	Water Surplus on Vegetated Pervious Areas (m/a)	Runoff Coefficient	Runoff Volume From Pervious Area (m3/a)	Infiltration Coefficient	Infiltration Volume from Pervious Area (m3/a)	Total Runoff Volume (m3/a)	Total Infiltration Volume (m3/a)
Low-Density Residential	40.67	0.29	11.79	0.707	83,433	28.88	0.298	0.60	51,630	0.40	34,420	135,063	34,420
Redirected Low-Density Res Rooftop Runoff to Stage 1 Lands	-0.60	1.00	-0.60	0.707	-4,244	0.00	0.298	1.00	0	0.00	0	-4,244	0
Med-Density Residential	18.72	0.43	8.05	0.707	56,943	10.67	0.298	0.60	19,079	0.40	12,719	76,022	12,719
Commercial	2.88	1.00	2.88	0.707	20,373	0.00	0.298	0.70	0	0.30	0	20,373	0
School	7.36	0.79	5.81	0.707	41,131	1.55	0.298	0.60	2,764	0.40	1,842	43,895	1,842
Open Space	2.40	0.07	0.17	0.707	1,188	2.23	0.298	0.40	2,661	0.60	3,991	3,849	3,991
SWM Pond	3.89	0.50	1.95	0.707	13,759	1.95	0.298	0.70	4,057	0.30	1,739	17,816	1,739
Greenland B	1.74	0.00	0.00	0.707	0	1.74	0.289	0.50	2,514	0.50	2,514	2,514	2,514
Greenbelt	49.43	0.00	0.00	0.707	0	49.43	0.289	0.35	49,998	0.65	92,854	49,998	92,854
ROW	31.55	1.00	31.55	0.707	223,185	0.00	0.298	1.00	0	0.00	0	223,185	0
Environmental Protection	1.50	0.00	0.00	0.707	0	1.50	0.289	0.50	2,168	0.50	2,168	2,168	2,168
Buffer	0.00	0.00	0.00	0.707	0	0.00	0.298	0.60	0	0.40	0	0	0
High Density	0.00	0.71	0.00	0.707	0	0.00	0.298	0.60	0	0.40	0	0	0
Total	**159.5**		**61.60**		**435,768**	**97.94**			**134,870**		**152,247**	**570,638**	**152,247**

C - STAGE 2 LANDS - POST DEVELOPMENT WATER BALANCE WITH LID MITIGATION

Land Use	Total (ha)	Impervious Factor	Impervious area (ha)	Water Surplus on Impermeable Surfaces (m/a)	Run off from Impervious Area (m3/a)	Estimated Pervious Area (ha)	Water Surplus on Vegetated Pervious Areas (m/a)	Runoff Coefficient	Runoff Volume From Pervious Area (m3/a)	Infiltration Coefficient	Infiltration Volume from Pervious Area (m3/a)	Total Runoff Volume (m3/a)	Total Infiltration Volume (m3/a)
Low-Density Residential	40.67	0.29	11.79	0.707	83,433	28.88	0.298	0.60	51,630	0.40	34,420	135,063	34,420
Redirected Low-Density Res Rooftop Runoff to Stage 1 Lands	-0.60	1.00	-0.60	0.707	-4,244	0.00	0.298	1.00	0	0.00	0	-4,244	0
Med-Density Residential	18.72	0.43	8.05	0.707	56,943	10.67	0.298	0.60	19,079	0.40	12,719	76,022	12,719
Commercial	2.88	1.00	2.88	0.707	20,373	0.00	0.298	0.70	0	0.30	0	20,373	0
School	7.36	0.79	5.81	0.707	41,131	1.55	0.298	0.60	2,764	0.40	1,842	43,895	1,842
Open Space	2.40	0.07	0.17	0.707	1,188	2.23	0.298	0.40	2,661	0.60	3,991	3,849	3,991
SWM Pond	3.89	0.50	1.95	0.707	13,759	1.95	0.298	0.70	4,057	0.30	1,739	17,816	1,739
Greenland B	1.74	0.00	0.00	0.707	0	1.74	0.289	0.50	2,514	0.50	2,514	2,514	2,514
Greenbelt	49.43	0.00	0.00	0.707	0	49.43	0.289	0.35	49,998	0.65	92,854	49,998	92,854
ROW	31.55	1.00	31.55	0.707	223,185	0.00	0.298	1.00	0	0.00	0	223,185	0
Environmental Protection	1.50	0.00	0.00	0.707	0	1.50	0.289	0.50	2,168	0.50	2,168	2,168	2,168
Buffer	0.00	0.00	0.00	0.707	0	0.00	0.298	0.60	0	0.40	0	0	0
High Density	0.00	0.71	0.00	0.707	0	0.00	0.298	0.60	0	0.40	0	0	0
Rear-Yard LID													50,848
Total	**159.5**		**61.60**		**435,768**	**97.94**			**134,870**		**152,247**	**570,638**	**203,095**

Pre-to-Post Development Change	% Change	**220%**	**-25%**
	Difference (m3)	**311,475**	**-51,381**
Pre-to-Post Development Change with Mitigation	% Change	**220%**	**0%**
	Difference (m3)	**311,475**	**-533**

Through the agency review of the Stage 1 stormwater management reports, it was agreed that the Town will not process any ECA applications for LID features that do not extend beyond two lots. These "small" LID measures do not qualify for the ECA process and only LIDs extending onto more than two properties require an ECA.

Based on the Preferred Framework Plan the proposed LID mitigation will add 50,848 m3/year of infiltration under post-development conditions (Table 5C and 6). This represents a pre-to-post development change of 0% for infiltration and +220% for runoff. This plan balances the pre-to-post development water budget in accordance with TRCA and CVC requirements.

To balance the surface water contributions to the Southwest Wetland (CVC) located in the northern area of the Mayfield West Stage 1 lands, 0.6 ha of rooftop drainage will be redirected from the Stage 2 Low-Density Residential lands to maintain the wetland hydroperiod. The total volume of runoff directed to the Stage 1 Lands is 4,244 m3/a (Table 6B). Figure 6 highlights the location and area of the Low-Density Residential rooftop land (SW-S1) to be redirected. The redirecting of rooftop drainage has minimal impacts on the Stage 2 post-development water balance when replaced by appropriate LID measures.

Fletchers Creek and Etobicoke Creek watershed divides bisect the Stage 2 lands, with roughly 65% of the development within the Etobicoke Creek watershed and the remaining 35% within the Fletchers Creek watershed. To maintain infiltration and runoff rates across both watersheds, 65% of the LID contributing area was allocated to lands within the Etobicoke Creek watershed and the remaining 35% of LID's were placed within the development footprint of the Fletchers Creek watershed.

Additional LIDs to be considered in future studies for both water balance and water quality erosion control include, but are not limited to:

- Downspout disconnection
- Additional topsoil depth
- Permeable pavement (subject to municipal approvals for applications on public property)
- Swales (in particular in greenlands corridors, parks and school blocks, at SWM outfalls, adjacent to rear lots, privately owned side/rear yard, overland flow easements
- Additional Infiltration facilities such as soakaway pits (pending confirmation of viability)
- Rain gardens and rain water harvesting

5.2.4.4. Groundwater Recharge

While the study area is predominantly underlain by low permeability aquitard materials, it still functions as a groundwater recharge area, albeit limited by the surficial soils. The area with highest infiltration potential is found along the Etobicoke Creek valley, which is part of the protected Greenbelt Lands. These lands will remain undeveloped and naturalization of the greenbelt lands over time is expected to increase the recharge function of this area.

Based on the pre-development water budget for the Preferred Stage 2 Framework Plan approximately 203,628 m3/year infiltrates and 259,162 m3/year becomes runoff. Without mitigation, infiltration will be reduced by 51,381 m3/year or 25% (Table 5B). As demonstrated through the use of predominantly rear-yard infiltration trenches and vegetative swale LID features the pre-to-post development infiltration volumes have been maintained for the site.

For the Preferred Framework Plan, the pre-to-post development water budget can be reasonably

maintained through the use of LID measures. No adverse impact to groundwater recharge or discharge is expected with the implementation of LID measures.

5.2.4.5. Groundwater Discharge

While the study area is predominantly underlain by low permeability aquitard materials, it still functions as a groundwater recharge area, albeit limited by the surficial soils. The area with highest infiltration potential is found along the Etobicoke Creek valley, which is part of the protected Greenbelt Lands. These lands will remain undeveloped and naturalization of the greenbelt lands over time is expected to increase the recharge function of this area.

Table 6: Proposed LID Design Details – Preferred Framework Plan

PRIVATE LOT (PL) LID SUMMARY								Conceptual LID Design													LID Water Balance Infiltration Contribution	
Watershed	LID Number	LID Location	Name	Type	Water Table Elevation (masl)	Post-construction Surface Elevation (masl)	Depth of water table below LID (mbgs)	Length (m)	Side Slope	LID Trench Width (m)	Area (m2)	Depth of Water in LID (m)	Porosity	LID Volume (m3)	Contributing Area (m2)	Runoff Coefficient	Rainfall Event Storage (mm)	Storage Volume (m3)	percolation Rate (mm/hr)	Drawdown Time (hr)	mm/yr of rainfall based on Event Storage	Infiltration Volume (m3/a)
Etobicoke Creek	PL-40	Private	Rear-yard catchbasin style LID	Vegetative Swale	256.5	260.5	4.0	390.0	3:1	1.2	468.0	0.3	0.4	56.2	5,850	0.6	15.0	52.7	12.0	25.0	651.0	2,285.0
	PL-41	Private	Rear-yard catchbasin style LID	Vegetative Swale	256	259.0	3.0	570.0	3:1	1.2	684.0	0.3	0.4	82.1	8,089	0.6	15.0	72.8	12.0	25.0	651.0	3,159.7
	PL-42	Private	Mid-block catchbasin style LID	Infiltration Trench	258	261.0	3.0	120.0	1:1	1.2	144.0	0.4	0.4	23.0	3,804	0.6	10.0	22.8	12.0	33.3	560.0	1,278.1
	PL-44	Private	Rear-yard catchbasin style LID	Vegetative Swale	258	261.0	3.0	380.0	3:1	1.2	456.0	0.4	0.3	54.7	5,890	0.6	15.0	53.0	12.0	33.3	651.0	2,300.6
	PL-45	Private	Mid-block catchbasin style LID	Infiltration Trench	258	261.0	3.0	180.0	1:1	1.2	216.0	0.4	0.4	34.6	5,706	0.6	10.0	34.2	12.0	33.3	560.0	1,917.2
	PL-59	Private	Rear-yard catchbasin style LID	Vegetative Swale	258	261.0	3.0	350.0	3:1	1.2	420.0	0.45	0.3	56.7	5,420	0.6	15.0	48.8	12.0	37.5	651.0	2,117.0
	PL-60	Private	Rear-yard catchbasin style LID	Vegetative Swale	258	263.0	5.0	160.0	3:1	1.2	192.0	0.45	0.3	25.9	2,455	0.6	15.0	22.1	12.0	37.5	651.0	958.7
	PL-61	Private	Rear-yard catchbasin style LID	Vegetative Swale	257	258.0	1.0	710.0	3:1	1.2	852.0	0.40	0.3	102.2	11,457	0.6	12.5	85.9	12.0	33.3	612.0	4,206.9
	PL-63	Private	Mid-block catchbasin style LID	Infiltration Trench	259	263.0	4.0	80.0	1:1	1.2	96.0	0.45	0.4	17.3	2,536	0.6	10.0	15.2	12.0	37.5	560.0	852.1
	PL-64	Private	Rear-yard catchbasin style LID	Vegetative Swale	258	261.0	3.0	220.0	3:1	1.2	264.0	0.4	0.3	31.7	3,270	0.6	15.0	29.4	12.0	33.3	651.0	1,277.4
	PL-65	Private	Mid-block catchbasin style LID	Infiltration Trench	259	263.0	4.0	110.0	1:1	1.2	132.0	0.45	0.4	23.8	3,487	0.6	10.0	20.9	12.0	37.5	560.0	1,171.6
	PL-68	Private	Rear-yard catchbasin style LID	Vegetative Swale	257	259.0	2.0	430.0	3:1	1.2	516.0	0.4	0.30	61.9	8,576	0.6	10.0	51.5	12.0	33.3	560.0	2,881.4
	PL-69	Private	Rear-yard catchbasin style LID	Vegetative Swale	257	259.0	2.0	430.0	3:1	1.2	516.0	0.4	0.40	82.6	8,576	0.6	15.0	77.2	12.0	33.3	651.0	3,349.6
	CE17	Public	Veg Swale in school park block	Vegetative Swale	257	259.0	2.0	160.0	3:1	3.0	480.0	0.4	0.30	57.6	7,360	0.6	12.5	55.2	12.0	33.3	612.0	2,702.6
	CE18	Public	Veg Swale in open space block	Vegetative Swale	257	259.0	2.0	180.0	3:1	3.0	540.0	0.3	0.30	48.6	7,360	0.6	10.0	44.2	12.0	25.0	560.0	2,473.0
Fletchers Creek	PL-46	Private	Mid-block catchbasin style LID	Infiltration Trench	259.5	261.5	2.0	120.0	1:1	1.2	144.0	0.4	0.4	23.0	3,107	0.6	10.0	18.6	12.0	33.3	560.0	1,044.1
	PL-47	Private	Mid-block catchbasin style LID	Infiltration Trench	260	262.0	2.0	50.0	1:1	1.2	60.0	0.4	0.4	9.6	1,521	0.6	10.0	9.1	12.0	33.3	560.0	511.1
	PL-48	Private	Mid-block catchbasin style LID	Infiltration Trench	259.5	261.5	2.0	60.0	1:1	1.2	72.0	0.4	0.4	11.5	1,800	0.6	10.0	10.8	12.0	33.3	560.0	604.8
	PL-49	Private	Mid-block catchbasin style LID	Infiltration Trench	256.5	257.5	1.0	160.0	1:1	1.2	192.0	0.4	0.4	30.7	5,072	0.6	10.0	30.4	12.0	33.3	560.0	1,704.2
	PL-51	Private	Mid-block catchbasin style LID	Infiltration Trench	256	257.0	1.0	160.0	1:1	1.2	192.0	0.4	0.4	30.7	5,072	0.6	10.0	30.4	12.0	33.3	560.0	1,704.2
	PL-52	Private	Mid-block catchbasin style LID	Infiltration Trench	256.5	257.5	1.0	140.0	1:1	1.2	168.0	0.4	0.4	26.9	4,384	0.6	10.0	26.3	12.0	33.3	560.0	1,473.0
	PL-53	Private	Mid-block catchbasin style LID	Infiltration Trench	256.5	257.5	1.0	150.0	1:1	1.2	180.0	0.4	0.4	28.8	4,384	0.6	10.0	26.3	12.0	33.3	560.0	1,473.0
	PL-54	Private	Mid-block catchbasin style LID	Infiltration Trench	256	257.0	1.0	110.0	1:1	1.2	132.0	0.4	0.4	21.1	3,226	0.6	10.0	19.4	12.0	33.3	560.0	1,083.8
	PL-55	Private	Rear-yard catchbasin style LID	Vegetative Swale	255.5	256.5	1.0	270.0	3:1	1.2	324.0	0.4	0.4	51.8	8,559	0.6	10.0	51.4	12.0	33.3	560.0	2,875.8
	PL-56	Private	Mid-block catchbasin style LID	Infiltration Trench	256	257.0	1.0	160.0	1:1	1.2	192.0	0.4	0.4	30.7	4,800	0.6	10.0	28.8	12.0	33.3	560.0	1,612.8
	PL-57	Private	Mid-block catchbasin style LID	Infiltration Trench	256	257.0	1.0	190.0	1:1	1.2	228.0	0.4	0.4	36.5	5,700	0.6	10.0	34.2	12.0	33.3	560.0	1,915.2
	PL-58	Private	Mid-block catchbasin style LID	Infiltration Trench	256	257.0	1.0	190.0	1:1	1.2	228.0	0.4	0.4	36.5	5,700	0.6	10.0	34.2	12.0	33.3	560.0	1,915.2
								6,230.0						**1,096.7**	**143,160.4**			**1,005.8**				**50,848.4**

Based on the pre-development water budget for the Preferred Framework Plan approximately 203,628 m3/year infiltrates and 259,162 m3/year becomes runoff. Without mitigation, infiltration will be reduced by 51,381 m3/year or 25% (Table 5B). As demonstrated through the use of predominantly rear-yard infiltration trenches and vegetative swale LID features the pre-to-post development infiltration volumes have been maintained for the site.

For the Preferred Framework Plan, the pre-to-post development water budget can be reasonably maintained through the use of LID measures. No adverse impact to groundwater recharge or discharge is expected with the implementation of LID measures.

5.2.4.6. Aquifers and Groundwater Users

The majority of the subsurface geology of the study area consists of either low permeability glaciolacustrine silty and clay, or low permeability silty clay till aquitard materials overlying Queenston Shale bedrock. No significant aquifers were identified through recent borehole drilling (WSP, 2017a and WSP, 2017b) or through a search of the MOECC water well database (See Figure 7).

While generally considered a poor aquifer, local groundwater users obtain potable water from the Queenston Shale bedrock aquifer formation, which at the site, is confined below the thick Halton Till Aquitard. The Queenston Shale is located between 10 – 40 m below ground surface, and the majority of the groundwater recharge to this aquifer is derived from upgradient areas closer to the Niagara Escarpment or areas where the shale is hydraulically connected to permeable aquifer materials. Therefore, due to the depth and confined nature the Queenston Shale aquifer, changes to land use or construction activities at the site will not adversely affect local groundwater users.

While the tableland portion of the site has a limited recharge function, it is important to recognize that even the limited groundwater recharge function of the site helps support groundwater levels and the overall water budget in the Etobicoke Creek and the Fletcher's Creek watersheds. Reasonable mitigation measures to balance the pre-to post-development infiltration rates that are commensurate with the physical properties of the on-site soils should be considered as part of the stormwater management plan.

5.2.4.7. Groundwater Supported Natural Features

No significant groundwater supported wetlands are present in the study area. A linear riparian mineral meadow marsh wetland is present along much of the length of Etobicoke Creek, however this feature is primarily supported by surface runoff, local recharge and shallow groundwater moving laterally within the Etobicoke Creek valley, and not by groundwater discharge from the site. Groundwater recharge within the Etobicoke Creek Valley will be maintained post-development, and no adverse impact to this feature is anticipated.

5.2.4.8. Source Water Protection

The Mayfield West Phase 2, Stage 2 site is not located within a wellhead protection zone (WPZ) or within a significant groundwater recharge area (SGRA). However, small parts of the Mayfield West Phase 2, Stage 2 boundary overlay a Highly Vulnerable Aquifer (HVA) as identified in the CTC Source Water Protection Plan near the boundary with the Etobicoke Creek valley (See Figure 8). This means a portion of the lands overlays an area underground that contains water that is or may be withdrawn for human use and is particularly susceptible to contamination because of its location near the ground's surface or where the overlying material in the ground above is highly permeable. While site-specific borehole investigations did not identify permeable materials or aquifer units at or within 10 m of surface within the Mayfield West Phase 2, Stage 2 Hydrogeology Study Area, the policies of the CTC Source Water Protection Plan should be considered for land use planning.

The CTC Source Protection Plan includes low and moderate threat policies for Highly Vulnerable Aquifers encouraging municipalities to require a salt management plan to be submitted as part of a complete application for development proposals. Through source protection plans approved under the Clean Water Act, 2006 and the Provincial Policy Statement, 2014, the Region and Town are required to implement necessary restrictions on development to protect, improve or restore vulnerable surface and ground water and protect designated vulnerable areas. Draft Regional Official Plan policies have been developed to address the CTC Region Source Protection Plan and PPS, 2014 direction for Highly Vulnerable Aquifers. The draft policies provide direction to the local municipalities to consider requirements for salt management plans and contaminant management plans as a condition of development approval in HVAs.

Draft Regional Official Plan policies have been prepared to address the CTC Plan and PPS requirements as follows:

2.2.8.2.42
Work with the area municipalities to encourage land uses considered to be a high risk to groundwater that are located within areas of high aquifer vulnerability to implement best management practices including requiring the submission of a contaminant management plan as a condition of development approval.

2.2.8.2.43
Encourage the area municipalities to require a salt management plan to reduce the future use of salt as a condition of development in highly vulnerable aquifers in accordance with the applicable source protection plan.

It is recommended that the Town of Caledon have regard for the proposed Regional Official Plan policies by including policies in the Secondary Plan to require the development of salt management plans and contaminant management plans, as appropriate, through development application approvals.

5.2.4.9. Stormwater Management

Six (6) stormwater management ponds will be constructed on the stage 2 lands (SWM Pond No. 1, No. 5, No. 6, No. 7, No. 8 and No. 9). SWM Pond No.1 is located north of Mayfield Road, west of McLaughlin Road. The remaining SWM ponds are located along the northern boundary of the site adjacent to the Etobicoke Creek valley.

In May 2017, WSP completed a series of groundwater monitoring wells at each SWM pond location along the Etobicoke Creek valley. The stabilized groundwater level and groundwater elevation observed at each pond on June 1 and June 5, 2017 are presented below.

- SMW Pond No. 5 (BH17-4): 1.99 to 2.37 m below existing grade (Elev. 258.02 to 257.64 m)
- SWM Pond No. 6 (BH17-5): 3.24 to 3.30 m below existing grade (Elev. 256.35 to 256.29 m)
- SMW Pond No. 7 (BH17-6 and BH17-7): 3.02 to 3.35 m below existing grade (Elev. 256.19 to 255.99 m)
- SWM Pond No. 8 (BH17-8): 1.82 to 1.86 m below existing grade (Elev. 257.05 to 257.01m)
- SMW Pond No. 9 is located within the lands of a non-participating landowner

In January 2016, WSP completed a borehole drilling program for site servicing. BH16-5 was completed adjacent to SWM Pond No. 1. The stabilized groundwater level and groundwater elevation observed on March 21, 2016 was:

- SMW Pond No. 1 (BH16-5): 1.80 m below existing grade (Elev. 245.55 m)

The geology at each SWM Pond based on the borehole drilling results is presented below:

- SMW Pond No. 1 (BH16-5): Silty clay till to silty sand till to a depth of 10.21 m where bedrock complex was encountered. A layer of silt was identified between 7.16 and 8.69 m. The soils were grey below 3.0 m.
- SMW Pond No. 5 (BH17-4): Silty clay till to a depth of 9.75 m. A layer of sandy silt was identified between 5.6 and 6.4 m. The soils were grey below 3.0 m.
- SWM Pond No. 6 (BH17-5): Silty clay till to silty sand till to a depth of 5.6 m. Between 5.6 m and 8.23 m, a layer of very stiff silty clay (5.6 to 7.16 m) followed by a later of silt (7.16 to 8.23 m). The soils were grey below 4.1 m.
    - A test pit was completed by TerraProbe (2014) at this SWM Pond location to a depth of 4.9 m. Clayey to silty till soils were encountered over the full length and the test pit was dry upon completion.
- SMW Pond No. 7 (BH17-6 and BH17-7): Silty clay till to a depth of 9.75 m. A layer of silt was identified between 5.60 and 7.16 m in BH17-6 and between 4.10 and 7.16 m in BH17-7. The soils were grey below 4.1 m.
- SWM Pond No. 8 (BH17-8): Silty clay till to a depth of 9.75 m. The soils were grey below 3.1 m.
- SMW Pond No. 9 is located within the lands of a non-participating landowner and does not have site specific borehole information.

While the final design of the SWM Ponds is not yet completed, they are expected to range between approximately 4.5 and 5.5 m in depth below existing grade. As the water levels were measured in early and late spring (March and June), they are expected to approximately represent the seasonal high water table. The permeability of the silty clay till and sandy silt for the Stage 2 lands is described in Table 3. The measured K-values ranged from between $3.8x10^{-09}$ m/sec and $1.7x10^{-06}$ m/sec with a geometric mean $8.2x10^{-8}$ m/sec for the silty clay till and sandy silt units.

Considering that the bottom on each SWM Pond will be founded in low permeability till soils (10^{-8} m/sec K-value) and no aquifer units were identified below the ponds, minor interactions with groundwater are not expected to adversely impact groundwater quality or quantity. Based on the above Palmer hydrogeologists are of the opinion that the existing native Halton Till Aquitard is sufficient to protect groundwater quality at each of the SWM Pond location. From a hydrogeological perspective, the added cost and risk of installing a clay liner (and potentially an underdrainage system to protect against heave of the clay liner) is not warranted as it does not increase the protection of groundwater resources within the Stage 2 lands beyond what the native till aquitard already provides.

5.2.4.10. Construction Dewatering

Although the final layout and design of stormwater management facilities, on-site buildings, and linear infrastructure was not complete at the time of this report, given the consistency of the geological and hydrogeological conditions at the site, a preliminary assessment of construction dewatering and permitting requirements can be made.

The groundwater table is expected to range between approximately 261 masl near the watershed divide between Etobicoke and McLaughlin Creeks, to approximately 251 masl along the southwestern portion of the study area. Silty clay glaciolacustrine or silty clay till soils are present at surface to a depth of at least 10 m and were shown to have a hydraulic conductivity that ranges between $4.1x10^{-06}$ to $4.1x10^{-09}$ m/s, with a geometric mean of $1.4x10^{-07}$ m/s. The radius of water table drawdown would be limited under these conditions.

A registration on the MECP Environmental and Sector Registry (EASR) is required for all construction

related water taking between 50,000 and 400,000 L/day. A Permit to Take Water (PTTW) is required for all water construction takings exceeding 400,000 L/day. Given the presence of low permeability soils present at the site construction, dewatering rates on the order of 50,000 L/day or less would be expected for a typical excavation. An assessment should be made during the Site Plan application stage if an EASR registration is required for site development. Due to the low permeability soils and the expected limited dewatering rates, no adverse effects to local water wells or natural features would be expected from construction dewatering.

5.2.5. Hydrogeological Recommendations

Based on the foregoing information presented in Section 4.2, the following recommendations and management strategies are applicable to the development as the applications progress towards detailed design, and site/draft plan applications:

- To adequately address water balance, low impact development features should be implemented in accordance with the conceptual LID plan presented within this report (Figure 6). Based on the completed calculation, adherence to this plan should result in no notable changes in infiltration to the subject lands.
- A contaminant management plan should be prepared for all applicable areas which are classified as Highly Vulnerable Aquifer.
- As the developments progress towards Site Plan Applications, the requirements for PTTW / EASR should be evaluated.
- Additional site-specific infiltration testing should be completed as the developments progress to Site Plan Applications to verify infiltration rates and confirm LID design.

5.3 Surface Water Resources

The planning for future watercourses within the Preferred Framework Plan built upon the constraint ranking and characterization provided in the AMEC Part C Report and further refined in the Mayfield West Phase 2, Stage 2 ROPA CEISMP Part A, B and C reports. Under the AMEC 2014 Part C report, a constraints map was included (Hensel Design Group Inc., 2014, Rev. 1). This report will utilize and include the latest completed constraints mapping as shown in Figures 9 and 10.

5.3.1. Existing Surface Water Conditions

The Mayfield West Phase 2, Stage 2 lands lie within the headwaters of Etobicoke Creek and Fletchers Creek. The Mayfield West Phase 2 FSR (Urbantech 2019) addressed drainage characteristics for the MWPh2 lands in detail. The MWPh2 lands are situated at the approximate drainage divide between the Etobicoke Creek and Fletcher's Creek watersheds.

The north portion of the MWPh2 lands is within the Etobicoke Creek watershed. The Etobicoke Creek valley traverses the site from west to east and is contained within the greenbelt limits, with the exception of a portion of the Stage 2 lands north of the Spine Road which is bisected by the Etobicoke Creek. The MWPh2 lands include some minor headwater features that convey runoff from the various Etobicoke Creek headwater subcatchments in the study area. The south portion of the MWPh2 lands is within the Fletcher's Creek watershed and similarly includes a number of small headwater swale features that drain towards the existing outlets along Mayfield Road. The land use in both catchments (within the Stage 1 / Stage 2 development limits) is predominantly agricultural, which has led to modification of the headwater features by farming activities. In general, the headwater features are poorly defined with ephemeral or intermittent flow.

In terms of external drainage, a 20.9 ha area within the Fletcher's Creek watershed west of Chinguacousy Road drains from west to east via a culvert into the MWPh2 lands. This includes drainage from the Chinguacousy Road ROW south of the Etobicoke Creek – Fletcher's Creek watershed divide. A large area west of Chinguacousy Road drains into the Etobicoke Creek tributaries within the MWPh2, Stage 2 lands. The Chinguacousy Road ROW north of the watershed divide drains into this feature as well.

A series of low points along Mayfield Road results in local drainage catchments along the road that are conveyed by the existing Mayfield Road culverts from north to south, towards the existing and future developments in the City of Brampton. Similar to the Chinguacousy Road drainage, the drainage divide between the Etobicoke Creek and Fletcher's Creek watershed defines the north/south drainage patterns for the existing McLaughlin Road ROW. There are no existing culverts crossing McLaughlin Road. The roadside ditches along the Hurontario Street ROW drain existing runoff to the Etobicoke Creek outlets to the north and south.

As was previously outlined in the Part A, B and C ROPA reports, the Mayfield West Phase 2, Stage 2 lands contain wetland natural features, some of which form part of the Etobicoke Creek Headwaters Natural Complex, a Provincially Significant Wetland (PSW). These wetlands are primarily fed by surface runoff, local recharge, and shallow lateral groundwater movement. Hence, the Etobicoke Creek is a sensitive water feature within proximity to the Secondary Plan.

5.3.2. Proposed Surface Water Conditions

As outlined in the AMEC Part C report and further refined through the Mayfield West Phase 2, Stage 2 CEISMP Part A, B and C reports, stormwater management strategies have been proposed to maintain drainage features and balance surface water contributions, as well as manage and maintain surface water quality and quantity through use of stormwater management infrastructure.

Wetlands

Preservation of drainage features to wetlands is to be maintained. To balance the surface water contributions to the Southwest Wetland (Greenlands A Woodlot / Wetland) located in the northern area of the Mayfield West Stage 1 lands, rooftop drainage will be redirected through Rooftop Drain Collectors (RDCs) from the Stage 2 Low-Density Residential lands to maintain the wetland hydroperiod. Figure 8 in the Part B ROPA (see Figure 6 herein) highlights the location and area of the Low-Density Residential rooftop land to be redirected. The redirecting of rooftop drainage has minimal impacts on the Stage 2 post-development water balance when replaced by appropriate LID measures. The FSR also notes that a LID feature will be provided at the outlet of the RDC to provide flow dissipation and encourage infiltration to better mimic existing conditions. The total contributing drainage area, outlet location and flow controls will be refined during detailed design.

Watercourses

The Mayfield West Phase 2, Stage 2 lands lie within the headwaters of Etobicoke Creek and Fletchers Creek. A Management Plan is required to provide consideration for the geomorphological and fisheries/aquatic characteristics of these features per the previously noted performance measures evaluation criteria. The headwater features of Etobicoke Creek and Fletchers Creek are shown on Figure 11.

Stormwater Management

The Mayfield West Comprehensive Environmental Impact Study (EIS) and Management Plan (MP) (AMEC, December 2014) provided recommendations for stormwater management under post-development land use conditions and indicated preliminary locations for SWM facilities.

The primary component of the SWM strategy involves maintaining the approximate pre-development watershed divide between the Etobicoke Creek and Fletcher's creek as well as the individual subcatchments/outlets within each watershed. This approach ensures that, with appropriate SWM controls, there is no change to the overall drainage patterns and sources of drainage to each outlet aside from that associated with increased imperviousness.

Stormwater Management Facilities within the Etobicoke Creek Subwatershed were sited using the following approach:

- Stormwater management facilities are required within the future urban development draining to existing receiving systems to be retained in the post-development condition in order to minimize requirements for drainage area diversions and associated over-control requirements for stormwater management, as well as fill requirements for the future development.
- Stormwater management facilities adjacent to linkages, woodlots, regulated watercourses are to be located outside of these features and systems where possible.
- The number and location of stormwater management facilities along the Etobicoke Creek are to be established in order to replicate the distribution of inflow locations under the pre-development condition.
- The total number of facilities is to be minimized to the extent possible in order to minimize operation and maintenance requirements for the Town of Caledon.

Under proposed conditions, the minor headwater reaches along the Etobicoke Creek valley will be utilized for the Etobicoke Creek SWM facility outfalls (Ponds 5-8), and others will be maintained to continue to provide surface conveyance (although with reduced contributing drainage areas).

The existing drainage catchments flow towards multiple outlets along Mayfield Road and Etobicoke Creek. In order to avoid the requirement for SWM controls (i.e., stormwater management ponds) at each existing outlet, the outlets were consolidated as described in the preceding section. The consolidation was done for practical grading and implementation reasons. Six SWM facilities were originally proposed along Mayfield Road; however, the Landowners Preferred Framework Plan (August 2019) proposed only four SWM facilities.

Furthermore, the Fletcher's Creek culvert outlets along Mayfield Road will be consolidated into 4 major storm outlets that will service some of the MWPh2 lands, with catchment areas draining to SWM Facility 1 and other consolidated outlets to Fletcher's Creek. This is in accordance with the approved Mayfield Road EA and is consistent with the proposed drainage patterns in Block 51-2 (between Chinguacousy Road and McLaughlin Road).

The major and minor drainage systems for the subject lands have been designed to convey storm runoff to the proposed SWM facilities prior to discharge to the consolidated Fletcher's Creek / Etobicoke Creek outlets.

5.3.3. Hydrological Impacts

A Hydrologic Impact Assessment was completed in the Mayfield West Phase 2, Stage 2 CEISMP Part B report (Crozier & Associates, 2020). The following objectives have been applied for the hydrologic and hydraulic component of the impact assessment:

- Future development and stormwater management practices are to provide requisite erosion control for protection of the downstream watercourses to ensure they remain stable.
- While the AMEC Hydrologic and hydraulic analyses in the Part B EIS (AMEC 2014) have been

completed for three development scenarios (existing, post-development with no SWM controls, post-development with SWM controls), their findings with respect to peak flows and flow control requirements are superseded (as directed by TRCA) by the 2013 "Etobicoke Creek Hydrology Update Study" by MMM Group. This study indicates the target flows for various catchments contributing to the Etobicoke Creek. The AMEC EIS targets for stormwater management regarding Fletcher's Creek remain unchanged.

- In addition to the foregoing, the long list of alternatives for stormwater management includes the application of source controls (i.e. Low Impact Development Best Management Practices) within the respective development areas, as well as a combination of source controls and end-of-pipe facilities. Various criteria have been applied and evaluated as part of other initiatives in order to establish the functional basis for determining the requisite capture rate and extent of application of LID infiltration BMP's, including water balance targets, water quality targets, and erosion control targets; however, questions and concerns regarding the long-term operation of these systems, primarily in a residential setting, has generally limited the extent to which these systems can be considered in assessing and establishing formal stormwater management criteria. Consequently, these practices are generally recognized as providing informal benefits toward stormwater quality and quantity control, however, are typically not considered when establishing a formal stormwater management plan.

As mentioned above, the Etobicoke Creek Watershed targets have been identified in the Etobicoke Creek Hydrology Update Study (MMM Group, 2013). In general, the VO2 model completed in the study indicates that frequency flows would increase downstream of the proposed development areas to the outlets of the MWP2 Area in the absence of SWM controls. This is an expected outcome of urbanization. Adequate sizing / design of end-of-pipe facilities can mitigate these increases. Target flow and volumetric rates were established in the AMEC EIS for Fletcher's Creek and Etobicoke Creek. The MMM Group study supersedes the results of the AMEC EIS with respect to Etobicoke Creek and recommends over-control of post-development flows from the MWPh2 area to 60% of the existing flows determined in the Etobicoke Creek Hydrology Update Study in order to prevent exceedance of existing targets downstream.

With respect to Regional control, it was found that control was not necessary for the majority of the subject lands that were evaluated under the post-development land use scenario. TRCA has indicated that lands not previously considered by the Etobicoke Creek Hydrology Update Study as potential development should provide Regional flow control. With respect to the MWPh2, Stage 2 lands, this generally applies to the lands between the greenbelt and Chinguacousy Road.

Furthermore, the Phase 2 Stage 2 lands are located in the Alloa Drain Extension catchment area. As required by the TRCA and Town, the existing flows in Etobicoke Creek will be matched through the use of the SWM facilities controlling flows to the targets established in the Etobicoke Creek Hydrology Update. Therefore, there will be no increase above these targets and hence no impact to the Alloa Drain Extension catchment flows. The Drainage Area Exchange drawing prepared by Urbantech demonstrated that the net change to the Etobicoke Creek drainage area (within the Alloa Drain Extension catchment) is minimal. As previously mentioned in the Part B Study, the Alloa Drain Extension report will have to be updated (by others) to reflect the final Stage 2 Draft Plan land uses.

5.3.4. Stormwater Management Requirements

Hydrologic analyses have been completed in order to evaluate the effectiveness of conventional stormwater management practice within the development area to mitigate the impacts of the proposed development with respect to increased risk of downstream flooding predicted upon controlling post-development levels for all events up to the 100 year.

The MMM Group Etobicoke Creek results indicate that post-development flows within the Etobicoke Creek Watershed would be adequately controlled if end-of-pipe facilities achieve the over-control target of 60% of existing flows. The AMEC EIS results indicate that stormwater management for the portion of the MWP2 Area within the Fletcher's Creek Subwatershed would generally control post-development flows to or below pre-development levels if the target flows and volumes are achieved at the end of pipe facilities. Additional analyses at the downstream Wanless Drive locations have confirmed that for the stormwater management facility sizing applied, post-development flows would be 10 % below pre-development levels.

Both the AMEC EIS targets for Fletcher's Creek and the Etobicoke Creek Hydrology Update targets were established independent of ultimate land use (i.e., on a flow per hectare basis) and therefore the proposed land use plan will not alter the flow targets (only the volume requirements will be impacted by the proposed impervious coverage and drainage area to each facility).

The AMEC EIS provided recommendations for stormwater management under post-development land use conditions and indicated preliminary locations for SWM facilities. The primary component of the SWM strategy involves maintaining the approximate pre-development watershed divide between the Etobicoke Creek and Fletcher's creek as well as the individual subcatchments/outlets within each watershed. This approach ensures that, with appropriate SWM controls, there is no change to the overall drainage patterns and sources of drainage to each outlet aside from that associated with increased imperviousness.

To control post-development drainage areas to pre-development flow rates, SWM design criteria was established, including the following requirements:

- Ensure that existing flow rates downstream of the subject lands are not exceeded under post-development conditions, thereby providing flood protection for properties downstream of the MWPh2 area;
- Provide adequate drawdown time / erosion control to protect the form and function of watercourses downstream of the SWM facilities;
- Ensure that the MECP-recommended stormwater quality treatment of runoff is provided;
- Maintain recharge volumes through the use of low impact development and other practices; and
- Maintain water balance to wetland features.

The following specific SWM criteria were established for the MWPh2 area:

Permanent Pool Volume - each stormwater management facility within MWPh2 within the Fletcher's Creek Subwatershed and Etobicoke Creek Watershed must meet the Enhanced (Level 1) criteria as per the MECP SWM Planning and Design Manual (March 2003).

Extended Detention / Erosion Control – A key element of the SWM strategy for developing lands is the determination of erosion thresholds, which dictate release rates from stormwater ponds to receiving creek systems. Erosion thresholds are based on the susceptibility of bed and bank material at the most sensitive reach downstream of the proposed stormwater outfall to be eroded and transported downstream. Practically, assessment of the stability of the channel materials at a representative grain size is compared to channel dimensions to determine a critical threshold discharge for entrainment; that discharge is then converted to a unit discharge per areal unit (most often expressed as cubic meters per second per hectare). When interpreted on an individual stormwater pond basis, the contributing area for the pond is multiplied by the unit discharge, thereby determining the appropriate release rate. Based on AMEC's approved erosion threshold

analysis and post-development land use modelling, the following target volumes and release rates were established:

Fletcher's Creek 250m³/impervious ha, released at 0.00025 m³/s/ha

Etobicoke Creek 325m³/impervious ha, released at 0.00031 m³/s/ha

Quantity Control – As detailed within the Crozier CEISMP Part B report, unit rates and volumetric storage criteria for quantity control were established by previous work completed by AMEC (2014) and MMM Group (2013). Based on previous modelling completed, pre-development unit runoff rates and required volumetric storage criteria (assuming no LID's) are as follows:

Fletchers Creek 25- year storm: 575m³/impervious ha, released at 0.008 m³/s/ha
100-year storm: 1215m³/impervious ha, released at 0.080 m³/s/ha

Etobicoke Creek Catchment/ outlet- specific based on Etobicoke Creek Hydrology update Study

Pond 9 Release rates governed by capacity of storm sewer on Humberside Drive downstream of Pond 9 (approximately 2.22m³/s)

The storage requirements for the Etobicoke Creek facilities are based on the Etobicoke Creek Hydrology Update study existing (60% over control) unit rates multiplied by the pre-development areas within the development area draining to each future outlet (or, in the case of Pond 9, the capacity of the existing storm sewer). The post-development drainage areas shall be controlled to the pre-development targets to establish the volume requirements. In accordance with the Etobicoke Creek Hydrology Update study, the 12-hour AES storms are considered to be the most conservative storm distributions for evaluating the storage requirements.

Regional Control – AMEC completed a Regional Storm assessment to establish the Regional flow control requirements for the Fletcher's Creek subwatershed north of Mayfield Road (Regional Storm SWM Assessment for Mayfield West Phase 2 within the Fletcher's Creek Subwatershed, 2013). The unit rates for Regional control are noted below, and in comparison with the 100-year rates noted in the preceding section, the Regional storm volume and release rate targets are similar to the 100-year targets and are similarly cumulative (measured from the permanent pool elevation).

Fletcher's Creek Regional storm: 1225m³/impervious ha, released at 0.09 m3/s/ha

Etobicoke Creek Regional storm: no control required per TRCA*

*Regional storm control was also found to be not required by MMM Group in the 2013 Etobicoke Creek Hydrology Update study and confirmed by TRCA, with the exception of lands not studied in the AMEC works (i.e. lands recently added to the Stage 2 limits along Chinguacousy Road and the North Lands), which are required to provide 214m³/ha of Regional storage unless future studies suggest otherwise.

5.3.5. Stormwater Management Recommendations

As outlined through the ROPA Parts A, B and C CEISMP, the Mayfield West Phase 2, Stage 1 Comprehensive Environmental Impact Study (CEIS) and Management Plan (MP) (AMEC, December 2014) provided recommendations for stormwater management under post-development land use conditions and indicated preliminary locations for SWM facilities. The Mayfield West Phase 2, Stage 2

CEISMP augments the Stage 1 CESIMP. The Phase 2 ROPA Part B report details the stormwater management strategy for the settlement boundary expansion area. Therefore, the Stormwater Master Plan is established through both the AMEC 2014 Stage 1 CEISMP and the 2020 Stage 2 CEISMP.

Five (5) end-of-pipe stormwater management facilities (wet ponds) are proposed to treat the post-development drainage areas within the Mayfield West Phase 2, Stage 2 area. It is noted that an additional facility east of McLaughlin Road, north of the Spine Road within the Stage 2 lands will be required to service the future employment lands. This pond may be a privately-owned SWM facility and has been shown conceptually since the survey and constraint mapping in the vicinity of the future employment lands has not been completed.

Ponds 1, 5, 6, 7, and 8 are situated in the Stage 2 lands. Of these Stage 2 facilities, Ponds 1, 6 and 8 are required to service the Stage 1 lands and are described in detail herein, in addition to Ponds 2, 3, 4 and 9 (See Figure 3, Preferred Framework Plan).

Other SWM facility types (dry ponds, wetlands, etc.) were not considered for this development. Consistent with the SWM strategy used in the adjacent MW1 and Block 51-1 / 51-2 communities, wet ponds were determined to be more appropriate in terms of meeting the quality and quantity control requirements for the subject lands.

The SWM targets / sizing criteria for the MWPh2 lands were established in the approved Mayfield West Comprehensive Environmental Impact Study (EIS) and Management Plan (AMEC, December 2014) and the Etobicoke Creek Hydrology Update Study (MMM Group, 2013).

The proposed SWM facility locations are similar to those presented in the approved Mayfield West Comprehensive Environmental Impact Study (EIS) and Management Plan (AMEC, December 2014). The SWM facilities in the Preferred Framework Plan have been situated in the proposed locations for the following reasons:

- To make use of existing/natural low points in terrain to minimize earthworks/cut and fill operations and maintain existing drainage patterns as much as possible;
- To maintain a permanent pool and drain into the receiving channels / existing / planned storm sewer outlets;
- To locate SWM facilities adjacent to the NHS and maintain flow input locations along the receiving channels were possible;
- To minimize storm sewer infrastructure size and avoid potential servicing crossing conflicts; the contributing areas to the SWM facilities are generally limited to 60 ha;
- To optimize land use by maximizing tableland and serviceable area; and
- To provide orientation most suitable for thermal mitigation/shading.

The SWM facilities within the Fletcher's Creek watershed are located at the proposed drainage outlets along Mayfield Road or the greenway corridors immediately upstream of Mayfield Road. These locations represent the low points of the respective catchments. Similarly, the SWM facilities in the Etobicoke Creek watershed are positioned at the natural low points of the catchment areas. With the exception of SWM Facility #9, the Etobicoke Creek SWM facilities have been situated within the Greenbelt limit, beyond the development area in an effort to optimize the future Stage 2 land use plan and meet the provincially mandated density targets for MWPh2 Stage 2. Note that potential increases in densities / imperviousness associated with the Stage 2 lands beyond those accounted for at this time could trigger retrofits to the any receiving pond in Stage 1, or necessitate other onsite measures in the Stage 2 lands.

5.3.6. Hydraulic Impacts

As outlined in ROPA Part B and further addressed in ROPA Preliminary Part C reports, through proper implementation of the SWM criteria and strategy established above, the hydrologic analyses have confirmed that increases in the frequency flows arising from the proposed development in the Fletcher's Creek and Etobicoke Creek system will be mitigated such that the channel flows will be less than or equal to existing conditions (see Appendix B). This will ensure that the flood elevations for the 2-year to 100-year events are unchanged relative to existing conditions and that there are no flooding concerns upstream or downstream of the subject lands. With respect to the Regional storm (Hurricane Hazel), as required by the MNRF in the River & Stream Systems: Flood Hazard Limit technical guidelines, the existing and proposed Regional flood modelling and mapping are to be based on the uncontrolled Regional flows. The existing flood mapping for Etobicoke Creek presented in Appendix B herein was based on the detailed LiDAR / topographic mapping for the existing ground conditions and the future uncontrolled Regional flows calculated in the Etobicoke Creek Hydrology Update Study.

Under the proposed land use scenario, the proposed SWM facility encroachments and grading along the Etobicoke Creek greenbelt / development limits alters the future Regional floodplain. The preliminary post-development flood modelling and mapping is presented digitally in Appendix B herein and is based on the future uncontrolled Regional flows from the Etobicoke Creek Hydrology Update Study and the preliminary grading for the subject lands. It has been confirmed that the water levels upstream of the subject lands (i.e., west of Chinguacousy Road) are not impacted by the encroachments. Refer to Appendix B, Drawing 102 for the proposed greenbelt grading.

As agreed with TRCA staff, compensating cuts within the Greenbelt / valley are proposed to mitigate the fill in the existing floodplain related to the pond encroachments and MEC-RO7 (See Figure 11). The proposed cut locations are identified on Drawing 102C (see Appendix B, herein) and are located on the FP Mayfield West (Caledon) Inc. and the Mayfield Developments Inc. properties. An incremental cut/fill analysis was completed to demonstrate the gain or loss in storage at various elevations within the valley. The analysis was limited to comparing the cut/fill within the impacted area only. The results indicate that on average, there is a net cut (provision of additional storage) within the system. The proposed flood mapping confirms that the compensating cut results in a reduction in the overall water levels relative to existing conditions. Refer to Appendix B for the incremental cut/fill results. The proposed floodplain is illustrated on Drawing 102B and cut/fill details on Drawing 102C. As shown on Drawing 102B, the post-development Regional water levels will be slightly below (1cm to 7cm) the existing Regional water levels in the vicinity of the culvert and proposed channel works. The existing flood elevations are shown on Drawing 101B. Refer to Appendix B for the flood mapping and corresponding calculations.

A riparian storage analysis was also completed to compare the existing and proposed storage within the Etobicoke Creek valley. The riparian analysis indicates that generally, the proposed storage matches the existing storage during the Regional storm but are slightly lower during the 2-year to 100-year events. The loss of riparian storage for these events is not due to filling the floodplain, but rather due to improvements / reductions in the water levels associated with the proposed cuts in the valley. In other words, the cuts provide more flow area for these events which results in a reduction in the riparian water levels (and riparian storage). This is unlikely to result in negative downstream impacts. It should be noted that the steady-state approach to analyze riparian storage between each cross-section does not entirely capture all the available storage in the system, which is better characterized by the incremental cut/fill. If necessary, a dynamic routing analysis can be completed to confirm that the slight reduction (ranging from 4% to 6%) has little or no effect on peak flow routing. Refer to Appendix B for the riparian storage results.

5.3.7. Surface Water Recommendations

Based on the foregoing, the following recommendations and management strategies are applicable to the development as the applications progress towards detailed design, and site/draft plan applications:

- SWM facility locations and sizes should be consistent with the recommendations of this report to address surface water quantity and quality considerations;
- SWM facilities must provide adequate drawdown time and erosion control to protect the form and function of watercourses downstream of the SWM facilities;
- SWM facilities must provide MECP-recommended stormwater quality treatment of runoff;
- SWM facilities must maintain recharge volumes through the use of low impact development and other practices;
- Alterations to the Regional floodplain must be addressed through compensating cuts within the Greenbelt to mitigate the fill in the existing floodplain related to the SWM facility encroachments and MEC-R07;
- To minimize the potential for erosion and off-site transport of sediment into surface water and wetland features, the project will implement Best Practises related to erosion and sediment control (ESC) for the protection of wetland.

5.4 Water Quality Protection

The AMEC (2014) report contained no water quality baseline data for Etobicoke Creek which lies in the Greenbelt immediately to the north of the proposed Mayfield West Phase 2, Stage 2 development area. However, the Endorsed Framework Plan and Preferred Stage 2 Preferred Framework Plan indicate that several Storm Water Management (SWM) ponds that will collect surface runoff from the Mayfield West development will be situated in the Greenbelt and discharge into Etobicoke Creek. Therefore, it is important to document baseline water quality conditions within Etobicoke Creek.

In 2013 The Toronto Region Conservation Authority (TRCA) established a water quality monitoring station (Mayfield EC3) on Etobicoke Creek near Hurontario Street. The purpose of establishing this station was to obtain baseline water chemistry for Etobicoke Creek prior to development of the Mayfield West Community project (TRCA pers. comm.). The monitoring station is downstream of the proposed development (see Figure 1). It would be prudent to also establish a water quality monitoring upstream of the Mayfield West community in the future if the goal is to measure potential impacts of the development and SWM ponds on Etobicoke Creek.

The ROPA Part B Report outlines detailed water chemistry data obtained from the TRCA for monitoring events from May 2013 to March 2017, via 39 sampling events downstream of the proposed development. The samples underwent water chemistry testing to form an analyte baseline for the following parameters: Alkalinity & Hardness, Ammonia, Aluminum, Conductivity, Chloride, E. Coli, Iron, Nitrate, Dissolved Oxygen, Total Phosphorus, Total Suspended Solids, and Turbidity.

The collected data forms baseline values for each parameter by which the management plan may be evaluated to mitigate deleterious changes in water chemistry.

The long-term freshwater quality guideline for chloride was exceeded on most sampling dates. Chloride levels in Etobicoke Creek are likely elevated as a result of the use of road salts in the watershed. Escherichia coli (E. coli) is an indicator of faecal contamination for fresh waters. The E.

coli levels in Etobicoke Creek ranged from 0 to very high (11,000 counts/100 mL). E. coli levels exceeded the recommended guideline for contact with users (i.e. swimming) on several occasions.

In general, metal concentrations in Etobicoke Creek were quite low and generally below their respective Provincial Water Quality Objectives (PWQOs). Notable exceptions were aluminum, arsenic and iron.

The TRCA is conducting fisheries surveys in Etobicoke Creek in the vicinity of the proposed Mayfield West Community development every 3 years, and benthic invertebrate surveys every year. The available information provides a robust database of biological conditions in the study area. The information suggests that water quality in Etobicoke Creek in the study area is somewhat degraded.

The concentration of total Phosphorous in Etobicoke Creek ranged from 0.028 to 0.78 mg/L, with only one value less than the PWQO (0.03 mg/L). Most Total P levels were greater than 0.1 mg/L, so Etobicoke Creek contains elevated levels of Phosphorous. This can lead to excessive plant growth and lower dissolved oxygen levels during the growing season.

In summary, the TRCA is collecting a comprehensive database of baseline water quality conditions in Etobicoke Creek prior to the Mayfield West development. The baseline data indicates impairment of some water quality parameters with elevated levels of chloride, bacteria and nutrients.

5.4.1. Water Quality Recommendations

Based on the foregoing information, the following recommendations and management strategies are applicable to the development as the applications progress towards detailed design, and site/draft plan applications:

- Consideration should be given to establishing a second water quality monitoring station upstream of the proposed Mayfield development to provide more robust water quality data.
- Potential changes to water quality from residential development should be mitigated by proper design of stormwater management ponds to meet MECP-recommended discharge quality criteria.
- Buffers and riparian enhancement should reduce agricultural runoff to reduce nutrient loading under existing conditions.
- Consideration should also be given to implementing thermal mitigation techniques such as cooling trenches and bottom draws within stormwater management facilities.

5.5 Erosion Control

The successful delivery of various components of the MWPh2 NHS and development areas requires an implementation plan / Erosion & Sediment Control strategy that considers the following items:

- maintaining the environmental integrity of the existing NHS throughout development
- sequencing of site works to deliver the NHS and infrastructure in a timely manner
- erosion and sediment prevention and control including stabilization of open spaces;
- co-operation amongst the developers, consultants and approval agencies; and,
- creativity and flexibility in solving implementation challenges

Ideally, the construction of the MWPh2 development projects would occur for all works in each subcatchment at once; however, this will not be possible in all cases due to non-participating ownerships and different development timing amongst the participating owners. Therefore, the

preparation of detailed design submissions should be accompanied by construction staging and sequencing plans prior to construction approvals to demonstrate when/where/how works will be implemented.

To ensure protection of the natural environment following the development works, a monitoring program is required to evaluate the existing conditions on the subject lands and assess if mitigation measures for development impacts are functioning as designed. The Comprehensive and Adaptive Management Plan / Monitoring Plan (CAMP) will address post-construction long-term monitoring of surface water quality and quantity, groundwater, and terrestrial / aquatic parameters. Baseline monitoring for these parameters has already commenced as per the Mayfield West Phase 2, Stage 1 EIS/EIR (Hensel Design Group, March 2019).

As it relates to the construction phase of development, the following monitoring strategy is recommended:

- Surface water quantity monitoring is not required, since the erosion & sediment control (E&SC) strategy will be designed to ensure that existing flow paths are maintained (where possible). The runoff volumes during construction will be similar to existing conditions and therefore no significant impacts are expected.
- Surface water quality monitoring during construction is required at temporary construction outlets via frequent visual inspections. For outlets related to high risk areas (high erodibility of soils and high sensitivity of the downstream receiver) as determined in consultation with the agencies through detailed design, turbidity monitoring will be recommended if required. Turbidity is a suitable indicator of total suspended solids at the temporary construction outfalls from the site. This can be easily measured using a hand-held turbidimeter. In general, the E&SC design will ensure that adequate quality treatment is provided prior to discharge via a treatment train of best management practices typically terminating in a sediment control pond or sediment trap. As E&SC is a dynamic process, the location of the surface water monitoring may change depending on the location of the works and outfalls. Therefore, the visual monitoring and turbidity monitoring of selected locations does not supersede the requirements of the Comprehensive Adaptive Management Plan (CAMP) long-term monitoring plan (baseline to construction to post-construction) at permanent locations.
- Groundwater level monitoring in nearby wells is a standard requirement from the Region that will be continued throughout the duration of construction to ensure that there are no impacts to adjacent wells.
- E&SC design and construction monitoring specific to the NHS systems will be required during detailed design of the NHS.
- No terrestrial or aquatic monitoring is required during construction as this will be completed as a requirement of the CAMP.

Rigorous erosion and sediment control measures will be designed, implemented and maintained throughout the construction period. At detailed design / site alteration, an Erosion and Sediment Control Plan will be prepared and designed in conformance with the Town 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:

- The limit of natural features (and associated buffers) and the overall Natural Heritage System

(NHS) limits shall be staked and temporary fencing provided to keep machinery out of sensitive areas. Fencing shall be located outside of the NHS with the exception of small intrusions for LIDs, grading, trails, stormwater management / storm outfalls, and habitat enhancements.

- Disturbed areas within buffers including exposed soils resulting from tilling should be seeded at the time of sediment control installation to avoid erosion and establishment of invasive species.
- All elements of the E&SC and SWM strategies (including temporary SWM facilities, swales, slopes, etc.) should be stabilized immediately following construction, where practical;
- Practical measures for the maintenance existing drainage patterns and water levels in wetlands and watercourses during construction must be identified and implemented, where feasible;
- Sediment control fence, tree preservation and snow fence will be placed prior to commencement of earthworks;
- Logistics/construction plan will be implemented to limit the size of disturbed areas, minimizing the non-essential clearing and grading areas. This plan shall identify exposed soils areas following initial grading and servicing and recommended immediate stabilization of inactive / exposed areas;
- Additional E&SC measures including barriers will be required to protect and avoid compaction / fouling of areas intended for LIDs.
- Temporary sediment ponds in the location of ultimate facilities, or other locations as deemed necessary based on development timing / participating ownership;
- 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 where required;
- 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; and,
- The "multiple barrier approach" will be applied to all construction stages to ensure erosion is prevented rather than reduced. Recommended measures are to be installed prior to the initiation of the earthworks and grading.

Reference will be made to the recent CSA Erosion and Sediment Control Inspection and Monitoring, the Guidelines for Erosion and Sediment Control for Urban Construction Sites prepared by the Greater Toronto Conservation Authorities (2006) and the Ministry of Transportation Environmental Guide for Erosion and Sediment Control (2015) when preparing Erosion and Sediment Control Plans. In particular, the "high risk" areas as they relate to erosivity and sensitivity of downstream receptors should be identified, and suitable erosion and sediment control measures should be employed in accordance with the procedures described in the above referenced documents.

The agencies have suggested the use of a single third-party erosion and sediment control monitoring consultant to facilitate monitoring during joint earthworks operations. However, this is only feasible to the extent that the various landowners will coordinate earthworks together, as they have the right to proceed independently and utilize the monitoring consultant of their choice.

A qualified consultant and/or contractor familiar with the maintenance, installation, and inspection / monitoring of E&SC measures should be involved as part of the detailed E&SC design, construction, and construction monitoring.

Where required and recommended by the agencies and E&SC design guidelines, construction

monitoring shall achieve the following objectives:

- To proactively identify concerns that have the potential to negatively impact the natural environment (e.g. damaged silt control measures);
- To document site conditions and compare them to a range of background conditions or control sites, depending on the parameter;
- To provide a reporting mechanism to the Town of Caledon and the CVC / TRCA for concerns that are identified on the site;
- To provide a mechanism to develop solutions to concerns identified on the site and carry out the required work; and,
- To document the resolution of the concern.

Erosion and sediment control are a dynamic design process that often requires adjustments to the designs / plans in order to adapt to changing site conditions. The above monitoring process will provide the necessary feedback to identify improvements or deficiencies in the E&SC plan.

Weekly construction supervision is proposed during site alteration works to identify how the E&SC plan performs and if amendments are needed. Sediment and erosion controls will be established, monitored and maintained to the satisfaction of the regulatory agencies. Bi-weekly reporting to the agencies is recommended.

All temporary erosion and sediment control measures will be routinely inspected and repaired during construction within 48 hours of identification of failure. Temporary controls will not be removed until the areas they serve are restored and stable. During and after rainfall / snow melt events, thorough inspections of all sediment fencing and sediment traps / sediment ponds will be undertaken and any deficiencies / repairs will be reported immediately. Follow-up inspections will be conducted to ensure the appropriate repairs or improvements are made. The inspections will occur:

Erosion & Sediment Control Prior to construction
Concurrent with the design and installation of E&SC measures, and before the start of construction, a qualified erosion and sediment control inspector shall:

a. verify that all receptors are adequately identified and protected by planned E&SC measures in order to monitor changes throughout the life of the project;
b. perform baseline turbidity monitoring using hand-held instruments (may be recommended as part of site-specific E&SC monitoring programs during detailed design).
c. establish reference/vantage points and monument for photo documentation;
d. collect date and time stamped photographs and a video record of receptors as they appear before construction, and any other areas of interest as determined during the planning and design stage, for baseline records;
e. verify that all photos and inspection and monitoring locations are documented on a geo-referenced map showing discharge locations and other points of interest;
f. complete an initial inspection to document that any installed E&SC measures conform to the E&SC plan and are appropriate for their intended application and location prior to the start of grading or soil movement activities; and
g. document all conditions

Erosion & Sediment Control Inspection during construction
During construction, qualified personnel shall at a minimum:

a. verify that all installed E&SC measures are in place, according to the E&SC plan agreed to

by the project owner or regulatory authority, with no noted deficiencies, and in accordance with the corresponding project site risk assessment completed during the planning and design phase, if applicable;

b. complete a daily review of weather forecasts to ensure that necessary inspection frequencies, if specified by contract or permit, are achieved;
c. complete a daily inspection during periods of significant rainfall events of duration greater than 24 continuous hours;
d. complete a daily inspection during thaw events;
e. complete an inspection, where possible, 24 hours prior to and within 24 hours after rainfall events exceeding regionally significant values or when storm warnings are issued;
f. complete at least one inspection weekly during construction;
g. complete at least one inspection semi-monthly no construction activity is taking place and none of the above conditions have taken place;
h. document all conditions and report to agencies bi-weekly.
i. re-inspect those areas where repairs or maintenance have been completed to verify that they were completed and done so correctly, and that they have alleviated any documented problem areas.

Post-construction Erosion & Sediment Control inspections

E&SC inspections shall be continued throughout the stabilization of the site by a qualified professional. This monitoring will likely extend through the assumption process in accordance with the Town's requirements.

As it relates to long-term post-construction monitoring of water quality, quantity, vegetation, wildlife, etc., specific details and timelines will be outlined in the CAMP document.

5.6 Geotechnical

A slope stability analysis was undertaken by WSP (June 2017) to establish the existing stable slope hazard limit in locations where encroachments into the Greenbelt area are proposed (I.e. Stage 2 SWM facilities) as well along the proposed channel works between Chinguacousy Road and into the Greenbelt Area. Previously collected geotechnical investigations by Soil Engineers Ltd. (2016) and Terraprobe were incorporated into the slope stability investigation and assessment completed by WSP in June 2017.

WSP (Geotechnical Engineers) was retained to asses slope stability of the subject lands. Areas within the Mayfield West Lands where the meander belt width of the channel is in contact with the valley toe of slope or extends beyond the toe, the system can be considered confined. In these areas, the hazard is delineated by accounting for an appropriate erosion setback from the watercourse and the geotechnical stable top of slope and, where required, an access easement. This definition was completed by WSP as part of their geotechnical study completed in 2017 (see Appendix c).

Detailed analysis was completed in areas where potential SWM facilities are being considered as part of the Preferred Land Use Framework Plan. The resulting stable top of slope limit is illustrated on Figure 10.

5.6.1. Topography & Soils

The Mayfield West Stage 2 Lands are located within the South Slope Physiographic Region, which lies between the Oak Ridge's Moraine and the Peel Plain (Chapman and Putnam 1984). This area is characterized by a flat to gently rolling Drumlinized Till Plain.

Overburden soils are dominated by clayey silt to silty clay Halton Till and range in thickness from 10-40m near the site. The Halton Till may contain isolated lenses of Lacustrine Laminated sand, silt and clay (Sharp et al 1999). Fine grained glaciolacustrine sediments (silt and clay) were identified along the northern site boundary, immediately south of Etobicoke Creek. Bedrock consists of red shale interbedded with grey to green limestone, known as the Queenston Formation.

Palmer Environmental (PECG) reviewed borehole logs from the Terraprobe study (2014) and WSP (2017a) and (2017b) well records to understand the surficial geology. The stratigraphy of the site that was encountered during borehole drilling is described in the section 5.6.3 below.

5.6.2. Geology

Accurately assessing a site wide and feature based water budget requires a detailed site and feature scale understanding of surficial geology. PECG reviewed borehole logs from Terraprobe (2013, 2014), and WSP (2016 reports alongside Ministry of Environment and Climate Change (MOECC) water well records to understand the surficial geology of the Mayfield West Phase 2 Stage 2 Lands. The surficial geology map is unchanged from the regional mapping provided by the Ontario Geological Survey (OGS) as all results indicated that the silty clay Halton Till is found almost ubiquitously across the study area. See WSP 2017 report in Appendix C herein for Figures 4 and 5 that present hydrostratigraphic cross-sections based on the results of borehole drilling.

Topsoil and Fill
Topsoil materials mixed with sand, silts and clays were encountered at ground surface in Boreholes BH16-12, BH16-22, BH16-29 through BH16-32, and BH16-40 through BH16-42. Fine and coarse grain fill materials were found at ground surface to depths ranging from 0.9 m - 2.0 m. The composition of the fill is silty clay to clay silt in all boreholes except BH16-7 where sand silt till was also encountered. Traces of gravel and organics were also observed in the fill material (WSP 2017b).

Silty Clay to Clayey Silt Till
The clay and silt textured soils of the Halton Till were identified in BH16-1, BH 16-8, BH16-10 through BH16-12, BH 16-16, BH16-22, BH16-23, BH16-29, BH16-31 through BH16-33, BH16-41, BH16-42, and BH16-44. The clay and silt textured soils were encountered between 0.8 to 4.6 m below the fill materials and extended to approximately 5.2m to 18.9 m below the ground surface elevation. Fine grained silty clay till was the most common overburden lithology within the Mayfield West Phase 2 Lands (WSP 2017b).

Sand and Silt
Deposits of sand and silt were encountered below the Halton Till at boreholes BH16-1, BH16-5, BH16-11, BH16-13 through BH16-15, BH16-34, and BH16-41. These soils are generally described as grey, sand to silt to sand silt, trace clay, trace gravel, compact to very dense and moist to wet. This unit ranges in thickness from 1.5 m to 4.4 m and was encountered between 5.6 m and 10.2 m below the ground surface elevation. These soils may be representative of interstadial deposits or lenses within the till; however, their depositional history was not investigated as part of this study and they are not considered to be a significant aquifer unit.

Shale Complex
Boreholes BH16-5, BH16-34 through BH16-39 passed through a unit of weathered shale and till at depths of roughly 4.1 m to 10.2 m below the ground surface elevation for lands in the southern portion of the studied area. The weathered shale is described as shale with limestone fragments, trace sand and silty clay in a till matrix. It is difficult to distinguish shale till from weathered Queenston shale bedrock unit, it's approximate extent over the competent bedrock of 2 m to 3.5 m is

presented in Figure 5 within WSP's 2017 report (see Appendix C).

Bedrock Geology

Shale bedrock of the Queenston Formation is presented below the entire study area and was assumed to be encountered in all boreholes at refusal. The inferred top of bedrock level varies in elevation from 252.7 m to 253.9 m in boreholes Bh-16-36 through BH16-39, as summarized in the WSP 2017b report (see Appendix C). This unit consists of fresh to moderately weathered, reddish brown, fine to very fine-grained shale interbedded with occasional to frequent light grey fine-grained mudstone and siltstone layers (Armstrong and Dodge 2007).

5.6.3. Slope Stability Assessment/Locations

A site-specific slope stability study was carried out by WSP in 2017 based on the current and previous geotechnical investigations. This study included a visual inspection of the slopes at the five (5) sites along the Etobicoke Creek shown in the WSP 2017 report on Drawing 1 (see Appendix C) and listed below (see Table 7) to assess the existing slope conditions with respect to any obvious signs of instability concerns. Slope stability analysis of selected slope cross-sections utilizing computer software SLIDE (Ver. 7.024), were carried out.

Table 7: Site Specific Slope Stability Study Locations

Site Number	Location
1	Along both banks of the Etobicoke Creek and is extended from Chinguacousy Road to about 150 m towards east
2	Proposed SWM Pond 5, located at about 250 m east of Chinguacousy Road
3	Proposed SWM Pong 6, located at about 400 m west of McLaughlin Road
4	Proposed SWM Pond 7, located on west side of OBRY Railway Line
5	Proposed SWM Pond 5, located at about 650 m west of Hurontario Street

5.6.4. Mapping

The topographic information was provided by Urbantech Consulting. Twenty (20) inferred slope profiles at the five (5) study site locations were prepared based on the topographic information and the completed site visual inspections**.** Table 8 lists the cross-sections inferred each of the locations examined:

Table 8: Proposed Slope Cross-section Profile Locations

Site	Cross-Sections Inferred
1	Three (3) cross-sections (CA-CA', CB-CB' and CC-CC')
2	Four (4) cross-sections (P5A-P5A', P5B-P5B', P5c-P5c' and P5D-P5D')
3	Five (5) cross-sections (P6A-P6A', P6B-P6B', P6C-P6C', P6D-P6D' and P6E-P6E')
4	Three (3) cross-sections (P7A-P7A', P7B-P7B', P7C-P7C')
5	Five (5) cross-sections (P8A-P8A', P8B-P8B', P8C-P8C', P8D-P8D' and P8E-P8E')

The cross-section locations were selected on the basis of the slope height and inclination to represent the critical slope condition present within the study area. The sections included a portion of the tableland extending across the slope down to flood plain and/or creek. The locations of the selected slope cross-sections and slope profile details are attached within the WSP 2017 report on Drawing Nos. 2, 3 and 9 to 28 (see Appendix C).

5.6.5. Slope Inspection

The subject five (5) sites/areas are located along Etobicoke Creek between Chinguacousy Road and Hurontario Street, in the Town of Caledon, Region of Peel, Ontario. The adjoining lands around the sloped creek sections are generally flat to gently rolling.

Visual inspections of the subject slopes at five sites were conducted on May 8, 2017. General information pertaining to existing slope features such as slope profiles, slope drainage, watercourse features, vegetation cover, structures in the vicinity of the slopes, as well as erosion and slope slide features were obtained during the inspection. Photographs of the sites taken during the site visits are shown in the WSP 2017 report in Appendix G (see Appendix C). A brief summary of the results of the visual inspection for each site are presented here.

Site 1 (Both banks of Etobicoke Creek, Chinguacousy Road to 150m East)
The meandering portion of the Etobicoke Creek in the study area is aligned in a north-south direction. The bank-full width of the creek varies from 8.0 m to 11.0 m. At the time of inspection, water was observed ponded below and near the culvert located at Chinguacousy Road, (WSP 2017 report, Photograph 2), (see Appendix C). However, within the study area, the depth of water varied from 0.5 m to 1.0 m. The ground to the west side of the creek was relatively flat and on the east side was gently rolling. The creek banks and bed were noted to be generally vegetated with grass and weed growth. In summary, there was no obvious sign of active bank erosion or undercutting within the study area.

Site 2 (Assumed Stormwater Mgmt. Pond 5)
The existing valley slope at Site 2 is gentle with maximum heights roughly extending to 4.0 m. The inclination of the slope generally varied from 4.6 horizontal : 1 vertical (4.6 H : 1 V) to 9.5 horizontal : 1 vertical (9.5 H :1 V).

The slope surface is generally densely covered with grass, weed and brush growth, as well as young to mature tree growth. A few leaning and downed trees were noted, however, the trunk growth of most of the tree species present is to be considered that of straight and upright conditions, with no evidence of significant root or trunk creep. The slope in this area appears to be stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides. Further, there was no evidence of any significant surface or rill erosion, as the slope was noted to be generally covered with a relatively dense vegetation cover.

The Etobicoke Creek after meandering in north-south direction, turns its direction by roughly 90° towards the east at the slope toe level in the western portion of Site 2. The Etobicoke Creek then flows along the toe of the slope with some bank undercutting of the slope toe being noted at various locations within the study area (WSP 2017) (see Appendix C).

Site 3 (Assumed Stormwater Mgmt. Pond 6)
The existing valley slope at Site 3 has inclination of the slope generally varying from 2.2 H : 1 V to 4.6 H : 1V, with a maximum height of 3.8 m ±. The slope surface is generally covered with grass, weeds and bush growth and a few tree species. Minor rill erosion extending from the tableland to the slop crest was noted (refer to WSP 2017 photograph 17, Appendix G) (see Appendix C, herein). The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides.

There is a wide floodplain located between the watercourse (Etobicoke Creek) and the slope toe. The floodplain (about 80 to 100 m wide) is vegetated with grasses, weeds, small brush and tree growth, (refer to WSP 2017 report photograph 19 and 20, Appendix G) (see Appendix C, herein).

Etobicoke Creek is generally entrenched and meanders within a broad floodplain. As noted, the watercourse and the slope toe are separated by a relatively wide floodplain and there is no watercourse situated within 15-m of the slope toe within the study area. Therefore, the subject slope is not subjected to toe erosion.

Site 4 (Assumed Stormwater Mgmt. Pond 7)

The existing valley slope at Site 4 has inclination generally varying from 3.6 H : 1 V to 4.8 H : 1 V, with a maximum height of 5.8 m ±. A drainage gully located in the western third of the slope and extending from the tableland to the floodplain was noted.

The slope surface is generally covered with grasses, weeds and bush growth. The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp tension cracks or recent slope slides.

A floodplain is located between the watercourse (Etobicoke Creek) and the slope toe. The floodplain, more than 15-m wide is vegetated with grasses (refer to Photograph 28 WSP 2017, Appendix G) (see Appendix C, herein). As the watercourse and the slope toe are separated by a floodplain more than 15-m wide, therefore, the subject slope is not subjected to toe erosion.

Site 5 (Assumed Stormwater Mgmt. Pond 8)

The existing valley slope at Site 5 has inclination generally varying from 1.9 H : 1 V to 5.6 H : 1 V, with a maximum height of 6.5 m ±.

The slope surface is generally densely covered with grasses, weeds, bush growth alongside young to mature tree species. A few leaning and fallen trees were noted, however, the trunk growth of most of the trees was noted to be generally straight and upward, with no evidence of significant root or trunk creep. The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides. Further, there was no evidence of any significant surface exposure, as the slope surface was noted to be generally covered with a relatively dense blanket of vegetation.

Etobicoke Creek within the Site 5 study area flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area (refer to Photographs 33 & 34 WSP 2017) (see Appendix C, herein).

5.6.6. Soil Parameters and Groundwater

Based on the borehole information as described in the WSP 2017 report, soil parameters were estimated based on public sheet data and empirical relationship. These soil parameters used in the slope stability analyses are given in Table 9.

Table 9: Soil Parameters for Slope Stability Analysis (WSP 2017)

SOIL TYPE (SEE SECTION 5 FOR SOIL DESCRIPTION)	SOIL DENSITY (kN/m³)	LONG-TERM STRENGTH	
		c' (kPa)	□' (DEGREE)
Clayey Silt Till (Stiff to Hard)	21.5	10	30
Sandy Silt (Compact to Dense)	21.0	0	36
Silt (Compact)	20.5	0	31

Table (10) soil strength parameters are based on the effective stress analysis for long-term slope stability. The stabilized groundwater table observed in the piezometers on June 1 and June 5, 2017 are listed below in Table 10.

Table 10: Groundwater Levels Observed June 1 and 5 (WSP 2017)

Site Location	Observed Groundwater
1 (BH17-1 to BH17-3)	0.93 to 1.31 m below existing grade (Elev. 258.14 to 256.27 m)
2 (BH17-4)	1.99 to 2.37 m below existing grade (Elev. 258.02 to 257.27 m)
3 (BH17-5)	3.24 to 3.30 m below existing grade (Elev. 256.35 to 256.27 m)
4 (BH17-6 and BH17-7)	3.02 to 3.35 m below existing grade (Elev. 256.19 to 255.99 m)
5 (BH17-8)	1.82 to 1.86 m below existing grade (Elev. 257.05 to 257.01 m)

The relevant groundwater table was used in the computer model to simulate normal groundwater table condition. A high groundwater table was assumed to simulate any future build-up (elevated groundwater condition) in a hypothetical slope model toe erosion allowance.

All five (5) sites are located along the valley slope of Etobicoke Creek. At site 1, Etobicoke Creek is generally entrenched and meanders within a broad floodplain. The creek banks and bed were noted to be generally vegetated with grasses and weed growth. There was no obvious sign of active bank erosion. At site 2, the Etobicoke Creek flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area. At site 3, the watercourse and the slope toe are separated by a relatively wide floodplain and there is no watercourse situated within 15-m of the slope within the study area. Therefore, the subject slope is not subjected to toe erosion. At site 4, the watercourse and the slope toe are separated by a floodplain more than 15-m wide, therefore, the subject slope is not subjected to toe erosion. At site 5, the Etobicoke Creek within the study area flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area.

The TRCA generally follows the MNR Policy Guidelines for erosion setback. The recommended toe erosion allowance at each site is summarized in Table 11.

Table 11: Recommended Toe Erosion Allowance at Each Site (WSP 2017)

Site Identification	Soil at Slope Toe	Evidence of Active Toe Erosion	Recommended Toe Erosion Allowance	Remarks
Site 1	Silty Clay Till	No	2 m	Bankfull width between 5 and 30 m
Site 2	Silty Clay Till	Yes	8 m	Active Toe Erosion
Site 3	Silty Clay Till	No	Not Applicable	Flood plain > 15 m
Site 4	Silty Clay Till	No	Not Applicable	Flood plain > 15 m
Site 5	Silty Clay Till	Yes	8 m	Active Toe Erosion

5.6.7. Stability of Existing Slope

Eight (8) boreholes (BH17-1 to BH17-8) were advanced near the slope crests to assess the subsurface soil and groundwater conditions comprising the subject slopes. The borehole data indicated that the site slopes consist of clayey silt till with interbeds of sandy silt.

The WSP 2017 report inferred twenty (20) slope cross-sections (Section A-A to Section N-N) of which Section P5A-P5A' at site 2, Section P6C-P6C' at site 3, Section P7B-P7B' at site 4 and P8B-P8B' at site 5

were the steepest and critical. A detailed engineering analyses of slope stability were carried out for the selected slope cross-sections utilizing computer software (SLIDE by Rocscience). For this study, the GLEPrice limit equilibrium method of analysis was adopted. This method of analysis permits the calculation of Factors of Safety for generated or assumed failure surfaces.

The analysis was carried out by preparing a model of the slope/site geometry and subsurface conditions and analyzing numerous failure surfaces in search of the minimum or critical Factor of Safety in order to assess the stability of the slope. The pertinent data obtained from the topographic and borehole information were input in the slope stability analyses. Many calculations were carried out to examine the Factors of Safety for varying depths for potential failure surfaces. The minimum Factors of Safety for the existing slope at Sections P5A-P5A' at site 2, Section P6C-P6C' at site 3, Section P7B-P7B' at site 4 and P8B-P8B' at site 5 are summarized in Table 12.

Table 12: Computed Factors of Safety for Existing Slope Sections (WSP 2017)

Site I.D.	Section	Type of Slope Slide	Min. Factor of Safety for Potential Slope Slides (Based on Borehole Information)	Remarks
Site 2	P5A-P5A'	Circular Slope Slide, Deep Seated	3.65	Drawing No.1 Appendix ( ) WSP 2017
Site 2	P5A-P5A'	Circular Slope Slide, Toe Failure	3.91	Drawing No. 1A, Appendix ( ) WSP 2017
Site 3	P6C-P6C'	Circular Slope Slide, Deep Seated	2.75	Drawing No. 2, Appendix ( ) WSP 2017
Site 3	P6C-P6C'	Circular Slope Slide, Toe Failure	2.25	Drawing No. 2A, Appendix ( ) WSP 2017
Site 4	P7B-P7B'	Circular Slope Slide, Deep Seated	4.01	Drawing No. 3, Appendix ( ) WSP 2017
Site 4	P7B-P7B'	Circular Slope Slide, Toe Failure	3.95	Drawing No. 3A, Appendix ( ) WSP 2017
Site 5	P8B-P8B'	Circular Slope Slide, Deep Seated	2.65	Drawing No. 4, Appendix ( ) WSP 2017
Site 5	P8B-P8B'	Circular Slope Slide, Toe Failure	2.36	Drawing No. 4A, Appendix ( ) WSP 2017

For land development and planning, the MNR Policy Guidelines allows a minimum Factor of Safety of 1.3 to 1.5 for slope stability. It is recommended that a minimum Factor of Safety of 1.5 be used for long-term slope stability. The computed Factor of Safety are presented in Table ( ) for the slope

stability analysis for the long-term of existing slope is considered to be adequate and satisfies the TRCA and MNR Policy Guidelines and industry standard practice.

WSP carried out a slope stability analyses on a hypothetical section, with slope height of 6-m at inclination of 2.0 H : 1 V to determine the minimum required long-term stable slope inclination. The slope was modeled with silty clay till, which is representative of site soil conditions. A groundwater level at about 1.0 m below ground surface as input to the model. The computed factors of safety for this hypothetical section were 1.95 for deep seated slope failure and 1.75 for slope toe failure. Therefore, a slope inclination of 2.0 H to 1 V or flatter is required for the long-term stability of the overburden slope.

5.6.8. Long-Term Stable Slope

The Long-term Stable Slope Top of Slope (LTSTOS) locations were calculated based on the applicable erosion and stability setbacks in accordance with the TRCA guidelines. The slope stability analysis on a hypothetical slope section found in the WSP 2017 report section 6.6 (see Appendix C, herein), concluded that a slope inclination of 2.0 H : 1 V or flatter is required for the long-term stability of the slope.

For site 1 where the Etobicoke Creek is entrenched within the relatively flat to gently sloping ground, only the erosion component will be applicable. (Drawings 9 to 11, Drawing 4 WSP 2017) (see Appendix C, herein) present the estimated location of the Long-term Stable Top of Slope Line/Long-Term Erosion Hazard Line in sections and plan (S1-S2-S3 on west side of creek and S4-S5-S6 on east side of the creek).

For site 2 where the creek is in contact with the toe of the slope, toe erosion and stability components will be applicable. (Drawings 12 to 15 and Drawing 5 WSP 2017) (see Appendix C, herein) present the estimated location of the Long-Term Stable Top of Slope Line in sections and plan (S7-S8-S9-S10).

For sites 3 where a flood plain more than 15-m wide separates the toe of the slope from creek, only stability component will be applicable. (Drawings 16 to 20 and Drawing 6 WSP 2017) (see Appendix C, herein) present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S11-S12-S13-S14-S15).

For site 4, where a flood plain more than 15-m wide separates the toe of the slope from creek, only stability component will be applicable. (Drawings 21 and 23 and Drawing 7 WSP 2017) (see Appendix C, herein) present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S16-S17-S18).

For site 5, where the creek is in contact with the toe of the slope, both toe erosion and stability components will be applicable. (Drawings 24 to 28 and Drawing 8 WSP 2017) (see Appendix C, herein) present the estimated location of the Long-Term Stable Top of Slope Line in sections and plan (S19-S20-S21-S22-S23).

In general, where the existing slope inclination is gentler than the computed stable slope inclination of 2 H : 1 V, the existing top of slope is the Long-term Stable Top of Slope Line.

5.6.9. Development Setback

In addition to the stability and erosion setbacks, an access allowance/development setback is typically required from the identified slope hazard area (long-term stable top of slope line location) to take into account possible external conditions which could have an adverse effect on the existing natural condition of the slope, and to provide access to the slope in emergencies. This

setback generally varies depending upon the policies of individual authorities. The determination of the setback value depends on a number of factors including but not limited to, the watershed classification, type of development, site specific conditions and available access to the slope. The minor structures may be allowed to be located closer to the long-term stable top of slope line but only if approved by the concerned conservation authority.

5.6.10. General Comments and Geotechnical Recommendations

Additional comments related to any future construction at this property and in terms of slope stability at the site are as follows:

- To reduce the risks of soil erosion on the slope surface, the vegetation and trees on the existing slopes must be preserved. Surface water must be either directed away from the slope of intercepted and diverted down the slope in a controlled fashion by using lined ditches, conduits and the like.
    - Reinforcement of the existing slope surface may also be of consideration.
- Structures must be founded behind the setback/long - Stable Top of Slope Line.
- The configuration of the slope should not be altered without prior consultation with a geotechnical engineer. In particular, the slope should not be steepened.
- Snow must not be piled near the top of the slope.
- Additional fill cannot be placed beyond Long-Term Stable Top of Slope Line as indicated in (Drawings 4 to 8 WSP 2017) (see Appendix C, herein)

5.6.11. Long-Term Monitoring Plan

To ensure an effective retention of the associated slope stability of Etobicoke Creek and reduce erosion hazards of future infrastructure (storm water mgmt. Facilities) the following long-term monitoring strategies are recommended:

- Monitor toe erosion conditions in comparison to the proposed erosion allowance per Table 13.
- Monitor and maintain the health of established vegetation along the existing creek embankments.
- Monitor and maintain erosion at designated outfalls to Etobicoke Creek.

5.7 Aquatic Ecosystem and Fisheries Considerations

All future development of the MWP2 Area within the Etobicoke Creek Watershed is located outside of the Greenbelt area which encompasses the high constraint watercourses within the Etobicoke Creek Valley. Consequently, the high constraint watercourses within the Etobicoke Creek Valley would be protected in-situ under the future land use conditions. The protection of the existing habitat and fish and benthic invertebrate communities in Etobicoke Creek and adjacent to and downstream from MWP2 is the primary consideration. Existing high and medium constraint drainage features will remain in-situ. The drainage density will also be maintained through corridor and swale creations. No deterioration of aquatic habitat or biotic communities is expected to occur as a result of the proposed development.

5.7.1. Aquatic Ecosystem Summary

The TRCA conducts fisheries surveys in Etobicoke Creek in the vicinity of the proposed Mayfield West community development every 3 years, and benthic invertebrate surveys every year. The available

information provides a robust database of biological conditions in the study area. The information suggests that water quality in Etobicoke Creek in the study area is somewhat degraded and would be classified as supporting warm water fish habitat. The benthic invertebrate community information also indicates impaired conditions. There may be opportunities to enhance stream habitat conditions with development of the Mayfield West Community development through buffer setbacks to reduce input of nutrients and sediment into the Creek, along with planting of riparian vegetation to provide shading to reduce stream temperatures and reduce bank erosion. Consideration should be given to conducting the benthic invertebrate sampling in early spring or late fall when diversity would be expected to be greater than midsummer sampling. The caveat would mean that subsequent samples would not be directly comparable to the existing database so this would need to be addressed, possibly by sampling both periods (spring, summer) for a number of years to compare results.

From a fisheries perspective, performance measures were related to maintenance of fish productive capacity and fish benthic communities, as well as potential net gains. These components are outlined below in further detail.

Fisheries and aquatic information provided under the AMEC (2014) CEISMP were also reviewed to identify data gaps and understand the additional activities and analysis that would be required to address the defined performance measures and finalize the preferred management strategy from a fisheries perspective. The Part A Stage 2 CEISMP included a review of existing background documents and fisheries survey data collected by TRCA through their Regional Watershed Monitoring Program (RWMP) as well as additional fish surveys completed by the AMEC (2014) study team. The main section of Etobicoke Creek that traverses the northern portion of the Stage 2 lands was classified as seasonal fish habitat. The low (green) constraint streams that drain in a northerly direction towards Etobicoke Creek were classified as either simple contributing habitat or not fish habitat. Overall, a total of twenty (20) fish species were captured across the Mayfield West Secondary Plan area and demonstrated a diverse fish community, including but not limited blacknose shiner (*Notropis heterodon*), northern redbelly dace (*Phoxinus eos*), pearl dace (*Margariscus margarita*) and central mudminnow (*Umbra limi*). These species are of conservation concern because of their sensitivity to habitat alterations such as decreased water quality and increased flow velocities (AMEC, 2014). Through the AMEC (2014) study and subsequent planning stages, it has been noted that there are no endangered species present in the Etobicoke Creek watershed downstream of Mayfield Road. As such, the performance measures associated with endangered aquatic species is not applicable for the Stage 2 lands.

TRCA has also completed extensive monitoring of benthic invertebrates as part of the RWMP on an annual basis. Summary metrics for benthic invertebrates were based on a relationship of Family Biotic Index (FBI) and water quality, with most of the measured sites for the study area showing poor to very poor results in terms of overall measurable taxa. Typically, a greater number of taxa often indicates better water quality. The overall score is very sensitive to tolerance of families of benthic invertebrates to low dissolved oxygen which is greatly affected by flow and water temperature.

From a fisheries and aquatic habitat perspective, potential impacts from development would therefore be associated with future stormwater discharge entering downstream receiving watercourses and reaches of Etobicoke Creek. Impacts could occur to aquatic systems as a result of stormwater quality and/or quantity issues (e.g. thermal impacts, increased pollutants, change in flow regime). The design approach outline for outfall wetland and swale feature creation will replicate form and function of low (green) constraint streams and provide a level of erosion control. Recommended design details have been provided in Drawings TYP-1 and TYP-2 (Geomorphix) (see Appendix D) for reference during future planning stages. From an aquatic habitat and fisheries perspective, these natural features will also provide organic inputs to the system, increased canopy

coverage, temperature regulation, polishing of flows, energy dissipation, and dispersion of flows. These benefits are intended to address potential impacts to the downstream aquatic system as a result of development. It is anticipated that these outfall features will ensure no net loss in fish productive capacity or fish and benthic communities.

5.8 Terrestrial Resources

Field assessments of vegetation and wildlife were completed by AMEC for the Mayfield West Phase 2 study area between April and November 2008. Supplementary data was obtained from TRCA, CVC, MNRF, relevant landowner consultant documents and from the Huttonville and Fletcher's Creeks Subwatershed Study – Characterization Report and Data (AMEC 2011). Additional field work related to SAR such as bats, birds, mammals, amphibians and reptiles was undertaken between 2011 and 2017 by Hensel Design Group (HDG) now Crozier & Associates (CFCA).

The Mayfield West Phase 2 Stage 2 lands are dominated primarily by agricultural and associated anthropogenic uses. Natural cover constitutes the remainder of the lands, with the majority of natural features (e.g., forest, wetlands, successional woodland) contained within the Greenbelt, primarily along the slopes and floodplain of the Etobicoke Creek valleylands. A total of 23 Ecological Land Classification polygons were documented in 2007 – 2008 field studies on the Stage 2 lands, with some revisions undertaken based on additional field work from 2011 to 2016.

Wetlands in the Upper Fletcher's Creek and Etobicoke Creek Headwaters have been evaluated by MNRF as Provincially Significant. All MNRF identified wetlands are illustrated on Figures 9 and 10.

The most extensive natural communities in the study area are associated with Etobicoke Creek valleylands and adjacent uplands; the central tributary is contained in the Greenbelt. A secondary tributary valley feature (permanent tributary), located in the northwest corner of the Stage 2 lands, contains some woodland, shrub thicket and meadow cover types which are not included in the Greenbelt MEC-R07, see Figure 11).

There are no upland woodland features within the Stage 2 lands outside of the Greenbelt. Natural cover outside of the Greenbelt consists mainly of short, disjunct deciduous hedgerows, along with small copses and individual trees. The remainder of the cover types are agricultural and/or anthropogenic (farmland and farmsteads). Significant Woodland criteria have been applied on an interim basis using the Region's ROPA 21B criteria; the forested Etobicoke Creek valleylands qualify as Significant Woodlands, all of which are contained within the Greenbelt. These features are shown on Figure T2B in AMEC Part A Report (AMEC et al. 2014a) (see Appendix E herein).

More than 300 plant species and 115 species of wildlife have been documented within the whole of the Mayfield West Phase 2 study area. All natural heritage features located within the Mayfield West Phase 2 Stage 2 lands are proposed to be retained and buffered so to maintain the habitat that supports the portion of the represented species that reside or utilize features within the Stage 2 lands.

Significant Wildlife Habitat (SWH) is afforded some protection under the Provincial Policy Statement, 2014 (Province of Ontario, 2014). The MNRF recently produced SWH criterion schedules for application in various ecoregions of Ontario (MNRF 2015). The background data reported for the Mayfield West Phase 2 study area was scrutinized against the Ecoregion 6E Criterion Schedule to redefine SWH functions attributable to the Stage 2 lands only. Based on the nature of the background data there are no defining criteria available with respect to SWH. Therefore, the SWH reassessment is conservative as it identifies all potential functions based simply on comprehensive lists of all species identified within the larger MWPh2, Stages 1 and 2 landscape area. Assessed under

the Ecoregion 6E Criterion Schedule, there are no SWH functions attributable to the Stage 2 lands. The following SWH functions identified according to Provincial criteria for candidate SWH include: Bat Maternity Colony (woodlands); Colonial Bird Nesting – Bank & Cliff (Banks of Etobicoke Creek); Animal Movement Corridor (Etobicoke Creek valleylands); Special Concern & Rare Wildlife (birds – woodlands/treed swamps, birds + Leopard Frog, Eastern Milksnake – grasslands/open country/shrublands of Etobicoke Creek valleylands, birds, amphibians & reptiles – wetlands, marsh, ponds, vernal pools).

The results of background field studies and species specific surveys completed in 2017, through consultation with the MNRF/MECP, confirmed that the following Endangered & Threatened Species associated with the MWPh2, Stage 2 lands: Barn Swallow (THR), END bats. Habitat of these species is associated with manmade structures (farm buildings). The MECP has provided guidance directing the installation of structures to be located within the Stage 2 lands to provide compensating habitat for the removal of manmade structures in advance of proposed development.

In conjunction with the Secondary Planning process, a Natural Heritage System (NHS) has been defined through natural features edge staking, application of policy mandated greenways and buffers combined with the top-of-bank staking and stable top-of-bank studies as reviewed and finalized by the agencies. The resulting Site Constraints and Opportunities Mapping are identified on Figure 10 and have formed the basis for the NHS identified within the Preferred Mayfield West Phase 2, Stage 2 Framework plan.

5.8.1. Terrestrial Resource Management

The measures which that have been identified in Provincial, Municipal and Conservation Authority documents have guided the development approaches used to identify, assess, protect and manage the Natural Heritage System for the MWPh2 lands.

Features to be Protected with no Development Permitted

- Significant Wetlands

Features to be Protected, unless it can be demonstrated that development will have no negative impacts on the natural features and their ecological functions

- Significant Valleylands
- Significant Woodlands
- Significant Wildlife Habitat
- Habitat for Endangered and Threatened Species
- Fish habitat

Buffers

- Draft Technical Guidelines for Greenbelt Plan (2008):
    - A minimum of 30 metres vegetation protection zone is required for the majority of natural heritage features including wetlands, seepages areas and springs, fish habitat, permanent and intermittent streams, lakes and significant woodlands;
    - For streams and watercourses with well-defined valley features, the minimum 30 metres is to be measured from the stable top of bank, as determined by the conservation authority.
- CVC (Watershed Planning and Regulation Policies – April 2010)
    - A minimum of 30 metres is maintained from any wetland, or 15 metres from the limit of hazardous land, whichever is greater (applies to single family residential development).
    - A minimum of 10m is maintained from any woodland dripline edge.

- TRCA (Valley and Stream Corridor Management Program)
    - Minimum 10 metre buffer from staked top of bank, stable slope line, contiguous vegetation, and/or regulatory floodplain.
    - A minimum of 10m is maintained from any woodland dripline edge.

Linkages and Restoration

- TRCA's TNHSS Target System for MWP2 indicates a primary focus on adding natural cover within the Greenbelt;
- The Etobicoke Creek Headwaters subwatershed contains the last remaining non-urbanized portions of the watershed, and therefore presents the majority of opportunities to restore natural land cover. The TRCA watershed report card (2006) targeted 11% natural cover for the watershed;
- A CVC/TRCA commissioned study (Gartner Lee Ltd., 2005) identified potential wetland restoration sites in the Region of Peel; these include localized wetland restoration opportunities associated with tributaries in the north half of the MWP2 study area.

Net ecological gain is a major objective of the development of the Mayfield West Phase 2 Stage 2 lands.

In April 2010, MNRF released the Second Edition of the Natural Heritage Reference manual, which is a guiding document to support the application of the natural heritage polices contained in the PPS (2005). The application of Environment Canada (2004) guidelines targets to highly fragmented landscapes in southern Ontario, which have been under intensive use for agriculture for more than a century, have been challenging. Jurisdictions (such as TRCA with its Terrestrial Natural Heritage System) have generally promoted the application of these targets outside of urbanizing areas. The need to balance other planning objectives (such as those under the Provinces Places to Grow Plan) has resulted in compromises. In this regard, the Second Edition of the Natural Heritage Reference Manual (MNR 2010) states (ref. Section 3.4.6.2):

"Every natural heritage system, however, will be different. There is no minimum size for a system or minimum percentage of a planning area or its natural features that must be included in the system. Therefore, the extend of the natural heritage system identified in the noted examples represents what was appropriate and achievable in those situations."

Given the conceptual working scale of the land use scenarios, the identification of appropriate environmental factors and measures has required scoping of the potential long list of targets to those which can be reasonably estimated at this scale. The future NHS must be in conformity with applicable legislation and policies at the Federal (Fisheries Act), Provincial (Provincial Policy Statement), Places to Grow, Ministry of Environment policies and regulations as well as addressing policies, guidelines and objectives in accordance with TRCA and CVC mandates, and the Town of Caledon's Official Plan. The Mayfield West Principles as adopted by Council in April 2009 underscore the intention to achieve net ecological gain where feasible, the adoption of an integrated design process, and fostering a local identity which includes the area's unique environmental features.

A summary of the terrestrial factors and measures that were applied to achieve the scenario ratings are presented below. The factors evaluate the potential impacts of the development concepts on quantity measures (i.e. amount of riparian, wetland and natural cover) and quality measures (native biodiversity functions, natural system protection requirement). These factors reflect commonly used indicators of natural heritage system health and integrity. For example, TRCA used quantity and quality as key factor categories in the development of their Terrestrial Natural Heritage System Strategy (2007). Similarly, these measures were a significant part of the suite of targets used in the testing of the Secondary Plan versions for the Mount Pleasant lands, located immediately south of

the current Mayfield West Phase 2 Stage 2 study area.

The measures at this stage are strictly focused on the natural environment component of the future natural heritage system. The urban elements of "green development" such as urban canopy, active parkland, energy efficiency and transit efficiency are not included in this screening as there is insufficient detail as to the final details of the future urban areas within the Preferred Framework Plan.

5.9 Fluvial Geomorphology & Erosion Control

Existing Conditions
The existing conditions of the development lands were originally evaluated from a fluvial geomorphological perspective under the 2014 CEISMP (AMEC). Geomorphix subsequently completed a gap analysis and summary of existing conditions and additional activities necessary to meet the requirements associated with river morphology. The existing conditions, characterization and constraints mapping were described in detail under the Part A CEISMP (Hensel Design Group Inc., 2019).

It should be noted that the study completed by AMEC (2014) fulfilled the requirements of fluvial geomorphological characterization; however, additional works were required as part of the updated Part A CEISMP (Hensel Design Group Inc., 2019) to characterize watercourse features on new lands within the Stage 2 area and update erosion hazard delineation based on more detailed information. Several of the meander belt widths provided by AMEC (2014) were reviewed and considered appropriate. The remaining belt widths outlined by AMEC (2014) were refined based on more detailed aerial imagery and topographic survey information or through an empirical modelling approach. Rapid geomorphological field assessments and meander belt width analysis were also completed for new lands in the Stage 2 area to support characterization included under the updated Part A CEISMP (Hensel Design Group Inc., 2019). It should be noted that the updated Part A CEISMP also included a review of the headwater drainage feature (HDF) assessments originally completed by AMEC (2014). It was determined that the HDF methodology and characterization outlined by AMEC (2014) was appropriate.

Management Strategies
A preferred management strategy was outlined for watercourse and headwater drainage features as part of the AMEC Part C (2014) report. Watercourse constraint ranking was completed, resulting in a classification of high (red) constraint, medium (blue) constraint, or low (green) constraint rankings applies to each reach in the study area (See Figure 11). Medium (blue) constraint streams are to remain in the form of an open channel but may be relocated, provided that a rehabilitation approach is applied. Low (green) constraint streams, can be eliminated, but the downstream function and cumulative benefits of these features must be maintained.

The proposed management strategy for the Mayfield West Phase 2 Stage 2 Lands follows the principles outlined in the AMEC (2014) study and includes several performance measures that should be considered in the context of future land use. In the context of stream morphology, this includes consideration of erosion hazards for all watercourse features, downstream erosion impacts, and maintenance of channel length and drainage density.

Fluvial geomorphological data and analysis provided under the AMEC (2014) CEISMP were reviewed to identify data gaps and understand the additional activities and analysis that would be required to address the defined performance measures and finalize the preferred management strategy. The Part A Stage 2 CEISMP included characterization of existing conditions and constraint mapping associated with natural hazards. Specifically, Part A included background information

review, confirmation of reach delineation completed by AMEC (2014), rapid geomorphological assessments, and erosion hazard delineation where required. It should be noted that the study completed by AMEC (2014) fulfilled the requirements of fluvial geomorphological characterization; however, additional works were required as part of the updated Part A CEISMP to characterize watercourse features on new lands within the Stage 2 area and update erosion hazard delineation based on more detailed information. Several of the meander belt widths provided by AMEC (2014) were reviewed and considered appropriate. The remaining belt widths outlined by AMEC (2014) were refined based on more detailed aerial imagery and topographic survey information or through an empirical modelling approach. Where they were appropriate, the meander belt widths were maintained. However, in a lot of cases, the erosion hazard associated with Etobicoke Creek reaches was more accurately defined by the stable top of bank and an erosion setback or erosion allowance. Where applicable, erosion hazard delineation was updated for confined reaches based on field observations of erosion and surficial geology. Rapid geomorphological field assessments and erosion hazard delineation was also completed for new lands in the Stage 2 area to support characterization included under the Part A CEISMP. It should be noted that the Part A CEISMP also included a review of the headwater drainage feature (HDF) assessments completed by AMEC (2014). It was determined that the HDF methodology and characterization outlined by AMEC (2014) was appropriate.

Erosion threshold work was also completed under the AMEC (2014) study. This information was also reviewed in the context of the preferred management strategy and the specific performance measures outlined as part of the analysis for the future land use plan. Erosion thresholds were determined along the most sensitive receiving reaches to inform future stormwater management pond release rates for the Etobicoke Creek system in association with the Stage 2 Lands. Unitary release rates were defined for the system, and as such, are independent of any one land use scenario. The rates defined in the AMEC (2014) study should be applied through future planning stages and at detailed design.

The final watercourse targets defined as performance measures under the AMEC (2014) study were related to maintenance of channel length and drainage density. AMEC (2014) completed an initial assessment to determine if drainage density targets could be met through maintaining the lengths of existing high constraint (red) and medium constraint (blue) streams. In the Etobicoke Creek watershed, and therefore in association with the Stage 2 lands, there was an overall surplus of stream length within the study area. A large amount of the streams associated with the Stage 2 lands are either high (red) or blue (medium) constraint watercourses. These streams will not be altered, and as such, there is no requirement or concern with regards to maintenance of channel length, form, or function. Although, there is a substantial number of low (green) constraint streams associated with the Stage 2 lands that will be removed from the landscape. It is anticipated that the function of these low order streams will be replicated through appropriate stormwater management facilities along with a treatment train of features, and that drainage density will be maintained through swale creation. Swale and wetland features are proposed downstream of SWM facility outfalls and within the proposed Natural Heritage System. The addition of swales will generally maintain channel length and offset the loss of green streams.

A total of four (4) stormwater management (SWM) facilities have been proposed within the northern extent of the Stage 2 lands which will ultimately drain to Etobicoke Creek. Several low (green) order streams will be removed to accommodate siting of these SWM facilities. For each SWM facility, outfall wetlands and swale features are recommended to offset removal of green streams and provide a treatment train that compliments site-level stormwater management plans. These designs will also provide a level of erosion control for each of the pond outfalls. Benefits of outfall wetland and swale features include organic inputs to the system, increased canopy coverage, temperature regulation, polishing of flows, energy dissipation, and dispersion of flows. Additionally, by retaining

flows, wetland features provide opportunities for infiltration, evapotranspiration, and detention on the landscape.

Outfall wetland or swale features should be designed to be stable under the predicted flow conditions. All materials should be hydraulically sized, and the design should be completed in planform, cross-section, and include any necessary bioengineering details for construction. All designs should be accompanied by a technical memorandum that describes the design approach for review by regulatory agencies. The design should also provide clear instruction for appropriate phasing and sediment erosion control during construction that is cognizant of phasing of the overall development. Consideration of swale and wetland features to be incorporated within the development plan will need to be undertaken as part of any site-specific Environmental Impact Studies, Functional Servicing Studies, and at detailed design. Recommended design details have been provided in Drawings TYP-1 and TYP-2 (see Appendix D) for reference during future planning stages.

It should be noted that all existing high (red) and medium (blue) constraint streams associated with the Stage 2 lands will remain in situ. The specific reaches directly altered by development are low (green) constraint headwater drainage features. These features are ephemeral and do not support fish or other aquatic species. It is anticipated that the function and downstream contribution of these features will still be maintained through the design and implementation of wetland and swale features associated with stormwater management (SWM) facility outfalls. The design approach outlined previously for outfall wetland and swale features will replicate form and function of low (green) constraint streams and provide a level of erosion control.

5.10 Opportunities for Enhancement and Mitigation

The Mayfield West Phase 2 Endorsed Framework Plan includes lands identified as Greenbelt Plan Area, Environmental policy Area, Greenway Corridor and Open Space Policy Area (see Figure 2). These land uses define a Natural Heritage System based on Environmental Constraints to development identified through field studies completed for the subject and adjacent lands over time by a multi-disciplinary team as shown on Figure 9 and Figure 10 Constraints to Development. The Landowners Preferred Framework Plan (August 2019) maintains the same NHS as that presented in the Town of Caledon's Endorsed Framework Plan.

During the process of developing the Guiding Principles, a sub-set of criteria was established to provide methods/concepts of how the Guiding Principles may be achieved. These methods/concepts were presented as opportunities to be included in the design of the development as follows as enhancement and mitigation measures:

Natural Heritage System (NHS)

- Protect and enhance existing woodlands, wetlands and wildlife corridors
- Prepare landscape restoration plans to establish vegetation within greenway corridors and feature buffer zones
- Scenic views and vistas integrated into community structure
- Integrate existing heritage landscapes (hedgerows) into introduced open space features
- Link existing and introduced open spaces where appropriate
- Integrate trails and pathways as part of an interconnected pedestrian and cycling network
- Trail and pathway locations to mitigate potential impacts to sensitive environments
- Inform homeowners of the importance and function of the NHS and related responsibilities

Low Impact Development (LID) / Sustainable Design

- Consideration for all LID measures as a key foundation for open space and built form design

- Innovative approach to urban stormwater management
- Prevent, retain, detain, use and treat runoff through hydrologically functioning landscapes
- Minimize or disconnect impervious surfaces and increase flow paths
- Preserve naturally vegetated areas and soil types that slow runoff and allow infiltration
- Integrate existing landscape heritage elements into open space features, where feasible
- Site layout and grading should be integrated with existing grade conditions, where feasible
- Consider underground parking or parking integrated into built form to reduce surface paving
- For lighting, achieve a balance between safety / security and energy consumption
- Establish 'green building' practices for publicly and privately developed built form
- Building placement should consider orientation for sun and wind

Parks and Open Spaces

- Hierarchy of park spaces with flexible design and programming options
- Alternative urban park spaces that are designed for higher density mixed-use areas
- Create unique parks that are distinguished through theme, programming, layout and facilities
- Park type and location to be appropriate for adjacent street classification
- Ensure a range of passive and active recreation opportunities for all age groups
- Integrate path connections as a component of the community trail network
- Generally, all residential areas to be within a 5-minute walk to a park or open space feature
- Parks shall be designed as focal points within the neighbourhood or community
- Where feasible, situate parks at the terminus of views

Transit-Oriented Development

- Reduce commuter travel time and dependence on automobile
- Provide a comprehensive, interconnected and accessible bus transit service
- Integrate a transit hub within close proximity to a higher density, mixed-use district
- Create an identifiable district character for the transit hub location
- Ensure convenient access to available modes of transit and service types
- Generally, all neighbourhood areas to be within a 400m radius (5 min. walk) of a transit stop

Transportation

- Balance street transportation function with pedestrian street zone and land use
- Establish hierarchy of roadways and transportation, as well as urban design function
- Human-scaled street right-of-way's and pavement widths
- Transit priority for roads designated as part of the transit network
- Address on-street parking as a key function of streets within mixed-use areas
- Provide lane-based built form product as appropriate to street/building function
- Provision for dedicated on-street bike lanes, as part of the overall cycling network
- Provision for multi-use paths within boulevards along arterial roads
- Consider roundabout configurations where pedestrian/cycling flows are not compromised
- Reconsider current standards related to intersection offsets, turning movements, etc.
- Consider road standards that help achieve a uniquely urban, compact 'village' character

Neighbourhood Structure

- Create pedestrian scaled neighbourhoods -
    - Walkable (400 metre walking radius)
    - Interconnected street / block pattern (modified grid)
    - Limited block lengths
    - Multiple, safe and convenient connections
    - Sidewalks on both sides of the street for all road types
- A hierarchy of roads based on a modified grid pattern
- A patterned community with discernible edges, gateways, centres and corridors

- Identifiable neighbourhoods with major uses (parks, schools, etc.) as organizing elements
- Built form type and architectural design to support neighbourhood structure
- Commercial and civic buildings to reinforce mixed-use centre / urban core areas
- System of parkland, corridors, stormwater management ponds and NHS to function as primary organizing element
- Alternative urban park spaces that are designed for higher density mixed-use areas
- Location of schools to facilitate easy pedestrian, cycling access
- Integration of SWM ponds as an extension of the NHS to facilitate linkages

Streetscape

- Design of streets shall emphasize pedestrian safety and comfort
- Variety of building typologies and styles to reinforce attractive, animated street zone
- Strong building/street relationship
- Adopt principles of Crime Prevention through Environmental Design (CPTED)
- Create a uniquely urban boulevard treatment and 'main street' character within mixed-use areas
- Family of gateway features ('kit of parts') at key areas used to help brand the community
- Street tree planting strategy to enhance street identification
- Integrate lay-by street parking for convenient access to retail / service amenities
- Integrate transit facilities (stops, shelters, seating) with boulevard design at bus stops

6.0 Long Term Monitoring Plan

To adequately evaluate the efficacy of the proposed monitoring and management strategy, a Comprehensive Adaptive Monitoring Plan (CAMP) will be implemented with adaptive/ mitigative measures to alter the management strategy as and if necessary. The CAMP will form the framework through which the performance of the CEISMP's recommended maintenance/ enhancement strategies will be measured. The CAMP will be developed to distinguish between natural variation in ecosystem function, and potential impacts resultant to land use changes.

Monitoring criteria and adaptive mitigation measures will be required for the following environmental systems:

- Surface Water Quality
- Surface Water Quantity
- Groundwater
- Terrestrial Resources
- Aquatic Resources
- Meteorological

A generalized CAMP protocol/ summary has been developed, based on the previously approved CAMP provided within the Comprehensive Mayfield West Phase 2, Stage 1 EIS/EIR report (HDG 2019). This general summary is outlined in Table 13 and will be refined and detailed in full through the review and finalization of this plan by the Town and Conservation Authorities. The final CAMP will be presented within the approved EIS/EIR for the Mayfield West Phase 2, Stage 2 lands.

6.1 Surface Water Quality

The AMEC (2014) report contained no water quality for Etobicoke Creek which lies within the Greenbelt immediately to the north of the proposed Mayfield West Phase 2 Stage 2 development area. However, in 2013 The TRCA established a water quality monitoring station (Mayfield EC3) on Etobicoke Creek near Hurontario Street. The purpose of establishing this station was to obtain

baseline water chemistry for Etobicoke Creek prior to development of the Mayfield West Community project (TRCA pers. comm.). Water chemistry data were obtained from the TRCA for monitoring events beginning May, 2013, to March, 2017.

The long term freshwater quality guideline for chloride was exceeded on most sampling dates. Chloride levels in Etobicoke Creek are likely elevated as a result of the use of road salts in the watershed. *Escherichia coli* (E. coli) is an indicator of faecal contamination for fresh waters. The E. coli levels in Etobicoke Creek ranged from 0 to very high (11,000 counts/100 mL). E. coli levels exceeded the recommended guideline for contact with users (i.e. swimming) on several occasions.

In general, metal concentrations in Etobicoke Creek were quite low and generally below their respective Provincial Water Quality Objectives (PWQOs). Notable exceptions were aluminum, arsenic and iron.

The concentration of total Phosphorous in Etobicoke Creek ranged from 0.028 to 0.78 mg/L, with only one value less than the PWQO (0.03 mg/L). Most Total P levels were greater than 0.1 mg/L, so

Table 13: Proposed Long Term Monitoring Plan for Mayfield West phase 2 Stage 2 Lands

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
Surface Water Quality	1. Sediment /Turbidity/TSS 2. Chemistry (P, K, N, Metals, E. Coli, etc.)	Water Quality (TSS Removal) Water Quality (Unspecified Parameters)	Standard Parameters including nutrients, metals, and bacteria, as well as particle size. From one TRCA SWM facility grab samples collected from the inlet and outlet of the selected representative stormwater management facility after construction. Each site should have 3 events sampled per year, typically representative of an average spring, summer and fall event (rainfall event depths over 10 mm depth are preferable). In addition, instream sampling at strategic points within receiving watercourses. All instream sampling to be for duration of build out.	• Seasonal • 3 Wet and 3 Dry events For a period 3 years after construction of stormwater management facilities.	TBD	• Characterize urban water quality impacts • Verify stormwater quality mitigation performance	Evaluate the potential to alter SWM Facility operational characteristics (outflow rate, permanent pool depth) to optimize performance (if possible).
	3. Benthic invertebrates		N/A See 30b this table	To be determined by the Town of Caledon through collaboration with the Conservation Authorities	TBD		
	4. Stream Temperature	Water Quality (Temperature)	Temperature Monitoring – continuous in all streamflow gauges and stormwater management pond discharge.	Thermal monitoring – Continuous Period: Stormwater Management Ponds for 2 years and instream sampling for duration of program after 90% buildout.	TBD	• Verify stormwater quality thermal mitigation performance • Etobicoke Creek only	Evaluate potential to alter SWM Facility operational characteristics to minimize thermal impacts(outflow rate, permanent pool depth) (if possible)
Surface Water Quantity	5. Peak Flows 6. Runoff Volume 7. Base Flow	Risk of Flooding Water Balance (Surface Water Quantity) Groundwater Discharge	The streamflow gauges must be installed, and the flow and water level measurements carried out, in accordance with recognized standards such as Water Survey Canada national standards (e.g. Environment Canada – Hydrometric Field Manual: Measurement of Streamflow, Measurement of Stage). For stream flow monitoring, a continuous streamflow gauge and possibly a temporary small weir, subject to meeting fisheries passage criteria, will be required to assist in low flow measurement. All gauges will be operable from April, subject to meeting fisheries passage criteria, through November 30; it is important to ensure no impacts	To be initiated in first year to establish base line runoff conditions and carry on for duration of program. For a period 3 years after construction of stormwater management facilities	TBD	• Comparison of the gauge results (selected to have similar soil and slope characteristics) would allow evaluation of the effectiveness of proposed SWM control • By considering trends and correlating with continuous flow data, impacts on ground water discharge can be assessed	Modify outflow rates as necessary to optimize: • Storm flow rate (flood) control • Base flow augmentation (Extended • Detention) • Seasonal stormwater management considerations (may suggest different operations for each season) Opportunity to re-assess SWMP for enhanced infiltration

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
			on the riparian area, sediment transport and water quality. A field verified rating curve is to be established in a location intended to remain relatively stable and unaltered during the monitoring period.				
	8. Water Budget	Water Balance (Surface Water Quantity and Groundwater Discharge)	Groundwater and Surface Water Levels Water level trends correlated to the established baseline conditions are necessary to assess changes to groundwater recharge and surface water runoff resulting from development. Continued monitoring of wetland water levels is required to observe changes to the established hydroperiods and to determine the effectiveness of mitigation measures, including the proposed LIDs	Wetland groundwater and surface water levels to be continuously monitored (i.e., 1-hour interval) using dataloggers at established locations. Dataloggers must be re-established at monitoring locations prior to construction. Manual measurements and logger downloads should be collected seasonally until buildout and for 3-years following construction. Consideration should be given to the timing and staging of buildout in the monitoring program.	TBD	Comparison between monitoring data and established wetland hydroperiods Impacts due to changes in recharge, runoff and stormwater management can be assessed Effectiveness of LIDs and mitigation measures	Opportunity to re-assess stormwater management and feature based LIDs for the effected location. Adaptive strategies for increasing or decreasing the volume/ timing of water entering wetland features through the proposed LID measures.
Surface Water Quantity	9. Stream Stability Downstream of SWM Facilities	Channel Adjustment compared to natural rates.	Stream Morphology <u>Existing Sites (update) and New Sites</u> <u>Setup</u> Measure field sites, which includes 10 cross-sectional measurements; substrate composition (30 pebble counts per cross- section, plus 5 – 10 samples of the sub-pavement) Add three monumental cross-sections (as part of the 10 cross-sections) Bank properties (height, angle, material, vegetation, root depth, undercuts and in-situ shear strength) Long profile survey (energy gradient, top and bottom of riffles, max pool depth) with Benchmark Erosion Pins – 3 to 5 Depth of Disturbance or Bed chains at each of the monumental cross-sections Photographs – at same vantage point <u>Monitoring of the sites after the initial setup</u> Re-measure of three monumental cross- sections to asses change in cross-sectional shape and substrate collection at each	Monitoring period –once a year for five years and/or after a high flow event	TBD	• Provide insight on channel processes and function; yield information regarding the response of the channel to a change in land use from upstream areas	Apply findings and results to future development to reduce long-term impacts. Can also be applied in determining any required fisheries compensation from future development.

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
			site Re-survey of the area tied to the benchmark – indicates incision/aggradation of the bed, change in riffle and pool gradients and lengths Re-measure of erosion pins and bed chains Photographs – at the same vantage point				
	10. Stream Erosion (bed and bank, riparian vegetation)	Sediment Input/Supply and Rate of Channel Adjustment	Erosion: Re-survey of cross-sectional shape; assessment of substrate sizes. Analysis would include tractive force and critical shear stress Re-measurement of erosion pins and bed chains; shows rate of bank erosion and bed incision/aggradation of the bed	Monitoring period –once a year for five years and/or after a high flow event	TBD	• To evaluate the sensitivity of the channel to changing flow regime and confirmation of erosional process. • Check to ensure that stormwater management and effects of upstream land use change are not increasing channel erosion	Possible alteration of SWM facility operations to reduce erosive forces
	11. Outfall Wetland and Swale System Downstream of SWM Facilities	Evidence of Erosion, Success of Prescribed Plant Materials	General observations including identification of any erosion issues, monumented photographs, annual survey of prescribed plant materials	During and immediately after the first large rain event in the first year, and once a year for two years after construction	Observations along area between outfall to receiving watercourse	Provide insight on SWM facility discharge and function, energy and flow dissipation in floodplain	Localized treatments to address erosion concerns, if required.

Groundwater
****Note that additional groundwater monitoring is not proposed for the Stage II lands.***
The measures originally proposed under the Stage 1 Lands are summarized here.
	12. Baseflow	TBD		Flow Rate – Spot Flow Measurements and Conditions
				Monitoring Period
				• Seasonally at 3 year intervals
				• Baseflow water quality spring and fall at 3 year intervals for:
				  • Inorganic parameters
				  • Nitrogen
				  • Metals
					TBD	TBD	Opportunity to re-assess SWMP for enhanced infiltration

	13. Groundwater Level and Chemistry	TBD		Groundwater levels seasonally until buildout and then seasonally every 3 years. Where additional monitoring sites related to site specific studies or the FBWB are selected continuous recording (i.e., 1h interval) is recommended. Chemical analysis once (1) during construction and once (1) within 3-years of buildout for: • Inorganic parameters	TBD	• Impacts due to changes in recharge and stormwater management can be assessed • Changes in groundwater quality from baseline can be assessed.	Opportunity to re-assess SWMP for enhanced infiltration or redirection of stormwater runoff. Opportunity to alter land-use practices to protect groundwater quality.

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
				• Nutrients (i.e., nitrate and phosphate) • Dissolved metals			
Terrestrial Resources	**Biodiversity**						
	14. Wildlife Diversity						
	14a. Bird Diversity	Biodiversity (Birds) Species at Risk Special Status Species Significant Wildlife Habitat	Point count surveys follow Forest Bird Monitoring Program (FBMP) protocols, but include all habitat types, not just forested lands.	Initiate in 2019 prior to site alteration and repeat at 3 year intervals until 80% build out of Phase 2 lands.	TBD	• Identifies trends in avian diversity and species guilds. • Information can be related to overall diversity targets and/or threshold values • that may indicate system stress or impairment. • Stations in Etobicoke Creek valley / Greenbelt Lands to be integrated into regional monitoring network. • Identifies potential stressors to the avian community	• Apply findings and results to future development to reduce long-term impacts.
	14b. Amphibian Richness	Biodiversity (Amphibian) Special Status Species Significant Wildlife Habitat	Point counts surveys using Marsh Monitoring Program (MMP) protocols, but not limited to marsh habitats.	Initiate in 2019 prior to site alteration and repeat at 3 year intervals until 80% build out of Phase 2 lands.	TBD	• Identifies trends in amphibian diversity. • Information can be related to overall diversity targets and/or threshold values that may indicate system stress or impairment. • Stations in new corridors and linkages assess effectiveness of wetland habitat creation. Stations in Etobicoke Creek valley / Greenbelt Lands can be integrated into regional monitoring network.	• Identify potential stressors to amphibian community and implement an appropriate management strategy to eliminate or reduce impacts. • Wetland performance review may be warranted if amphibian breeding is not sustained. • Apply findings and results to improve current habitats and to guide future development to reduce long-term impacts.
	14c. Other Wildlife (mammals, reptiles, insects)	Biodiversity (other wildlife) Special Status Species Significant Wildlife Habitat	Incidental observations during bird diversity, amphibian richness, and vegetation surveys	Initiate in 2019 prior to site alteration and repeat when other biological surveys are being conducted.	TBD	• Information can be related to overall diversity targets and/or threshold values that may indicate system stress or impairment. • Complimentary to regional monitoring network.	• Identify potential stressors to other wildlife and implement an appropriate management strategy to eliminate or reduce impacts. • Apply findings and results to future development to reduce long-term impacts.
	15. Natural Cover						
	15. Natural Cover Type • Forest & Wetland (21) • Riparian (33)	Vegetation Communities Significant Wildlife Habitat	Classify natural cover according to standard ELC vegetation types.	Initiate in 2019 prior to site alteration and repeat in 2029.	TBD	• Identifies relative changes to natural cover types. Can be used to assess whether targets are being attained. • Complimentary to TRCA and CVC land cover analysis programs.	• Refine vegetation management strategies to achieve desired natural cover representation. • Apply findings and results to future development phases.

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
	14b. Amount of Natural Cover (21,22)	Woodlands Wetlands Forest Interior	Aerial Photo Interpretation & GIS Analysis	Initiate in 2019 prior to site alteration and repeat in 2029.	TBD	• Identify net changes to amount of natural cover by type. • Data can be used to assess whether targets are being attained. • Complimentary to TRCA and CVC land cover analysis programs.	• Refine vegetation management strategies to achieve natural cover quantity objectives. • Apply findings and results to future development phases.
	16. Habitat Quality						
	16a. Age, Structure & Composition	Biodiversity Species At Risk Special Status Species Significant Wildlife Habitat	Ecological Monitoring and Assessment Network (EMAN) Terrestrial Volunteer Monitoring Program (TVMP) standards (Forests) CVC/TRCA standards (Wetlands)	Local Scale - Initiate in 2019 and repeat at 5 year intervals until 80% build out of Phase 2 lands. Regional Scale - Initiate in 2019 and repeat at	TBD	• Identifies trends in the condition of representative natural habitats	• Refine vegetation management strategies to achieve natural cover quantity objectives. • Apply findings and results to future development phases.
	16b. Health	Natural Area Protection	EMAN Forest Health Standards	Local Scale - Initiate in 2019 and repeat at 5 year intervals until 80% build out of Phase 2 lands. Regional Scale - Initiate in 2019 and repeat at 3 year intervals until 80% build out of Phase 2 lands.	TBD	• Monitoring can identify vegetation health issues that may indicate system stress or impairment. • Identifies potential stressors to vegetation health.	• Implement and appropriate management strategy to eliminate or reduce impacts.
	16c. Disturbance	Natural Area Protection	EMAN TVMP standards.	Local Scale - Initiate in 2019 and repeat at 5 year intervals until 80% build out of Phase 2 lands. Regional Scale - Initiate in 2019 and repeat at 5 year intervals until 80% build out of Phase 2 lands.	TBD	• Identifies the type, magnitude, frequency and location of disturbance to the natural environment.	• Implement an appropriate management strategy to eliminate or reduce direct human impacts to the natural environment.
	16d. Invasive Species	Biodiversity (Plant)	EMAN TVMP standards.	Local Scale - Initiate in 2019 and repeat at 5 year intervals until 80% build out of Phase 2 lands. Regional Scale - Initiate in 2019 and repeat at 3 year intervals until 80% build out of Phase 2 lands.	TBD	• Identifies trends in invasive species populations that may indicate system stress or impairment.	• Implement and/or refine vegetation management strategy to eliminate or reduce the threat of invasive species populations on the natural environment.
	16e. Indicator Species	Biodiversity (Plant) Significant Wildlife Habitat	Map populations of significant & sensitive flora and estimate their abundance. Refer to TRCA and CVC lists of Rare or Sensitive Indicator Species	Initiate in 2019 and repeat on 5 year intervals until 80% build out of Phase 2 lands.	TBD	• Identifies trends in sensitive and significant plant species populations. The status of these populations can be an indicator of habitat quality.	• Implement and/or refine management strategy to protect rare species populations.
	17. Buffer Integrity						
	17a. Structure & Composition	Natural Area Protection Habitat Restoration	Transect based sampling across retained natural features from one development edge to another using EMAN TVMP – Gradient Sampling Protocols. Experimental design to use distance from development as an independent variable.	Initiate monitoring in 2019, repeat in year 0, 5, 10 & 15 from date of occupancy of lands adjacent to each transect.	TBD	• Will provide quantitative data to describe changes to buffer structure and composition over time.	• Implement management strategies as necessary to achieve desired buffer form.

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
	17b. Buffer Condition	Natural Area Protection Habitat Restoration	Record evidence of human related disturbances according to type, magnitude and frequency and photo document. Use ELC Disturbance Categories.	Initiate monitoring in 2019, repeat in year 0, 5, 10 & 15 from date of occupancy of lands adjacent to each segment.	TBD	• Identifies the type, magnitude and frequency of human related disturbances within buffer zones.	• Implement management strategies to reduce stress and restore buffer functions. • Develop and enforce By-Laws • Educate residents
	17c. Survivorship	Natural Area Protection Habitat Restoration	Estimate survivorship of planted material in buffer zones using transect based sampling.	Monitor annually for 3 years following installation to confirm 'free to grow' (woody cover emerged above surrounding meadow cover).	TBD	• To evaluate the effectiveness of restoration plantings. What levels of survivorship being achieved for woody and non-woody material?	• Rectify planting failures to achieve desired density and height. Re-evaluate restoration targets.
	19. Linkages & Restoration Areas (22,33)						
	19a. Dimensions, Structure & Composition	Habitat Restoration	Use transect based sampling to document structure and composition across linkage features and corridor using EMAN TVMP – Gradient Sampling Protocols	Initiate monitoring in 2019, repeat in year 0, 5, 10 & 15 from date of occupancy of lands adjacent to each transect.	TBD	• To assess the form and condition of linkage features.	• Develop and implement a management strategy to maintain desired linkage objectives where feasible. • Apply findings to future development to reduce long-term impacts.
	19b. Amphibian Movement	Habitat Restoration	Monitor spring amphibian movements in created linkages using double courses of drift fencing. Monitor amphibian road kills at road crossings of linkages and corridor during spring.	Initiate in year 0, and once again at 80% build out of lands adjacent to linkages.	TBD	• To assess amphibian movement in created linkages immediately following construction and under the post-development condition. • To identify alternate amphibian movement pathways.	• Incorporate design elements to facilitate amphibian migration. • Add directional wildlife fencing or other measures to reduce road kills. • Enhance breeding habitat by extending hydroperiods or enlarging pools.
	19c. Survivorship	Habitat Restoration	Estimate survivorship of planted material using transect based sampling.	Monitor annually for 3 years following installation to confirm 'free to grow' (woody cover emerged above surrounding meadow cover).	TBD	• To evaluate the effectiveness of restoration plantings. What levels of survivorship being achieved for woody and non-woody material?	• Rectify planting failures to achieve desired density and height. Re-evaluate restoration targets.
Aquatic Resources	20a. Benthic Invertebrates (Regional scale, conducted by relevant agencies)		Regional-scale cumulative effects monitored using established TRCA Regional monitoring program in Etobicoke Creek and established CVC Effectiveness Monitoring Strategy protocol in Fletchers Creek watershed, or current equivalent.	As per established TRCA and CVC schedules.	TBD	• Identifies trends/changes in benthic community using various indices. • New locations, if required, focus on impacts related to the pending development	• Investigate causes if negative impacts observed. • Apply findings and results to future development.
	20b. Benthic Invertebrates (Local Scale)		No local scale monitoring proposed in Etobicoke Creek watershed. If permanent flow is established in newly constructed Fletcher's Creek tributaries within Mayfield West then benthic invertebrate monitoring to be conducted using current CVC Effectiveness Monitoring protocol or equivalent.	Annually for three years following establishment of seasonal or permanent flow.	TBD.	• Indication of habitat quality if permanent aquatic habitat is created.	• None - for information only.

SYSTEM	GENERAL PARAMETER	PERFORMANCE MEASURE INDICATOR	PROTOCOL(S)	FREQUENCY/DURATION	LOCATION/AREA	MONITORING OUTCOME	ADAPTIVE MANAGEMENT RESPONSE
	21a. Stream Temperature (Regional scale, conducted by relevant agencies)		Regional-scale cumulative effects monitored using established TRCA Regional monitoring program in Etobicoke Creek and established CVC Effectiveness Monitoring Strategy protocol in Fletchers Creek watershed, or current equivalent.	As per established TRCA and CVC schedules.	TBD	• Identifies trends/changes in water temperature. • New locations, if required, focus on impacts related to the pending development	• Investigate causes if negative impacts observed. • Apply findings and results to future development.
	21b. Stream Temperature (Local scale)		Refer to Parameter #4.	Refer to Parameter #4.	TBD	Refer to Parameter #4.	Refer to Parameter #4.
	22a. Fish Habitat and Community (Regional scale, conducted by relevant agencies)		Regional-scale cumulative effects monitored using established TRCA Regional monitoring program in Etobicoke Creek and established CVC Effectiveness Monitoring Strategy protocol in Fletchers Creek watershed, or current equivalent.	As per established TRCA and CVC schedules.	TBD	• Identifies trends in fish community and habitat. New locations, if required, focus on impacts related to the pending development	• Investigate causes if negative impacts observed • Apply findings and results to future development.
	22b. Fish Habitat and Community (Local scale)		No local scale monitoring proposed in Etobicoke Creek watershed. If permanent aquatic habitat is established in newly constructed Fletcher's Creek tributaries within Mayfield West then fish habitat and community monitoring to be conducted using current CVC Effectiveness Monitoring protocol or equivalent.	Annually for three years following establishment of seasonal or permanent flow.	TBD	• Indication of habitat quality if permanent aquatic habitat is created.	• None - for information only.
	23. Redside Dace (Regional scale, conducted by relevant agencies)		Extent of occupied habitat downstream from Mayfield West to be monitored as part of Redside Dace monitoring program conducted by others. Protocols to be determined by monitoring agency.	To be recommended by the monitoring agency and confirmed by the Town of Caledon.	TBD	To be recommended by the monitoring agency and confirmed by the Town of Caledon.	To be recommended by the monitoring agency and confirmed by the Town of Caledon.
	24. Riparian Zone Cover (included in #32)						
Other	25. "New" Rainfall		Rainfall Measurement Rainfall drives all hydro-meteorological processes. As such, it is important to have a good understanding of the amount and temporal distribution of rainfall, in order to be able to assess all environmental processes. Intensity measuring gauge with maximum timestep of 10 minutes.	Rainfall – Continuous Monitoring Period - same as Flow Rate	TBD	• Allows assessment of volumetric runoff response • Allows further verification hydrologic model	Potential to update hydrologic model local through calibration/verification based on rainfall and stream flow results and optimize facility performance.
	26. "New" Snow Course		Note: "New" snow course is not required as sufficient existing sites are available.			□	

Etobicoke Creek contains elevated levels of Phosphorous. This can lead to excessive plant growth and lower dissolved oxygen levels during the growing season.

In summary, the TRCA is collecting a comprehensive database of baseline water quality conditions in Etobicoke Creek prior to the Mayfield West development. The baseline data indicate impairment of some water quality parameters with elevated levels of chloride, bacteria and nutrients. Consideration should also be given to establishing a second water quality monitoring station upstream of the proposed Mayfield development.

6.2 Hydrology and Fisheries

Given that permanently flowing or direct fish habitat watercourses are not to be altered in the Stage 2 lands, potential impacts to aquatic resources would be associated with developed flows that are discharged to the downstream receiving watercourses of Etobicoke Creek. There is an existing monitoring program for the Etobicoke Creek watershed that was developed by TRCA as part of their Regional Watershed Monitoring Program (RWMP). This long-term monitoring initiative is in place to assess aquatic habitat and species (fish and benthic invertebrates) and detect cumulative effects of upstream land use changes. It is likely that the existing RWMP sites are adequate to assess any potential impacts as a result of the proposed development plan, and that a local-scale monitoring protocol is not required.

It is also anticipated that impacts to downstream watercourses associated with stormwater discharge quality and quantity (I.e., sediment/turbidity, water chemistry, water temperature, discharge rates) will be reviewed and mitigated through the monitoring protocols developed for Surface Water Quality and Surface Water Quantity associated with proposed stormwater management (SWM) facilities. An adaptive management response has been developed for these components that will address site-specific concerns with regards to downstream impacts to aquatic species and habitat.

6.3 Groundwater Quality and Quantity

No specific additional groundwater monitoring is proposed for the Mayfield West Phase 2 Stage 2 Lands as potential changes to groundwater quality and quality are not expected for the Preferred Framework Plan. A Comprehensive and Adaptive Management Plan and Monitoring Plan (CAMP) for groundwater and surface water is currently in place Mayfield West Phase 2 Stage 1 Lands.

6.4 Stream Morphology

Long term monitoring related to fluvial geomorphological/ stream morphology considerations is summarized in the above CAMP Table, and is applicable to the following objectives:

- Provide insight on channel processes and function, yield information regarding the response of the channel to a change in land use from upstream areas.
- To evaluate the sensitivity of the channel to changing flow regime and confirmation of erosional process.
- Check to ensure that stormwater management and effects of upstream land use changes are not increasing channel erosion.
- Provide insight on SWM facility discharge and functions, energy and flow dissipation in floodplain.

6.5 Terrestrial Resources

Under the AMEC CEISMP Report and the updated Hensel Part A/ Crozier Part B CEISMP reports, the terrestrial/ natural heritage system was studied in detail. This work included an in-depth wildlife inventory, and the identification of two know species at Risk. This information was utilized in the development of NHS constraints to development areas, and through the updated Part C report will be used to inform the management plan and the development of associated mitigative measures to maintain natural features/ functions in accordance with relevant policy.

The long-term monitoring program for Terrestrial Resources is intended to have the following scope:

- Changes in land cover will be tracked for a multi-year period to be determined in consultation with the Conservation Authority.
- Permanent vegetation sample lots will be established, as necessary, to monitor long-term change in terrestrial communities.
- Transects will be regularly surveyed within core features from adjacent development.
- Breeding bird and amphibian monitoring surveys will be conducted at regular intervals until a percentage of Phase 2 lands have been built out.
- Incidental wildlife sightings will be recorded concurrently with other terrestrial surveys.

7.0 Environmental Management Plan

7.1 Performance Measures

Through the completion of the ROPA Part B report (Crozier & Associates, 2019), various evaluation factors were considered in detail with the objective of assessing whether the proposed development scenarios and associated management strategies were anticipated to adequately protect and enhance the area's environmental systems in accordance with governing legislation and practices. These interdisciplinary criteria were evaluated using an integrated approach, with respect for the interconnected relationships between natural systems. Staked top-of-bank constraint limits that extended outside of the Greenbelt limit have been removed through consultation within the TRCA with compensation to be provided as a part of the EIS/EIR.

The evaluation criteria assessed within the Part B and Part C report are summarized as follows:

Discipline	**Factor**
Terrestrial	Riparian Cover
	Wetland Cover
	Natural Cover
	Native Biodiversity Functions
	Natural System Protection
Fisheries and Aquatic Habitat	Watercourse Protection (sensitivity/ # crossings)
Hydrology	Groundwater Recharge and Discharge
	Aquifers and Local Groundwater Users
	Pre-to-Post Development Site and Features Water Budget

Stream/Fluvial Geomorphology	Maintenance of Channel Length
	Erosion Potential
	Maintenance of Drainage Density
Hydrology/Hydraulics	Flooding Potential (downstream off-site)
	Flooding Potential (on-site)
Water Quality	Instream Water Quality (mass loading)

The reader is directed to the previously completed CEISMP Part B for the additional detail related to the Evaluation Factors.

The above criteria may be further distilled and refined to formulate specific and quantifiable performance measures by which the effectiveness of the chosen management plan may be assessed on an ongoing basis. Utilizing the AMEC Part C reports (2014) as a framework for monitoring and evaluating the successful management objectives, the identified performance measures and corresponding management objectives have been summarized in the CAMP matrix (see Table 14).

7.2 Natural Heritage System

The Provincial Policy Statement (PPS) defined an NHS as "a system made up of natural heritage features and areas, and linkages intended to provide connectivity (at the regional or site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species, and ecosystems". The land management strategy identified in the Preferred Framework Plan (August 2019, see Figure 3) identifies and protects significant natural heritage features and functions and establishes naturally vegetated connections among significant features. The scale of connectivity spans watersheds and hence represents not only local but regional scale. Therefore, the NHS established in the Preferred Framework Plan is consistent with Provincial direction with respects to identification/delineation of an NHS and hence is the preferred management strategy applied to the Mayfield West Phase 2 Stage 2 lands to establish an NHS.

The Preferred Framework Plan (Figure 3.) identifies land use designations defining a Natural heritage System (NHS). During preparation of the Preferred Framework Plan, efforts were made to confirm existing natural heritage features from the subject lands. Once confirmed, key natural heritage features were protected on the landscape and appropriate buffers/setbacks to these features were confirmed with the agencies. Linkages between natural heritage "patches" were strategically located to provide connectivity between patches and to facilitate linkages between lands south of Mayfield Road and the Etobicoke Creek corridor. This NHS provides opportunity for net increase in woodland area, wetland area and for wildlife movement and habitat enhancements. The NHS also provides opportunity for recreation and a community trail network. Natural heritage features and functions included in the NHS include: Provincially Significant Wetland (PSW), watercourses (Etobicoke Creek plus key headwater drainage features), meander belt (Etobicoke Creek), top-of-bank (Etobicoke Creek), significant woodlands and setbacks to features as approved by review agencies. In addition, the NHS presented on the Framework Plan includes Environmental Policy Areas and Greenway Corridor land use designations that establish linkages through the Phase 2 lands connecting natural areas/drainage features on lands south of Mayfield Road (Fletcher's Creek watershed) to the Etobicoke Creek valleylands. Through restoration these linkages establish habitat connections among natural areas of the Fletcher's Creek and Etobicoke Creek watersheds

that don't currently exist.

7.2.1. Key Components of The Natural Heritage System

Under the works associated with the Part B report (Crozier & Associates 2019), a natural heritage inventory was evaluated and used to establish the baseline conditions for the Mayfield West Phase 2 Stage 2 lands. Key components of the NHS identified through this exercise include the following areas:

Area 2 Fletcher's Creek Headwaters
West of McLaughlin Road

- Low constraint watercourses present with one medium constraint tributary present
- Minimal riparian cover or habitat connectivity, potential for increased riparian cover and linkages
- Tableland woodlot with upland and swamp habitat just south of subwatershed boundary
- Woodlot meets Town and ROPA 21B significant Woodland criteria
- MNRF evaluated wetlands in this woodlot are part of the Upper Fletcher's Creek Provincially Significant Wetland (PSW) complex
- Provincial 'Species at Risk' – Barn Swallow (Threatened)
- Significant Wildlife Habitat (SWH) present based on ROPA 21B criteria
- Existing agricultural fields support wildlife movements as well as habitat for area sensitive open country bird species

Area 4 – Etobicoke Creek Subwatershed
West of McLaughlin Road, South of Greenbelt

- Low constraint watercourses extend out of Greenbelt
- Minimal riparian cover or habitat connectivity; limited potential for increased riparian cover and linkages
- Existing agricultural fields support wildlife movements as well as habitat for area sensitive open country bird species
- Hedgerows provide local linkage functions
- Localized heritage trees in hedgerows and agricultural fields
- Based on EIR & recent 2017 SAR field work by SLR
- SWH functions – None
- SAR – Property 2, 4 Barn Swallow; Property 2, 4, 11 END bats

Area 7 – Etobicoke Creek Subwatershed
Greenbelt East of McLaughlin Road

- High constraint permanent Etobicoke Creek channel
- Additional minor and complex contributing watercourses of low and medium constraint
- Potential for increased riparian cover and linkage
- Ravine forests meet Town and ROPA 21B Significant Woodland criteria
- Ravine meets ROPA 21B Significant Valleyland criteria
- Wetlands present within ravine are a part of the Etobicoke Creek Headwaters Provincially Significant Wetland Complex
- Provincial 'Species at Risk' – Butternut (Endangered); Bobolink and Eastern Meadowlark (Threatened); Eastern Wood-Pewee and Wood Thrush (Special Concern)
- Significant Wildlife Habitat (SWH) present within ravine based on ROPA 21B criteria

- Existing agricultural fields within an adjacent to ravine support wildlife movements as well as habitat for area sensitive open country bird species

Area 8 – Etobicoke Creek Subwatershed
Greenbelt West of McLaughlin Road

- High constraint permanent Etobicoke Creek channel
- Additional seasonal and complex contributing watercourses of low and medium constraint
- Potential for increased riparian cover and linkage
- Forests meets Town and ROPA 21B Significant Woodland criteria
- Valleylands meet ROPA 21B Significant Valleyland Criteria
- Wetlands present associated with watercourses are part of the Etobicoke Creek Headwaters Provincially Significant Wetland Complex
- Provincial 'Species at Risk' - Barn Swallow, Bobolink and Eastern Meadowlark (Threatened); Eastern Wood-Pewee and Wood Thrush (Special Concern)
- Significant Wildlife Habitat (SWH) present within ravine based on ROPA 21B criteria
- Existing agricultural fields within and adjacent to ravine support wildlife movements as well as habitat for area sensitive open country bird species

7.2.2. Natural Heritage System, Buffers and Linkages

A "Green Development" approach is considered to be a model applicable to the Mayfield West Phase 2 Stage 2 area given a) the presence of a significant Greenbelt designated area and b) the presence of other natural features and potential regional linkages that have been approved (Stage 1 lands) as part of the Town of Caledon Council endorsed Framework Plan for the Mayfield West Phase 2 Secondary Plan dated August 29, 2013 and maintained in the Landowners Framework Plan, August 2019. The opportunity therefore exists to link natural heritage features found within the Etobicoke Creek corridor and related Greenbelt lands within Stage 2 lands to approved Terrestrial Greenlands A and B Corridors located in Stage 1 lands through to regional linkages in the North West Brampton Landscape Scale Analysis (Dougan & Associates, 2011). The Principles identified for the Phase 2 lands, particularly Principle 1 (Achieve net Ecological Gain), Principle 2 (Adopt an integrated design process) and Principle 8 (Ensure community connectivity and integration at all scales). The "Green Development" approach functionally integrates the future built environment with the core natural features, corridor and other linkages, and buffer areas/uses.

It should be emphasized that when the existing agricultural matrix is replaced by urban development, the mobility of terrestrial species will be significantly reduced, and potent stressors will be added to the environment. To partially address these factors, riparian-based linkages are currently being implemented in the approved Mount Pleasant Secondary Plan that extend up to Mayfield Road, with the intention of creating connections to the isolated woodlots north of Mayfield Road, and ultimately to the Etobicoke Creek valley in the Greenbelt. These linkages are intended to contain riparian, upland and wetland components and thereby may provide some opportunity for terrestrial species movements, potentially including reported species of concern. These linkages are consistent with findings of the North West Brampton Landscape Scale Analysis, and Fletcher's Creek Subwatershed Study.

7.2.3. Natural Heritage System Phasing and Construction Practices

The Natural Heritage System may be phased, and multiple staged permits may be issued by the applicable agency to accommodate phasing of the NHS provided that the Conditions of Approval or Individual Draft Plans of Subdivision address phasing of the NHS implementation including interim strategies if needed.

During construction, the risk of sedimentation is highest to wetlands. To minimize the potential for erosion and off-site transport of sediment into surface water and wetland features, the projects will implement Best Practises related to erosion and sediment control (ESC). The following ESC measures are most important for the protection of wetland:

- Retain the existing vegetation and stabilize ground with vegetation where possible
- Limit the duration of soil exposure and/ or phase construction
- Limit the size of the disturbed area
- Maintain overland sheet flow and avoid concentrating flow
- Store and stockpile soil away from watercourses, drainage structures, wetlands, and the top of slopes.

Further erosion and sediment control (ESC) strategy measures and recommendations are provided in section 7.5 of this report.

7.2.4. *Endangered Species Act*/Species At Risk – Planning Approvals

Based on submission of an Information Gathering Form in 2016 and ensuring consultation with the MNRF, the subject and adjacent lands provide habitat for the following Endangered and Threatened species protected under Ontario's Endangered Species Act, 2007 (ESA): Barn Swallow (*Hirundo rustica*) (Threatened), Mouse-eared bats (*Myotis*) (Endangered); and Redside Dace (*Clinostomus elongatus*) (Endangered). Barn Swallow and Myotis bat habitat of concern to approval agencies (MNRF) with respect to the proposed development is associated with barns and other built structures historically located on some of the properties contained within the subset of properties providing habitat for these two species. Redside Dace occur within Fletcher's Creek downstream of Mayfield Road. Headwater drainage features of the subject lands contribute seasonal surface water inputs to this downstream Redside Dace Habitat. The drainage features of the subject lands are not considered occupied habitat of Redside Dace but rather - "contributing".

Based on recent field work (Barn Swallow, bats) and past discussion with MNRF regarding Redside Dace, we anticipate that ESA authorizations will have to be secured with respect to barns and other structures with respects to barn Swallow (ESA Registry Submission with construction of Barn Swallow compensating nest structures in the Etobicoke valleylands or elsewhere within 1km as per O. Reg. 248/08) and Myotis bats (potentially an ESA C-permit defining actions to achieve overall net benefit – to be established in consultation with MECP). Based on built past discussions with the MNRF we anticipate that concerns with respects to Redside Dace can be adequately addressed through engineering design of SWM ponds that discharge to the Fletcher's Creek watershed in a manner consistent with provincial direction (based on past discussions with the MNRF, ESA authorization not anticipated to be required – subject to MECP review and input).

7.2.5. Guidelines for Terrestrial/Natural heritage System Studies

Under the AMEC CEISMP Part C (2014) report and the updated Hensel Part A/ Crozier Part B CEISMP (2019) reports, the terrestrial/natural heritage system was studied in detail. This work included an in-depth wildlife inventory, and the identification of two known Species at Risk. This information was utilized in the development of NHS constraints to development areas, and through the updated Part C report, will be used to maintain natural features/functions in accordance with relevant policy.

Under the AMEC CEISMP (2014) report, the following information was identified as being recommended for incorporation within the individual site specific EIS studies:

- Identification of cover targets and targeted indicator species for the existing natural areas within the NHS, corridor, linkages and restoration areas
- Inclusion of a management plan specifying approaches by species and area
- Consideration and summary of how NHS targets/opportunities have been addressed through EIS recommendations
- Consideration of SAR and inclusion of measures to ensure basic habitat and wildlife movement requirements are satisfied
- Identify general habitat management requirements for natural areas, buffers and corridors

7.3 Aquatic Habitat Management Considerations

The AMEC (2014) CEISMP report found there to be no permanently flowing watercourses within the area that would be directly altered through development activities. If impacts to aquatic biota and associated habitat were to occur, it would be in the watercourses to which the subject lands drain, Fletcher's Creek and Etobicoke Creek. Both watercourses have management strategy considerations that were identified during the CEISMP process completed by AMEC in 2014 and outlined in the Comprehensive Adaptive Management Plan (CAMP).

7.3.1. Etobicoke Creek

The AMEC (2014) report found that no deterioration of aquatic habitat or biotic communities is expected to occur as a result of the proposed subject lands development. The primary considerations within Etobicoke Creek are the protection of existing fish habitat and benthic invertebrate communal functions.

Any impacts that may occur to the aquatic biota of Etobicoke Creek are likely to be associated with the discharge of stormwater. No direct alteration of the creek is anticipated, and it is generally well buffered from the development by the Green Belt and overall development setback limit determined through consultation efforts.

The TRCA's Regional Watershed Monitoring Program (RWMP), is a science-based, long term monitoring initiative. It is intended to collect aquatic and terrestrial ecosystem data at the watershed and sub-watershed scale, and across the jurisdiction as a whole. The intention is to provide critical data to enable key planning and reporting abilities for the agency. The RWMP assess aquatic habitat and species (fish and benthic invertebrates), among other factors. It is likely that the existing RWMP sites are adequate to assess any potential impacts as a result of the proposed development plan, and that a local-scale monitoring protocol is not required.

7.4 Climate Change

It is noted that the factors of climate change should be considered during the design of the MWPh2 Preferred Framework Plan. Climate change was to be considered in accordance with the MECP Low Impact Development Stormwater Management Guidance Manual, which was regarded to be forthcoming, and which was to contain guidance relating to design considerations to address climate change. It is noted that as of March 2020, this manual is still in draft format. Notwithstanding this fact, the development of final design plans should consider information found within the draft report, as it relates to climate change – particularly in the area of the implementation of Low Impact Development (LID) technologies.

7.4.1. Guiding Principles Relation to Climate Resilient Land-Use Planning

The development of nine Guiding Principles for the Secondary Plan were established during the Mayfield West Phase 2 planning process and were endorsed by the Town of Caledon. These guidelines, previously circulated to the Core Management Committee, included:

1. *Achieve net ecological gain, where practical, possible and advisable.*
2. *Adopt an integrated design process.*
3. *Foster a local identify rooted in the spirit of the Town of Caledon.*
4. *Establish the structure for a close-knit small town that fosters self-sufficiency.*
5. *Achieve a range of mix of housing.*
6. *Promote walking, cycling and transit opportunities.*
7. *Maximize conservation and innovation (water, waste, energy).*
8. *Ensure community connectivity and integration at all scales.*
9. *Support adaptive change.*

The purpose in creating the Guiding Principles was to assist all stakeholders in establishing the Preferred Framework Plan for the Mayfield West Phase 2, Stage 2 area.

7.4.2. Provincial Policy Statement on Energy, Air and Climate Change

The Provincial Policy Statement (PPS), 2020 provides policy direction on matters of provincial interest related to land use planning, development and climate change management. Section 1 of the PPS outlines policies associated with future development and land use patterns. Policies within this Section relevant to this report relating to climate change land-use planning include:

"Section 1.8 Energy Conservation, Air Quality and Climate Change
Section 1.8.1 Planning authorities shall support energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions, and climate change adaptation through land use development patterns which:

a. *Promote compact form and a structure of nodes and corridors;*
b. *Promote the use of active transportation and transit in and between residential, employment (including commercial and industrial) and institutional uses and other areas;*
c. *Focus major employment, commercial and other travel-intensive land uses on sites which are well served by transit where this exists or is to be developed; or designing these to facilitate the establishment of transit in the future;*
d. *Focus freight-intensive land uses to areas well served by major highways airports, rail facilities and marine facilities;*
e. *Improve the mix of employment and housing uses to shorten commute journeys and decrease transportation congestion;*
f. *Promote design and orientation which:*
1. *Maximizes energy efficiency and conservation, and considers the mitigating effects of vegetation; and*
2. *Maximizes opportunities for the use of renewable energy systems and alternative energy systems; and*
g. *Maximize vegetation within settlement areas, where feasible."*

The development proposals shall be consistent with the policy statements made under this Act. The framework of section 1.8.1 of the PPS was identified as being a fundamental piece to the planning approach applied to the Mayfield West lands.

7.4.3. Research and Information gathering on Climate Change, Mitigation and Adaptation (MOECC)

The 2016 Research and Information Gathering on Climate Change Mitigation and Adaptation Report prepared for the MOECC discusses the linkage between climate change and the land-use planning process. The report was completed to provide research and recommendations to aid Ministries and stakeholders in planning for climate change.

The objectives/recommendations relevant within the Climate Change, Mitigation and Adaptation report with regards to climate change land-use planning are as follows:

1. "Providing update-to-date linkage between land-use planning and actions to mitigate and adapt to climate change (CC) in the Greater Golden Horseshoe (GGH);
2. Provide land-use planning best practices, including key land-use indicators, land-use planning objectives, key information needs, planning tools, policies and performance measures to mitigate and adapt to climate change;
3. Provide a comparison of best practices to Ontario's existing land-use policy framework for the GGH, including the Growth Plan, the Greenbelt Plan, the ORMCP and the NEP and the Provincial Policy Statement 2014 (PPS);
4. Provide recommendations to support climate change mitigation and adaptation on changes that may be appropriate to the Growth Plan, the Greenbelt Plan, the ORMCP and the NEP;
5. Provide recommendations on potential performance measures, indicators or other metrics, which could be used to determine if climate change-related objectives within the Provincial Plans are being met."

The 2016 Research and Information gathering on Climate Change, Mitigation and Adaptation report prepared for the MOECC called for an adoption of a fully encompassed advisory panel of stakeholders throughout the entirety of the planning process. The Mayfield West Phase 2 Planning process has included multiple stakeholders who have provided input to assist in identifying thresholds, performance measures, setbacks, etc.

8.0 Policy Conformity Assessment and Recommendations

8.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) 2020 provides policy direction on matters of provincial interest related to land use planning and development. Section 3 of the *Planning Act* requires that decisions affecting planning matters "shall be consistent with" policy statements issued under the Act. Section 1 of the PPS outlines policies associated with future development and land use patterns. Policies within this Section relevant to this report include:

"Section 1.1.1 Healthy, livable and safe communities are sustained by:

c) avoiding development and land use patterns which may cause environmental or public health and safety concerns; and
h) promoting development and land use patterns that conserve biodiversity…

Section 1.5.1 Healthy, active communities should be promoted by:

d) recognizing provincial parks, conservation reserves, and other protected areas, and minimizing negative impacts on these areas

Section 1.6.6.7 Planning for stormwater management shall:

a) be integrated with planning for sewage and water services and ensure that systems are optimized, feasible and financially viable over the long term;
b) minimize, or, where possible, prevent increases in contaminant loads;
c) minimize erosion and changes in water balance, and prepare for the impacts of a changing climate through the effective management of stormwater, including the use of green infrastructure;
d) mitigate risks to human health, safety, property and the environment;
e) maximize the extent and function of vegetative and pervious surfaces; and
f) promote stormwater management best practices, including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

As established in the updated Parts A and B of the CEISMP reporting (HDG March 2019, Crozier & Associates January 2020), existing natural heritage and hazard areas have been delineated and serve as a development constraint for the Secondary Plan. The development constraint is further protected by minimum 10-metre buffering from which development is prohibited from encroaching. The delineation of the natural heritage features and hazard areas and associated buffering contribute to the conservation of biodiversity which allow urbanization and the continuation of existing natural areas to co-exist and flourish.

With respect to stormwater management, the preferred land use plan provides for stormwater management ponds which control and effectively minimize and /or prevent increases in contaminant loads. As outlined in the Part B ROPA (Crozier, January 2020) 3.5.3. Stormwater Management Requirements and 3.5.7 Hydraulic Impacts) the proposed stormwater management system also ensures there will be no adverse impact to downstream flooding as stormwater management facilities have been sized to achieve an over-control target of 60% of existing flows and are located to maintain the overall drainage patterns and sources of drainage, consistent with the MMM Group Etobicoke Creek Hydrology Update Study (April 2013) and the AMEC EIS (2014). The stormwater management criteria identified in the Part B ROPA (Crozier, January 2020) will ensure that flood elevations for the 2-year to 100-year events are unchanged relative to existing conditions and that there are no flooding concerns upstream or downstream of the Subject Lands. With regards to the regional event and as agreed with TRCA staff, compensating cuts within the Greenbelt / valley are proposed to mitigate fill placement in the existing floodplain related to alteration of the future Regional floodplain. This will result in a reduction in the overall water levels relative to existing conditions for the Regional event, and although not quantified, it can also be anticipated that there will be decreases in potential downstream shear stresses in the channel due to additional capacity in cut areas, resulting in reduced flow velocities. Low impact development is proposed throughout the development area and will contribute to a pre to post development water balance. All development is proposed above the Regional floodline to avoid risk to human health and safety and property damage.

Section 2 of the PPS outlines policies associated with the wise use and management of resources. Policies within Subsection 2.1 relevant to this report include:

"Section 2.1.1 Natural features and areas shall be protected for the long term.

Section 2.1.2 The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground

water features.

Section 2.1.3 Natural heritage systems shall be identified in Ecoregions 6E & 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas.

Section 2.1.4 Development and site alteration shall not be permitted in:
a) significant wetlands in Ecoregions 5E, 6E and 7E; and
b) significant coastal wetlands.

Section 2.1.5 Development and site alteration shall not be permitted in:
b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River;
c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River;

unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Section 2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.

Section 2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions."

All existing natural features and areas are generally associated with the Etobicoke Creek valley and have been delineated by a constraint line which will prevent development from occurring within the feature and will be dedicated to public authorities (Toronto Region Conservation Authority) for long term protection. While the entire Etobicoke Creek valley system is planned to remain intact as shown on the Landowner's preferred Land Use Plan, new terrestrial corridors connecting the existing woodlots within the Stage 1 areas to the Etobicoke Creek system will provide new linkages and improve ecological function and biodiversity of the natural heritage systems. Further, as stated previously, buffering to the Natural Heritage System will be provided which will create spatial separation between the development of the Stage 2 area and the various natural features. It is through this buffering and planned buffer enhancements that no negative impacts will occur to the natural features or their ecological function. The proposed Rural Service Centre settlement area boundary for the Mayfield West Phase 2, Stage 2 Secondary Plan does not encroach within the Greenbelt Plan Area that applies to the Etobicoke Creek Valley and associated tableland.

Policies within Subsection 2.2 relevant to this report include:

Section 2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:

- *a) using the watershed as the ecologically meaningful scale for integrated and long-term planning, which can be a foundation for considering cumulative impacts of development;*
- *b) minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts;*

c) evaluating and preparing for the impacts of a changing climate to water resource systems at the watershed level;
d) identifying water resource systems consisting of ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas, which are necessary for the ecological and hydrological integrity of the watershed;
e) maintaining linkages and related functions among ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas;
f) implementing necessary restrictions on development and site alteration to: 1. protect all municipal drinking water supplies and designated vulnerable areas; and 2. protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions;
g) planning for efficient and sustainable use of water resources, through practices for water conservation and sustaining water quality;
h) ensuring consideration of environmental lake capacity, where applicable; and
i) ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

Section 2.2.2 Development and site alteration shall be restricted in or near sensitive surface water features and sensitive ground water features such that these features and their related hydrologic functions will be protected, improved or restored. Mitigative measures and/or alternative development approaches may be required in order to protect, improve or restore sensitive surface water features, sensitive ground water features, and their hydrologic functions."

The Etobicoke Creek is the sensitive surface water feature within proximity to the Secondary Plan.

The watershed and water resource systems are being protected or improved within the study area through the design of the Mayfield West Stage 2 Secondary Plan and the comprehensive stormwater management requirements for the Secondary Plan. In support of the settlement area boundary expansion, this Report provides a comprehensive stormwater management master plan which demonstrates the avoidance of negative impacts on watershed conditions and the water resource system, including quality and quantity. Development within all key hydrologic areas and the Natural Heritage System are also avoided. This Report also includes an overview of the proposed comprehensive adaptive management plan and monitoring plan to protect and improve water resource systems within the subject lands as well as the preferred management strategy for the system. The comprehensive study included investigation of the water resource system including surface water features, areas and functions, wetlands, watercourses, groundwater features, areas and functions, groundwater recharge and discharge, highly vulnerable aquifers. The development and analysis of the preferred management strategy to address these is located in Section 4.0 of this report.

Section 3 of the PPS outlines policies associated with protecting public health and safety. The primary objective of this Section is to direct development away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards. The main hazards within the study area include the Etobicoke Creek watercourse and associated erosion and floodplain as well as the Etobicoke Creek valley embankment. As shown on Drawing 101B of the Part B Report (See Figure 10 herein) showing proposed constraint mapping, generally, all hazards are located within the Greenbelt Plan Area where development is not directed to occur with the exception

of stormwater management facilities. Further policy discussion on the location of the stormwater management facilities is provided under Section 2.3 (Greenbelt Plan).

8.2 A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019)

A Place to Grow (*Growth Plan*) is the Province's initiative to plan for growth and development in a way that supports economic prosperity, protects the environment and helps communities achieve a high quality of life. Section 2.2.8 of the Growth Plan provides policies relating to settlement area boundary expansions. Policies within this Section relevant to this report include:

"Section 2.2.8.3 Where the need for a settlement area boundary expansion has been justified in accordance with policy 2.2.8.2, the feasibility of the proposed expansion will be determined and the most appropriate location for the proposed expansion will be identified based on the comprehensive application of all of the policies in this Plan, including the following:

c) the proposed expansion would be informed by applicable water and wastewater master plans or equivalent and stormwater master plans or equivalent, as appropriate;
d) the proposed expansion, including the associated water, wastewater and stormwater servicing, would be planned and demonstrated to avoid, or if avoidance is not possible, minimize and mitigate any potential negative impacts on watershed conditions and the water resource system, including the quality and quantity of water;
e) key hydrologic areas and the Natural Heritage System for the Growth Plan should be avoided where possible;
i) the policies of Sections 2 (Wise Use and Management of Resources) and 3 (Protecting Public Health and Safety) of the PPS are applied;
j) the proposed expansion would meet any applicable requirements of the Greenbelt, Oak Ridges Moraine Conservation, Niagara Escarpment, and Lake Simcoe Protection Plans and any applicable source protection plan;"

In support of the settlement area boundary expansion, this Report provides a comprehensive stormwater management master plan which demonstrates the avoidance of negative impacts on watershed conditions and the water resource system, including quality and quantity. Development within all key hydrologic areas and the Natural Heritage System are also avoided. Sections 2 (Wise Use and Management of Resources) and 3 (Protecting Public Health and Safety) of the PPS have been applied as per Section 2.1 of this Report. Out of the various Provincial Plans referenced in Section 2.2.8.3(j) of the Growth Plan, only the Greenbelt Plan affects the study area. Conformity with the Greenbelt Plan is elaborated in Section 2.3 of this Report.

Section 4 of the Growth Plan provides context and policies relating to the protection of valuable features and resources. Among these valuable features and resources are Water Resource Systems, Natural Heritage Systems, Key Hydrologic Features, Key Hydrologic Areas, Key Natural Heritage Features and those areas adjacent to these systems and features. As required by Section 4 the Growth Plan, this Report addresses watershed planning in a comprehensive, integrated and long-term approach for the protection and enhancement of the quality and quantity of water within the watershed. The Natural Heritage System (NHS) referred to in Section 4 of the Growth Plan relates to NHS Mapping introduced in 2018 outside of the Greenbelt Plan Area.

As the study area is only affected by the Natural Heritage System mapping within the Greenbelt Plan, the Growth Plan policies relating to the Growth Plan NHS do not apply. Instead, the 2017 Greenbelt Plan is the governing document for the Natural Heritage System within the study area as

well as the Key Hydrologic Features and Areas and Key Natural Heritage Features.

8.3 TRCA Living City Policies

Under Section 28 of the Conservation Authorities Act, a Conservation Authority can implement a program or policy to further its objectives of conservation. The Living City Policies was adopted by the TRCA in 2014 as the policy document to guide the TRCA in the planning and development approvals process for the next 10 years. The TRCA defines The Living City "where human settlement can flourish forever as part of nature's beauty and diversity".

The approved Guiding Policies as described in **Section 4.1** of this Part C LOPA report meet the objectives of The Living City Policies in that they share objectives for a sustainable, innovative and unique community.

8.4 Etobicoke and Mimico Creeks Watershed Plan

The Etobicoke and Mimico Creeks Technical Update Report (TRCA 2010) contains policies and management directions to restore watershed health and identifies priority areas for integrated regeneration projects within the Etobicoke and Mimico Creeks watersheds. The report documents new policy directions and rationale as well as monitoring and adaptive management. Implementation priorities are discussed in Section 11 of the report and it is noted that five strategic management directions are drawn from the recommendations contained within each section of the report. These directions are:

1. Expand and enhance natural cover and connectivity.
2. Restore a more natural water balance.
3. Foster stewardship and sustainable behaviour.
4. Manage the rebounding groundwater levels.
5. Advance the science and practice of watershed management.

Section 6 of this Part C report includes the management strategy for the preferred Framework Plan as well as the performance measures by which the effectiveness of the chosen management plan may be assessed on an ongoing basis (see Table 14).

8.5 Water Balance for Protection of Natural Features

Appendix D of the TRCA's Stormwater Management Criteria document contains the TRCA's guidelines for requirements to maintain the hydrologic function of any natural heritage features that have been recommended for protection. The objective for the Guiding Principles is stated in Section 1.1 of Appendix D as follows:

"The objective of protecting a natural feature's specific water balance is to ensure that the changes anticipated post development do not exceed the feature's capacity to respond and adapt, allowing for its long-term perpetuation and sustainability, while minimizing the resources/interventions needed to manage and maintain it. This is really an assessment of risk. The desire is to maintain the physical and biological complexity of the system and not move to a more simplified system."

Water balance requirements for wetlands, woodlands and watercourses are defined as well as the

steps involved to complete the water balance.

This report includes an overview of existing conditions of the water resource system within the subject lands as well as the preferred management strategy for the system as outlined in Section 6 of this report. Guidelines for site specific studies related to the water resource system are noted in Section 8 of this report.

8.6 Etobicoke Creek Hydrology Update

The Etobicoke Creek Hydrology Update (MMM Group, 2013) prepared for the TRCA, includes updates of the hydrologic models for Etobicoke Creek watershed and stormwater management quality control criteria for the watershed. The report includes recommendations to provide guidance to government agencies and the private sector to manage and plan existing and proposed developments. Estimated peak flows for existing and future land use scenarios are included and quantity control strategies for both 1 in 2 and 1 in 100 year and regional storm events are presented in Sections 6.2 and 6.3. It is expected that the quantity control strategies included within the report are implemented for any future development. Sections 5.3.1 and 6.1.2 of this Part C report address the Etobicoke Creek Watershed and the proposed strategies to manage the watershed in the Landowners preferred Framework Plan (August 2019).

8.7 Town of Caledon Official Plan

The Town of Caledon Official Plan is a statement of principles, goals, objectives and policies intended to guide future land use, physical development and change and the effects on the social, economic and natural environment within the Town of Caledon. The study area is designated "Prime Agricultural Area", "Environmental Policy Area" and contains a Greenbelt Plan overlay in the Town's Official Plan.

With respect to the "Prime Agricultural Area", it is the goal of the Caledon Official Plan to "*protect Prime Agricultural Areas by encouraging the business of agriculture, by providing for innovation and diversification within agriculture, by providing additional economic opportunities through On-farm Diversified Uses, and by limiting non-agricultural severances*". However, given that the study area is subject to a proposed settlement boundary expansion for the accommodation of growth, it is expected that the Prime Agricultural Area designation will be removed. Justification in this regard is provided in the associated Meridian Planning Justification Report and the Colville Agricultural Impact Assessment.

The "Environmental Policy Area" designation within the study area generally represents the Etobicoke Creek Valley System. Section 5.7.1 of the Town's Official Plan states that the Environmental Policy Area (EPA) includes all Natural Core Areas and Natural Corridors. Section 5.7.3.1 generally prohibits new development within the EPA with the exception of activities permitted through approved Environmental Management Plans. This CEISMP Part C Report represents the applicable Environmental Management Plan for Mayfield West Phase 2 and generally does not support or propose new development within the EPA. The Official Plan also requires areas designated EPA to be zoned in a separate classification in the implementing Zoning By-law. The lands currently under the EPA designation are currently zoned "EPA" in the Town's By-law.

Further, Section 3.2.4.6 states that all development proposals within, containing and adjacent to EPA shall be required to conduct appropriate environmental studies/investigations, up to, and including an EIS and MP. Under Section 3.2.3.3 of the Official Plan, it states "*the preparation of Environmental*

Impact Studies and Management Plans [EIS and MPs] for development adjacent to EPA provides a mechanism for identifying how a proposal satisfies the Town's ecosystem policies and performance measures". The EIS and MP is required to address the Official Plan's Ecosystem Integrity and Planning Objectives and Ecosystem Planning Strategy. Generally, the Ecosystem Integrity and Planning Objectives Official Plan and CEISMP Report aim to protect, maintain, enhance and restore ecosystem functions and processes, ecosystem attributes and values, and physical and biological systems.

With respect to the "Greenbelt Plan" overlay, it is the objective of the Town to:

"implement the Greenbelt Plan through local land use planning policies and decisions in a manner that is consistent with the intent of the Greenbelt Plan and is supportive of the Strategic Direction, Goals, Objectives and Policies of the Region of Peel Official Plan and this Plan."

Section 7.13.3.1.1 provides policies relating to the Prime Agricultural Area designation within the Greenbelt Plan and states that Prime Agricultural Areas shall generally not be re-designated for non-agricultural uses. The CEISMP recommends the protection, restoration and enhancement of the Greenbelt Plan lands and does not require the lands to be re-designated. While stormwater management ponds are proposed within the Prime Agricultural Area of the Greenbelt, public uses, such as stormwater management facilities, are permitted in all land use designations.

Section 7.13.3.2.1 provides policies relating to the Natural System of the Greenbelt Plan. The policies primarily relate to the avoidance of impacts to Key Natural Heritage Features or Key Hydrologic Features of their functions and avoid the reduction of pervious surfaces within the Natural System. There are generally no new buildings or structures proposed with in the Natural System of the Greenbelt Plan and therefore no impacts to the Natural Heritage Features or Key Hydrologic Features of their functions nor to the perviousness of the Natural System. Further, the EPA designation within the Official Plan may be adjusted to more accurately reflect the Natural Heritage Features or Key Hydrologic Features identified within the Greenbelt as part of the Local Official Plan Amendment in accordance with Section 7.13.3.2.3.3.

Section 4.2.3 provides policies relating to settlement expansions. Settlement expansion policies relating to the natural environment include:

"4.2.3.3.1 Expansions to settlements will require an amendment to this Plan and shall be undertaken through a municipal comprehensive review that will address the following:

(b) Protection and enhancement of natural environmental, and cultural resources, including identification of a natural heritage system;

(k) The provisions of the … the Greenbelt Plan; and

(q) The proposed expansion will meet the requirements of the Greenbelt Plan…"

As demonstrated throughout this Part C Report, the report sets out appropriate protection and enhancement of the various natural environmental features and identifies a natural heritage system. Also, as demonstrated through this policy review, the provisions of the Greenbelt Plan have been addressed and the proposed expansion meets the requirements of the Greenbelt Plan. This includes a proposed cut-fill balance within the Etobicoke Creek floodplain that was agreed with TRCA staff, that maintains the incremental floodplain storage volume reduction related to the pond encroachments. This is further expanded in Section 3.5.7 of the Part B ROPA.

8.8 Region of Peel Official Plan

The Region of Peel Official Plan outlines strategies to guide growth and development within the Region. The study area is located within the "Rural Area" of the Regional Structure Plan and also within the "Prime Agricultural Area". A portion of the study area, particularly the general area along the Etobicoke Creek Valley, is located within the "Core Areas" of the Region's Greenlands System and identified in the Region's Official Plan as being within the Province's Greenbelt Plan. While the lands are currently designated "Rural System" and "Prime Agricultural Area", this Part C – Preliminary Implementation Plan CEISMP Report is prepared in support of a Regional Official Plan Amendment to redesignate a portion of the study area from "Rural System" and "Prime Agricultural Area" to "Rural Service Centre". Further, notwithstanding the "Prime Agricultural Area" status, the proposed Amendment will also remove a portion of the study area from the "Prime Agricultural Area". Further discussion and rationale in this regard is provided by the associated Meridian Planning Justification Report and the Colville Agricultural Impact Assessment.

With respect to the "Core Areas" of the Region's Greenlands System, this area contains ecological features, forms and/or functions that provide favourable conditions for uninterrupted natural systems and maximum biodiversity. In general, Core Areas include significant wetlands, significant coastal wetlands, Core woodlands, Environmentally Sensitive or Significant Areas, Provincial Life Science Areas of Natural and Scientific Interest, significant habitats of threatened and endangered species, Escarpment Natural Areas of the Niagara Escarpments Plan and Core valley and stream corridors (Sec 2.3.2.2 ROP).

Under Section 2.3.1 of the Region Official Plan, it is the objective of the Region to "*identify, protect and support the restoration and rehabilitation of the Greenlands System*". The implementation of the CEISMP recommendations achieves this objective. Section 2.3.2.6 of the Region's Official Plan prohibits development and site alteration with the Core Areas of the Greenlands System. As demonstrated through this Report, with the exception of required drainage outlets to the Etobicoke Creek, no development is proposed within the Core Areas.

8.9 Greenbelt Act – Ontario Reg. 59/05

The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological and hydrological features, areas and functions occurring within the Greenbelt Plan Area. A portion of the study area, particularly, the general area along the Etobicoke Creek Valley is located within the Greenbelt Plan Area and more specifically, within the "Protected Countryside" with a "Natural Heritage System" overlay.

In general, the "Protected Countryside" is made up of an Agricultural System and a Natural System, together with a series of settlement areas. The Greenbelt Plan relies on local Official Plans to determine whether lands within the Agricultural System are comprised of "Prime Agricultural Areas" or "Rural Areas". Based on the Town of Caledon Official Plan, the Greenbelt's Agricultural System within the study area comprises a "Prime Agricultural Area".

Section 3.1 of the Greenbelt Plan provides policies related to the Agricultural System. Prime Agricultural Area policies under Section 3.1.3 of the Greenbelt Plan promote a full range of agricultural-related uses and normal farm practices. It is intended that as development approvals occur within the Mayfield West Phase 2 Stage 2 settlement area, existing agricultural operations located on table lands within the "Prime Agricultural Area" will become small, narrow, isolated and fragmented in nature on the remnant lands between the settlement area and the valley. As a part of the Preferred Landowners Framework Plan it is required that the table lands within

the Greenbelt be naturalized and made a part of the natural heritage system. It is also intended that these lands will be dedicated into public ownership as a condition of development approvals.

Section 3.2 of the Greenbelt Plan provides policies related to the Natural System within the Protected Countryside. The Natural System is made up of a "Natural Heritage System" and a "Water Resources System". The Natural Heritage System includes core areas and linkage areas of the Protected Countryside containing the highest concentration of the most sensitive and/or significant natural features and functions. The Water Resource System is made up of both ground and surface water features and areas and their associated functions, which provide the water resources necessary to sustain healthy aquatic and terrestrial ecosystems and human water consumption.

Similar to the Agricultural System policies, the Natural Heritage System policies under Section 3.2.2 permit a full range of existing and new agricultural, agricultural-related and on-farm diversified uses and normal farm practices. The Water Resource System policies under Section 3.2.3 require planning authorities to provide for a comprehensive, integrated and long-term approach for the protection, improvement or restoration of the quality and quantity of water.

Section 3.2.5 provides policies relating to Key Natural Heritage Features and Key Hydrologic Features. The Natural Heritage System within the study area represents a water resource system and contains various Key Natural Heritage and Hydrologic features including fish habitat, wetlands, the Etobicoke Creek and significant valleylands. The Greenbelt Plan does not generally allow for development or site alteration within key natural heritage or key hydrologic features within the Natural Heritage System with the exception of forest, fish and wildlife management, conservation and flood or erosion projects, infrastructure and other limited purposes. Further, the Greenbelt Plan requires a minimum 30-metre vegetation protection zone from the outside boundary of the wetlands and the Etobicoke Creek watercourse.

As demonstrated on Figure C-1 and Drawing 101B (See Figures 9 and 10 herein) in the updated Part B Report (Crozier & Associates 2019), the Greenbelt Plan boundary provides containment of all constraints from the various Key Natural Heritage and Key Hydrologic features and therefore, any development within the Mayfield West Phase 2 Stage 2 settlement area would respect the required setbacks. In some cases, proposed stormwater management facilities and grading/restoration areas within the Greenbelt Plan Area will result in site alteration within the Etobicoke Creek Valley vegetation protection zone, but not within the vegetation protection zones to the Provincially Significant Wetlands associated with Etobicoke Creek. However, these alterations will contribute to natural heritage conservation or facilitate infrastructure permitted within the Protected Countryside. In no case do the alterations encroach into the key features or have any adverse impacts to the Natural Heritage System as confirmed with the TRCA. The resulting site alterations within the setback areas will require compensation as a part of the overall compensation/restoration plans to be provided in the EIS/EIR to the satisfaction of the Town and the TRCA.

Section 3.2.5.5 of the Greenbelt Plan requires a natural heritage and/or hydrological evaluation identifying a vegetation protection zone for any development or site alteration occurring within 120 metres of a key natural heritage feature or natural heritage system. This CEISMP Part C Report demonstrates the provision of the required vegetation protection zones for the protection of the various features including a Comprehensive Adaptive Management Plan.

Section 3.3.3 provides policies relating to the provision of Municipal Parkland, Open Space and Trail Strategies within the Protected Countryside. To provide the community with access to the Natural Heritage Area, it is intended that a contiguous multi-use trail system will be integrated into the Greenbelt Plan Area while avoiding Key Natural Heritage and Key Hydrologic features for both the protection of the features and for the safety of trail users.

8.10 Toronto and Region Conservation Authority

Ontario Regulation 166/06 is the Generic Regulation of the *Conservation Authorities Act*, which came into effect in May 2006, specific to the regulation of development, interference with wetlands and alterations to shorelines and watercourses. Under this regulation, hazardous lands, wetlands, shorelines and areas susceptible to flooding, and associated allowances within the Authority are delineated by the "Regulation Limit" shown on maps that are filed by the Authority. Under Regulation 166/06, the Toronto and Region Conservation Authority (TRCA) requires that approvals be obtained for any proposed development within areas regulated under their jurisdiction.

The intent of the permit process is to ensure that activities in these areas will not result in a risk to public safety or property damage, and that the natural features are protected through the conservation of land.

Under Ontario Regulation 166/06 Section 2, development is prohibited in or on the areas within TRCA jurisdiction that are prone to flooding, meander hazards and wetlands amongst the many development prohibitions listed. The flood hazard line of the Regulation Limit is typically associated with the stable top of bank or regulatory floodplain plus a setback to facilitate access to the top of bank. The Regulation Limit follows the maximum extent of the combined floodplain and meander belt limits. Under this regulation, permission is required from the conservation authority to develop within prohibited areas including wetlands or to alter a watercourse. Acquisition of this permission requires the completion of an Application for Permission to be filed with the Authority. It should therefore be assumed that an authorization would be required for any fill or alterations within the Regulation Limit area. If the extent of the fill or alterations identified in the Development Plan were deemed significant, an Environmental Impact Study may be triggered.

Portions of the subject lands are within the TRCA Regulation Limit. This situation does not prohibit development on the subject lands but requires that a permit be obtained from the TRCA prior to commencement of any construction activities.

8.11 Credit Valley Conservation

Ontario Regulation 160/06 is the Generic Regulation of the *Conservation Authorities Act*, which came into effect in May 2006, specific to the regulation of development, interference with wetlands, and alterations to shorelines and watercourses. Under this regulation, hazardous lands, wetlands, shorelines and areas susceptible to flooding, and associated allowances within the Authority are delineated by the "Regulation Limit" shown on maps that are filed by the Authority. Under Regulation 160/06 of the *Conservation Authorities Act*, the Credit Valley Conservation Authority (CVC) requires that approvals be obtained for any proposed development within areas regulated under their jurisdiction. Intent of the permit process with CVC is the same as in Section 3.5 of this EIS/EIR, and permission is required from the CVC to develop within prohibited areas including wetlands or to alter a watercourse. This permission requires completion of an Application for Permission to be filed with the Authority. Authorization would be required for any fill or alterations within the Regulation Limit area. If the extent of the fill or alterations identified in the Development Plan were deemed significant, an Environmental Impact Study may be triggered. Portions of the subject lands are within the CVC Regulation Limit. This does not prohibit development on the subject lands, but requires that a permit be obtained from the CVC prior to the commencement of any construction activities.

8.12 Federal Species at Risk Act

The Federal *Species At Risk Act,* 2002 (SARA) applies to species under federal jurisdiction (i.e., aquatic or migratory bird species listed as Endangered (END), Threatened (THR) or extirpated on Schedule 1 of the Act) wherever they occur. Other species listed at END, THR or extirpated on Schedule 1 of the Act receive protection on federal lands only, unless an emergency order (I.e., Section 80) or "safety net provisions" of the Act have been invoked for specified private or Crown lands.

The SARA provides protection of individuals from kill, harm, harass, capture or take as well as the "residences" and "critical habitat" of those species for which such habitat has been defined and a recovery strategy or action plan has been approved. The Act defined residences as "a dwelling-place, such as a den, nest or other similar area or place that is occupied or habitually occupied by one or more individuals during all or part of or their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating". Critical habitat is defined as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat (ecological niche) in the recovery strategy or in an action plan for species".

There is one known bird species, listed as Threatened (THR), that has been identified in the Stage 2 lands. Dialogue with MNRF regarding permitting is ongoing.

8.13 Provincial Endangered Species Act

Ontario's *Endangered Species Act,* 2007 (ESA) provides regulatory protection to Endangered (END) and Threatened (THR) species prohibiting harassments, harm and/or killing of individuals and destruction of their habitats. Habitat is characterized within the ESA as:

(a) General Habitat: an area on which a species depends directly or indirectly to carry out its life processes (under clause 2(1)(b) of the Act) or,

(b) Regulated Habitat: the area prescribed for a species in a habitat regulation (under clause 2(1)(a) of the Act). A habitat regulation may prescribe an area as the habitat of a species by describing the boundaries of the area, the features of the area, or by describing the area in any other manner. Regulated habitat may be smaller or larger than general habitat. As well, unlike the general habitat of a species, regulated habitat may include areas currently unoccupied by the species, such as areas where the species formerly occurred or areas where there is the potential for the species to become re-established. These areas are commonly referred to as "recovery habitat".

- Both general habitat and regulated habitat include places the species uses as dens, nests, hibernacula or other residences (subsection 2(1)).

There are two known wildlife species listed as Species At Risk in the *Endangered Species Act, 2007* (Province of Ontario 2007). One on these is a species of bat that is listed as endangered (END) and the other is a bird species that is considered threatened (THR). As per the policies and protocols of the ESA, 2007 and due diligence required by a landowner for any proposed land use change, an Information Gathering Form (IGF) was submitted to the MNRF Aurora District Office in August 2016. Subsequent to the submission, meetings and various correspondence were held or provided to MNRF staff, to provide a clear understanding of the ESA, 2007 requirements and obligations related to the proposed development contemplated on the Stage 2 lands. The SAR due diligence process and the legislative requirements (e.g., Part C Permit, Letter of Advice, Notice of Registration) to facilitate the proposed land uses on the Stage 2 lands is on-going, and continues as part of the Mayfield West Secondary Plan Phase 2, Stage 2 planning process.

8.14 Federal Fisheries Act

The Federal *Fisheries Act* was amended by Bill C-68 which received royal assent on June 21, 2019(An Act to Strengthen and Modernize Canada's *Fisheries Act)*. Prior to the amendments of Bill C-68, Bill C-38_4 which received royal assent on June 29, 2012 removed protection provisions surrounding fish and fish habitat from the *Fisheries Act.* The associated amendments of Bill C-36_4 that came into law in 2012 were found to challenge the ability of the federal government to protect fish and fish habitat. With the amendments brought forth through the onset of Bill C-68 the reinstatement of these protection provisions was re-established.

Nonetheless, the federal *Fisheries Act,* 1985 requires that projects are to avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO). This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery.

Consultations with DFO and MECP are ongoing and any required permitting/authorization associated with fisheries resources must be obtained as a part of approving detailed design plans.

9.0 Guidelines for Future Site-Specific Studies

9.1 Comprehensive Environmental Impact Statement/Environmental Implementation Report

Under the AMEC CEISMP Report (2014) and the Part A ROPA (Hensel Design Group, 2019) and the ROPA Part B and Part C CEISMP reports (Crozier & Associates, 2020), the terrestrial/ natural heritage systems were studied in detail. This work included in-depth vegetation and wildlife inventories and the identification of Species at Risk. Field work completed to 2018 will be utilized to complete this report. No additional field work, post 2018, will be completed. This information was utilized in the identification of constraints to development and a Natural Heritage System for the Mayfield West Phase 2, Stage 2 lands.

The following information was identified by Town, CAs and Stakeholders as being recommended for incorporation within the required comprehensive EIS/EIR study to be prepared for the whole of the Mayfield West Phase 2, Stage 2 lands:

- Identification of wetland and woodland cover objectives and targeted indicator species for the existing natural areas within the NHS, corridor, linkages and restoration areas;
- Inclusion of an implementation principals plan specifying approaches by species and area;
- Consideration of SAR and inclusion of measures to ensure basic habitat and wildlife movement requirements are satisfied;
- Identify general habitat management requirements for natural areas, buffers and corridors;
- **Integrate the findings from all other supporting reports (functional servicing, fluvial geomorphology, hydrogeology, etc.) to evaluate potential impacts to development and recommend required mitigations.**

9.2 Hydrogeology and Water Budget

A comprehensive hydrogeological investigation has been completed as part of the updated CEISMP Part A and Part B reporting using boreholes and groundwater monitoring wells completed as

part of the Comprehensive EIS/EIR Report (HDG 2019), site and feature based water balance investigations, slope stability studies along Etobicoke Creek and site servicing assessments along the Spine Road and McLaughlin Road. Using this data, an assessment of groundwater levels, soil permeability, groundwater flow direction, and percolation rates were provided in the updated CEISMP Part B Report (Crozier & Associates 2019). Conservative values for groundwater levels and percolation rates were utilized for LID design and planning.

Should additional investigations be undertaken to further refine the hydrogeological conditions on a site-specific basis through a subsequent planning process (e.g. Draft Plan of Subdivision), these studies should focus on percolation testing and groundwater level measurements at the location of proposed LIDs. Should deep foundations be proposed, the hydrogeological assessment should focus on estimating construction dewatering rates and management of dewatering discharge.

9.3 Functional Engineering Studies

In support of the various development applications for the Preferred Framework Plan and individual Draft Plans, functional level engineering studies/ reports will be required to support the planning applications and to speak to the servicing/ stormwater management strategies of each individual land holding.

Further to the functional level studies which support the Preferred Framework Plan and individual development Draft Plan applications, detailed design studies and specifications will be required to facilitate the final approval and construction of each development. These detailed studies will elucidate upon, and provide implementation plans for the recommendations and preliminary designs of the functional level reports.

These reports will speak in detail to the implementation strategy of servicing and stormwater management infrastructure associated with each individual development. The report provides detailed consideration of stormwater management infrastructure including wet-ponds and Low Impact Development infrastructure, as well as conveyance and distribution networks for stormwater, sewage and municipal water.

9.4 Fluvial Geomorphological Studies

From a fluvial geomorphological perspective, there are several components of the management strategy that should be considered at detailed design to ensure that potential impacts to stream morphology and receiving watercourses are addressed. An erosion control strategy should be finalized in association with site-specific stormwater management (SWM) plans. As outlined in Section 5.1.6, an erosion mitigation strategy was developed under the AMEC (2014) study. The unitary release rates defined in the 2014 study should be applied through future planning stages and during detailed design.

In further support of site-specific SWM plans, outfall designs should be provided for SWM facilities following the approach outlined in Section 5.1.6. Outfalls should be finalized as part of detailed design and should be accompanied by a technical design brief that outlines pre-development site conditions, design considerations, and provides technical details and recommendations for implementation and monitoring of the proposed design.

9.5 Restoration of Greenbelt Plan Area, Greenway Corridors and Buffers

Implementation and specific design details/planting specifications for restoration of the greenbelt areas, greenway corridors and buffers will be established through the preparation of Detailed Restoration Plans in support of Draft Plans of Subdivisions. These plans will be subject to approval of TRCA, CVC and Town of Caledon. Restoration of the subject lands will be progressive and determined by the phasing of development and related buildout timing. Monitoring of the success of the restoration efforts and related adaptive management will be a fundamental component of the establishment of the Natural Heritage System for the Mayfield West Phase 2, Stage 2 lands. As part of the Greenbelt Plan Area restoration and mitigation works, specific areas at the SWM outlets/outfalls for Ponds 5, 6, 7 and 8 and within the valley corridor have been identified for wetland creation. The TRCA was consulted on the design principles for the wetland features. Benefits of these pocket wetlands include organic inputs, temperature regulation, polishing, energy dissipation, and dispersion of flows. Additionally, by retaining flows, the wetland may provide opportunities for infiltration, evapotranspiration, and detention. Detailed outfall designs identifying pocket wetland creation and naturalized connections to Etobicoke Creek are to be included in the EIS/EIR for the Mayfield West Phase 2, Stage 2 lands.

10.0 References

AMEC Environment & Infrastructure (AMEC), December 2014. Mayfield West Plan Comprehensive Environmental Impact Study and Management Plan, Part C: Detailed Analysis and Implementation. Final Report. December 2014.

Crozier & Associates Inc. 2020. Comprehensive Environmental Impact Study and Management Plan, Part C: Preliminary Implementation Plan. Second Submission.

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Hensel Design Group Inc., 2017. Comprehensive Environmental Impact Study and Management Plan, Part A: Proposed Land Use Impact Assessment., Third Submission March 27, 2019.

Hensel Design Group Inc., 2017. Environmental Impact Statement/Environmental Implementation Report for the Mayfield West Phase 2 Landowners Framework Plan. Second DRAFT Submission October 2017, Third Submission July 2018, Final Submission March 2019.

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Toronto and Region Conservation Authority, 2014. The Living City Policies for Planning and Development in the Watersheds of The Toronto and Region Conservation Authority. November 28, 2014.

Borehole Investigation References

AMEC, 2010. Mayfield West Phase 2 (West) Part B, Town of Caledon Draft Report August 2010.

Terraprobe Inc., 2014. Hydrogeologic Evaluation & Monitoring Program, Proposed Mayfield West Phase Two, Caledon, Ontario. File No. 13-11-6174

WSP Canada Ltd. (2017a). Slope Stability and Streambank Erosion Analysis at Five Areas Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON

WSP Canada Ltd. (2017b).Geotechnical Investigation Sanitary Trunk Sewer on Mayfield West Phase 2, Caledon, ON

APPENDIX A

Hydrostatigraphical Cross Sections

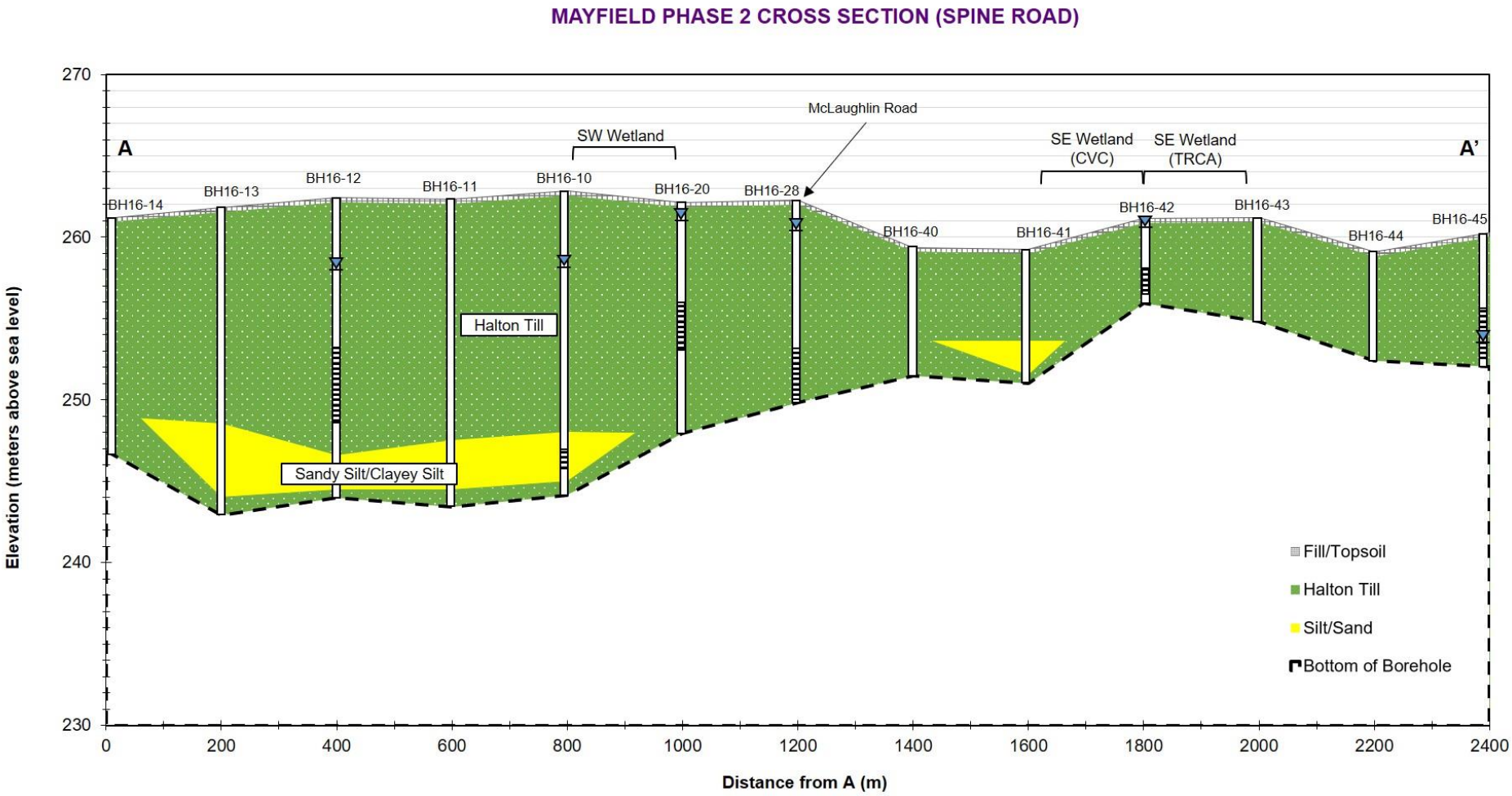


Figure 5. A-A' Cross-section along proposed Spine Road

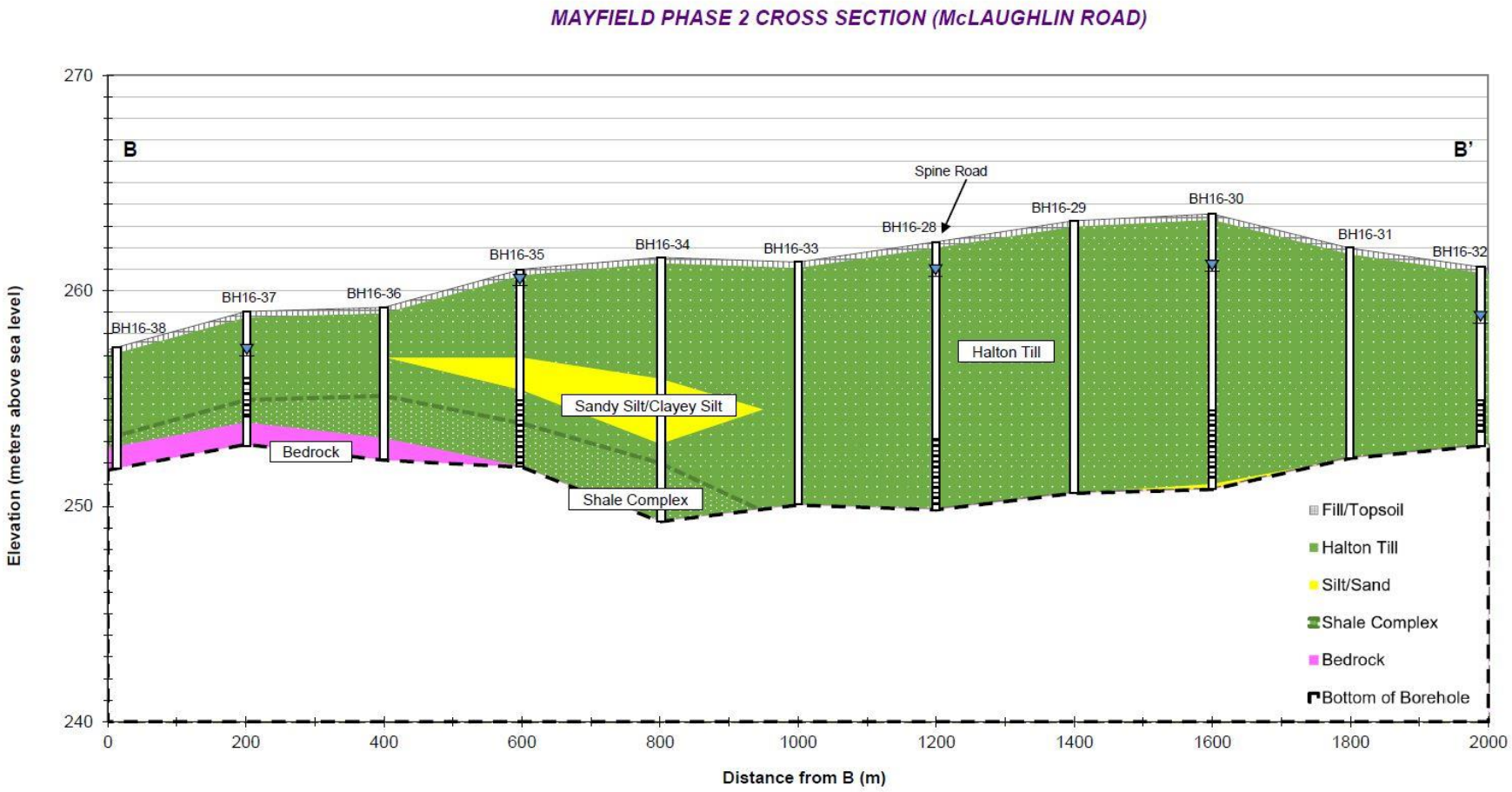



Figure 6. B-B' Cross-section along McLaughlin Road

APPENDIX B

Drawing 102 - Greenbelt Grading Plan
Drawing 102B – Proposed Flood mapping Plan
Drawing 102C – Cut/Fill Analysis
Floodplain Mapping Calculations, Riparian Storage Analysis
(Urbantech 2020)



LEGEND:

EX CONTOUR @ 25cm INTERVAL (BASED ON AVAILABLE LIDAR AND GROUND SURVEY INFORMATION)	PROPOSED MASTER DEVELOPMENT LIMIT (REFER TO DRAWING 101B)
EX REACH/WATERCOURSE	PROPOSED AREA FOR COMPENSATING CUT AND RESTORATION WITHIN GREENBELT
POST DEVELOPMENT REGIONAL FLOOD LINE (PREPARED BY URBANTECH BASED ON THE 2013 ETOBICOKE CREEK HYDROLOGY UPDATE STUDY)	

urbantech

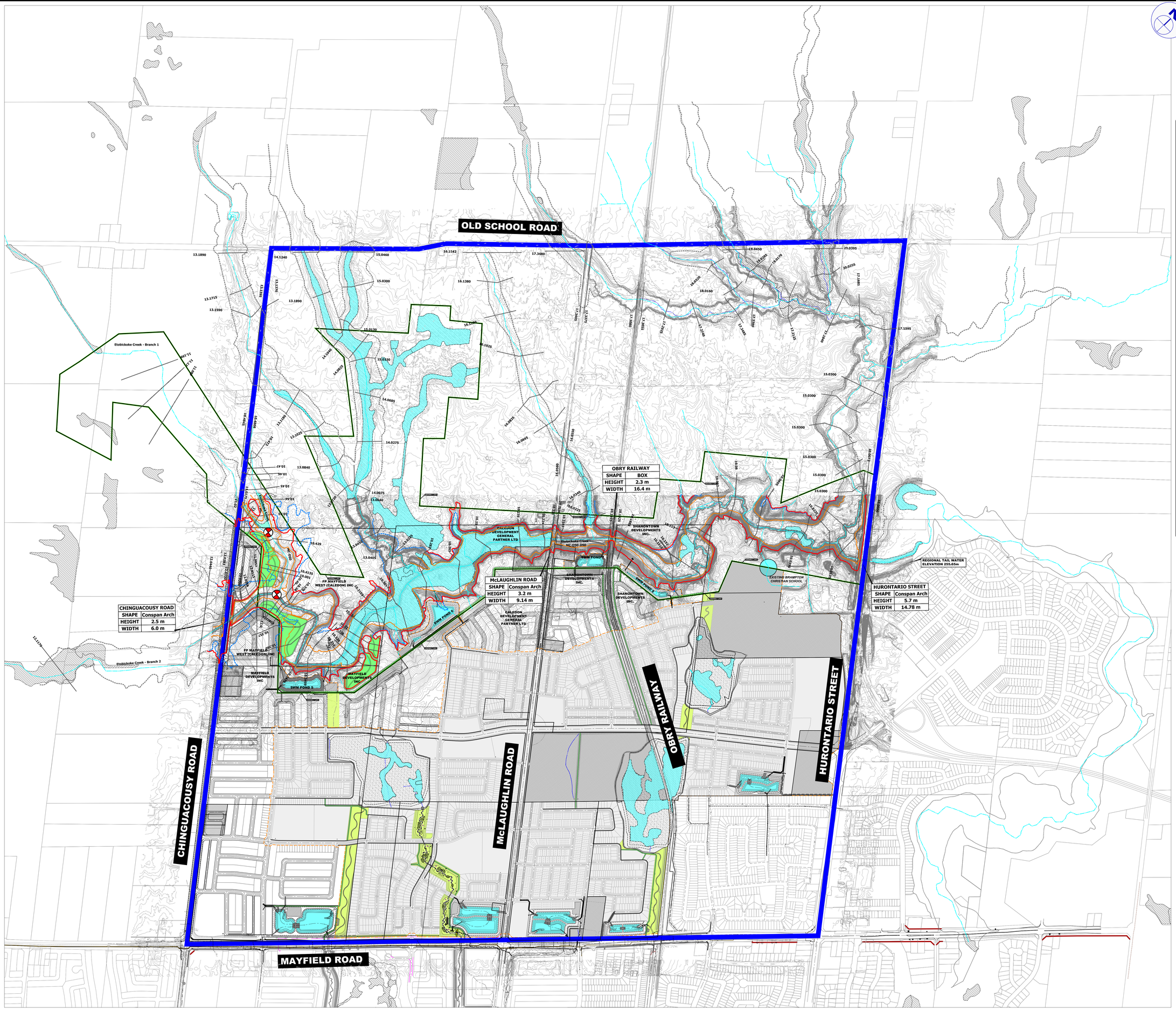
Urbantech Consulting, A Division of Leighton-Zec Ltd.
3760 14th Avenue, Suite 301, Markham, Ontario L3R 3T7
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TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2

PROPOSED GREENBELT GRADING AND STORMWATER MANAGEMENT POND LOCATIONS

SURVEYED BY: RPE	DATE: JUNE 2015	CONTRACT NO.
DRAWN BY: V.P.	CHECKED BY: D.Z.	DRAWING NO.
DESIGNED BY: D.Z.	CHECKED BY: D.Z.	102
SCALE: 1:1250	DATE: JANUARY 2020	

File: P:\Projects\15-483\Reports\CEISMP\Part B\DRAWINGS\102 - Proposed Greenbelt Grading.dwg - Revised by <DZEC> : Wed, Jan 08 2020 - 11:44am



K-plan

LEGEND:

- EX REACH/WATERCOURSE
- EXISTING WETLAND
- GREENBELT LIMIT
- WATERSHED BOUNDARY
- APPROXIMATE FLOODLINE FROM AMEC EIS (2014) (REACHES NOT MODELLED BY URBANTECH)
- EXISTING REGIONAL FLOODLINE BASED ON TRCA/MMM GROUP ETOBICOKE CREEK HYDROLOGY UPDATE (2013) AND AVAILABLE TOPOGRAPHIC MAPPING (PREPARED BY URBANTECH FOR CEISMP PART A REPORT)
- RIVER JUNCTION
- 10.3105 HEC-RAS CROSS SECTION AND NUMBER
- PROPOSED GREENBELT CORRIDOR GRADING AND RESTORATION AREA
- PROPOSED 100 YEAR FLOODLINE BASED ON TRCA/MMM GROUP ETOBICOKE CREEK HYDROLOGY UPDATE (2013) AND AVAILABLE TOPOGRAPHIC MAPPING
- PROPOSED REGIONAL FLOODLINE BASED ON TRCA/MMM GROUP ETOBICOKE CREEK HYDROLOGY UPDATE (2013) AND AVAILABLE TOPOGRAPHIC MAPPING

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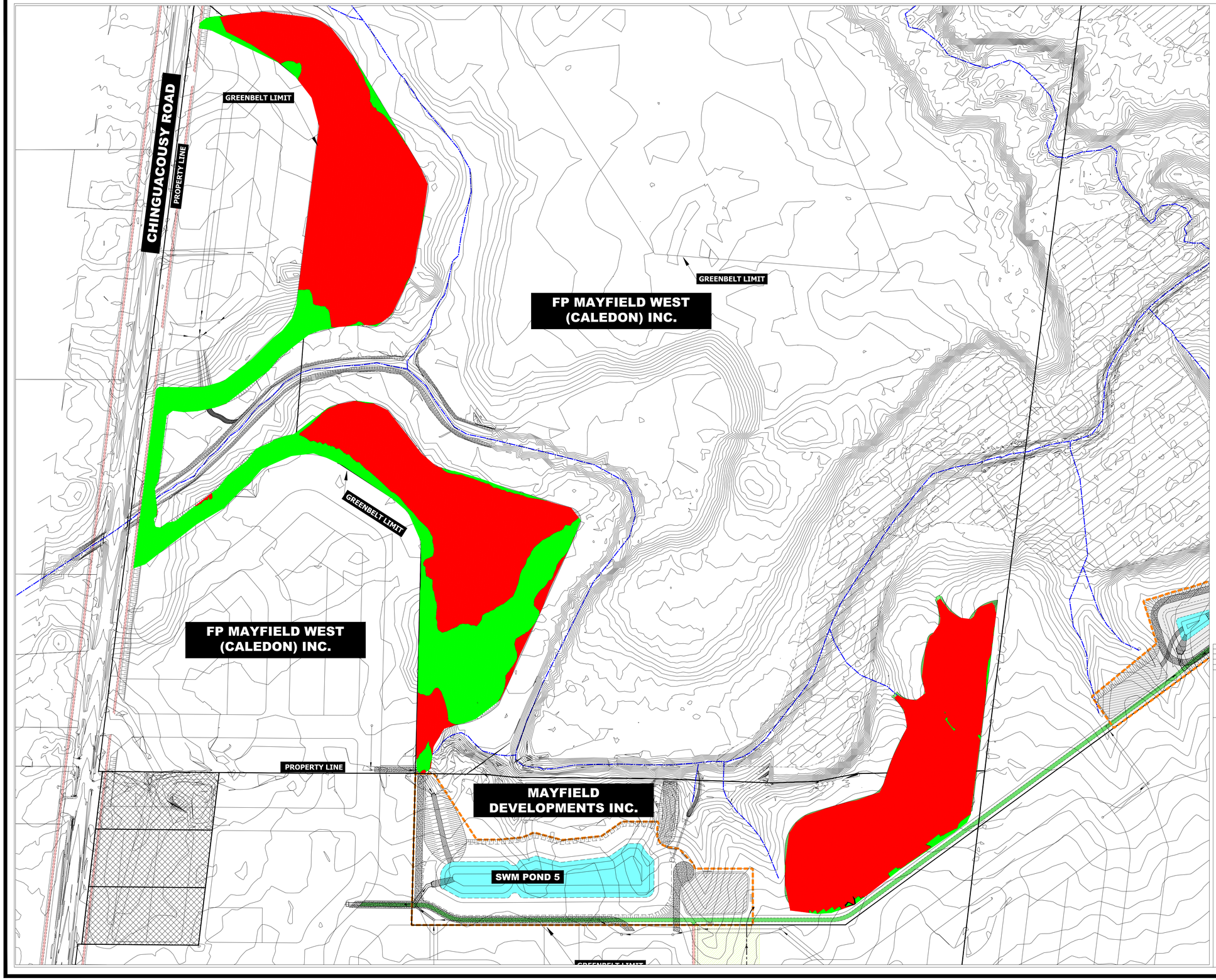
Management Consultants, A Division of Urbandale Corp Ltd.
2192 Lake Avenue, Suite 201, Pickering, Ontario, L1V 1C7
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TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2
STAGE 2

PROPOSED ETOBICOKE CREEK FLOODMAPPING AND HEC-RAS CROSS SECTION LOCATION PLAN

SURVEYED BY:	R.P.E.	DATE:	2016	JOB NO.	15-483
DRAWN BY:	V.P.	CHECKED BY:	D.Z.	DRAWING NO.	102B
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.		
SCALE:	1:5000	DATE:	JANUARY 2020		

File: P:\Projects\15-483\Reports\CEISMP\Part B\DRAWINGS\102B - MW2 Proposed Floodmapping.dwg - Revised by <DZEC> : Sat, Jan 04 2020 - 10:13am



LEGEND:

- PROPOSED CUT IN THE EXISTING FLOODPLAIN/GREENBELT
- PROPOSED FILL IN THE EXISTING FLOODPLAIN/GREENBELT
- UNDISTURBED EXISTING FLOODPLAIN

No.	REVISION	DATE	BY
4			
3			
2			
1			

TOWN OF CALEDON

LICENSED PROFESSIONAL ENGINEER
D. ZEC
D. ZEC
90432295
APR.2019
PROVINCE OF ONTARIO

TOWN FILE No.

PROJECT 15-483

REGION FILE No.

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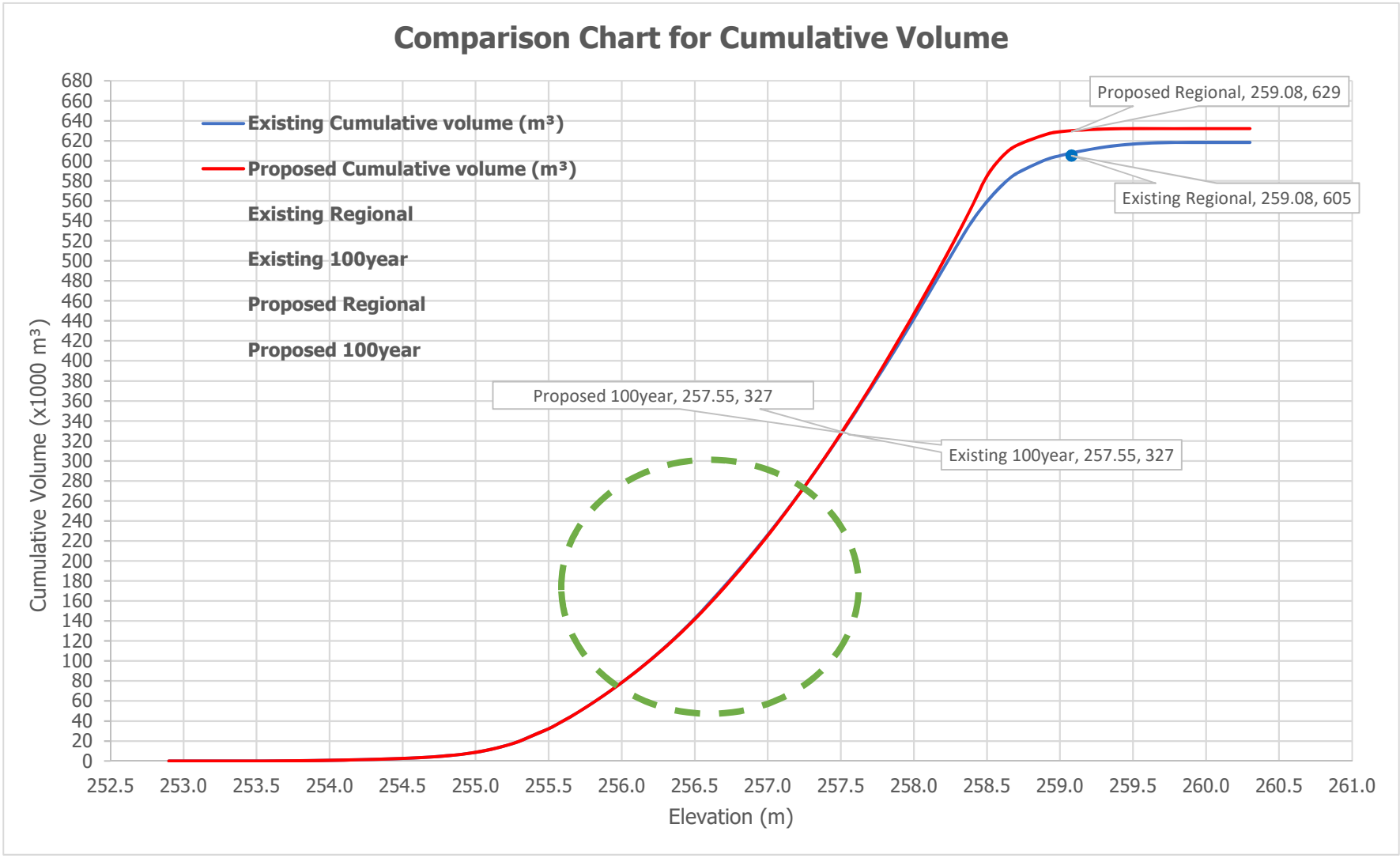
MAYFIELD WEST 2 (STAGE 2)

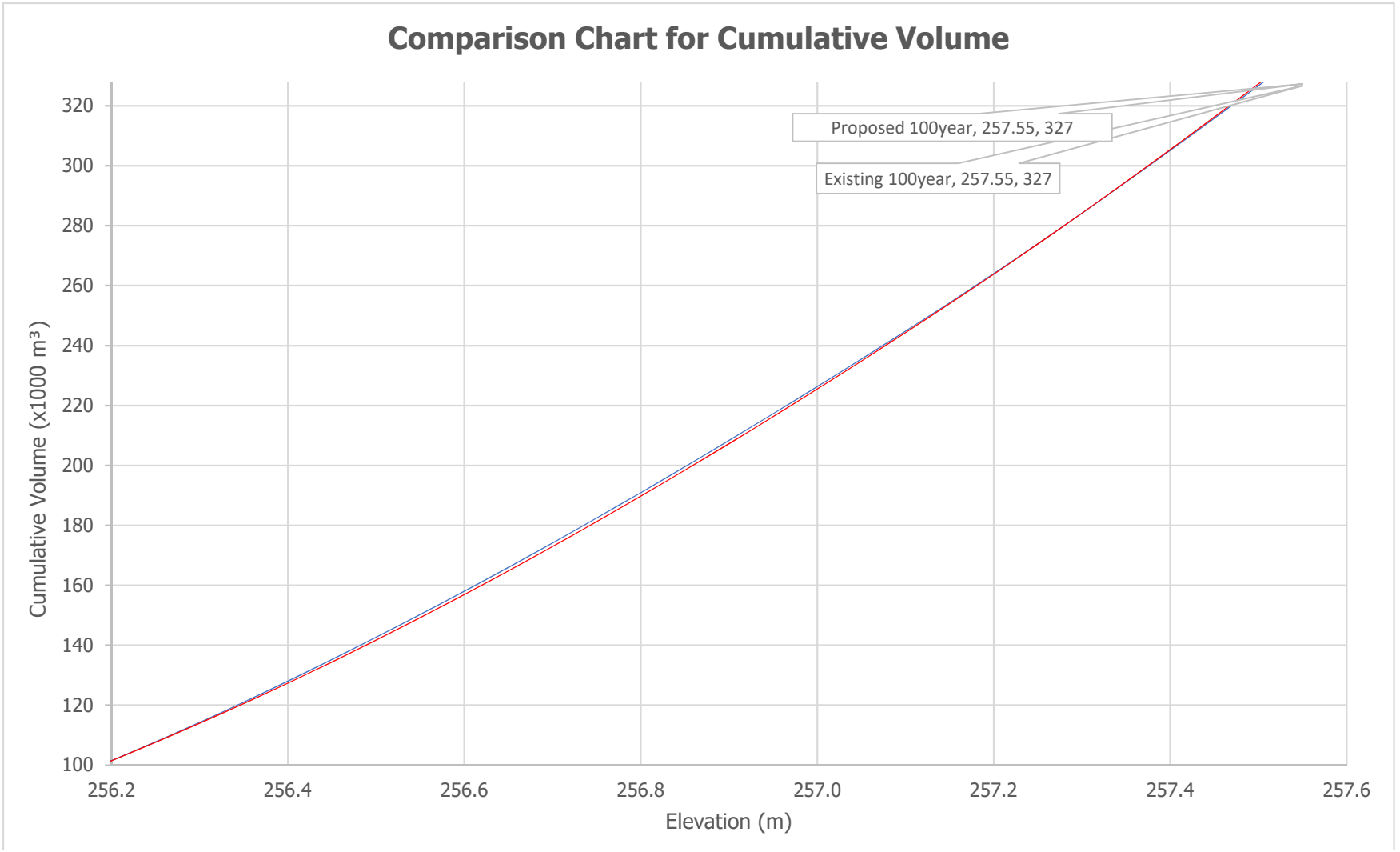
GREENBELT CUT-FILL PLAN

SURVEYED BY: D. SEARLES	DATE: OCTOBER 2017	CONTRACT NO.	
DRAWN BY: V.P.	CHECKED BY: V.P.	DRAWING NO.	
DESIGNED BY: D.Z.	CHECKED BY: D.Z.		102C
SCALE: N.T.S.	DATE: JANUARY 2020		

File: P:\Projects\15-483\Reports\CEISMP\Part B\DRAWINGS\102C - MW2 Greenbelt Cut-Fill Plan.dwg - Revised by <DZEC> : Sat, Jan 04 2020 - 10:18am

Mayfield West II Etobicoke Creek Cut/Fill Analysis




Comparison Chart for Cumulative Volume
Proposed 100year, 257.55, 327
Existing 100year, 257.55, 327
Cumulative Volume (x1000 m³)
320
300
280
260
240
220
200
180
160
140
120
100
256.2
256.4
256.6
256.8
257.0
257.2
257.4
257.6
Elevation (m)

Incremental Cut-Fill Volume Comparison Results									
Elevation Range (m)		Existing Volume (m³)	Existing Cumulative volume (m³)	Proposed Volume (m³)	Proposed Cumulative volume (m³)	Difference	Difference (%)	Cumulative volume Difference	Cumulative volume Difference (%)
252.90	253.00	0	0	0	0	0	0.00	0	0.00
253.00	253.10	0	0	0	0	0	0.00	0	0.00
253.10	253.20	0	0	0	0	0	0.00	0	0.00
253.20	253.30	1	1	1	1	0	0.00	0	0.00
253.30	253.40	2	3	2	3	0	0.00	0	0.00
253.40	253.50	10	13	10	13	0	0.00	0	0.00
253.50	253.60	26	39	26	39	0	0.00	0	0.00
253.60	253.70	43	82	43	82	0	0.00	0	0.00
253.70	253.80	76	158	76	158	0	0.00	0	0.00
253.80	253.90	123	281	123	281	0	0.00	0	0.00
253.90	254.00	165	446	165	446	0	0.00	0	0.00
254.00	254.10	220	665	220	665	0	0.00	0	0.00
254.10	254.20	271	937	271	937	0	0.00	0	0.00
254.20	254.30	330	1267	330	1267	0	0.00	0	0.00
254.30	254.40	389	1656	389	1656	0	0.00	0	0.00
254.40	254.50	450	2106	450	2106	0	0.00	0	0.00
254.50	254.60	531	2637	531	2637	0	0.00	0	0.00
254.60	254.70	620	3257	620	3257	0	0.00	0	0.00
254.70	254.80	817	4073	817	4073	0	0.00	0	0.00
254.80	254.90	1105	5179	1105	5179	0	0.00	0	0.00
254.90	255.00	1457	6636	1457	6636	0	0.00	0	0.00
255.00	255.10	2091	8727	2091	8727	0	0.00	0	0.00
255.10	255.20	2754	11481	2754	11481	0	0.00	0	0.00
255.20	255.30	3650	15131	3650	15131	0	0.00	0	0.00
255.30	255.40	4669	19800	4670	19801	1	0.02	1	0.00
255.40	255.50	6275	26075	6274	26075	0	0.00	1	0.00
255.50	255.60	6275	32349	6274	32350	0	0	1	0
255.60	255.70	7738	40087	7738	40088	0	0.00	1	0.00
255.70	255.80	8513	48601	8513	48601	-1	-0.01	0	0.00
255.80	255.90	9274	57875	9272	57873	-2	-0.02	-2	0.00
255.90	256.00	9957	67832	9954	67827	-3	-0.03	-5	-0.01
256.00	256.10	10599	78431	10596	78424	-2	-0.02	-7	-0.01
256.10	256.20	11222	89652	11220	89643	-2	-0.02	-9	-0.01
256.20	256.30	11884	101536	11823	101466	-61	-0.52	-70	-0.07
256.30	256.40	12767	114303	12525	113991	-243	-1.94	-313	-0.27
256.40	256.50	13724	128027	13395	127386	-329	-2.45	-641	-0.50
256.50	256.60	14663	142691	14365	141751	-298	-2.08	-940	-0.66
256.60	256.70	15366	158057	15179	156930	-187	-1.23	-1127	-0.72
256.70	256.80	16102	174159	16038	172968	-64	-0.40	-1191	-0.69
256.80	256.90	16792	190951	16797	189765	5	0.03	-1186	-0.62
256.90	257.00	17394	208345	17536	207301	142	0.81	-1043	-0.50
257.00	257.10	17993	226337	18213	225515	220	1.21	-823	-0.36
257.10	257.20	18494	244832	18819	244334	325	1.73	-498	-0.20
257.20	257.30	19223	264055	19487	263821	264	1.35	-234	-0.09
257.30	257.40	20150	284205	20394	284215	244	1.20	10	0.00
257.40	257.50	20922	305128	21214	305429	292	1.38	302	0.10
257.50	257.60	21577	326705	21898	327327	320	1.46	622	0.19
257.60	257.70	22082	348787	22589	349916	507	2.24	1129	0.32
257.70	257.80	22583	371370	23249	373165	666	2.86	1795	0.48
257.80	257.90	23105	394475	23931	397096	826	3.45	2621	0.66
257.90	258.00	23601	418076	24627	421722	1026	4.16	3646	0.86
258.00	258.10	24086	442163	25260	446982	1173	4.65	4820	1.08
258.10	258.20	24560	466723	25798	472780	1238	4.80	6057	1.28
258.20	258.30	25060	491782	26384	499164	1324	5.02	7381	1.48
258.30	258.40	25048	516830	27277	526441	2229	8.17	9611	1.83
258.40	258.50	23220	540050	28611	555052	5391	18.84	15002	2.70
258.50	258.60	19235	559285	29665	584717	10431	35.16	25432	4.35
258.60	258.70	15664	574948	18729	603446	3065	16.37	28498	4.72
Total volume		618436		632222		13786		13786	

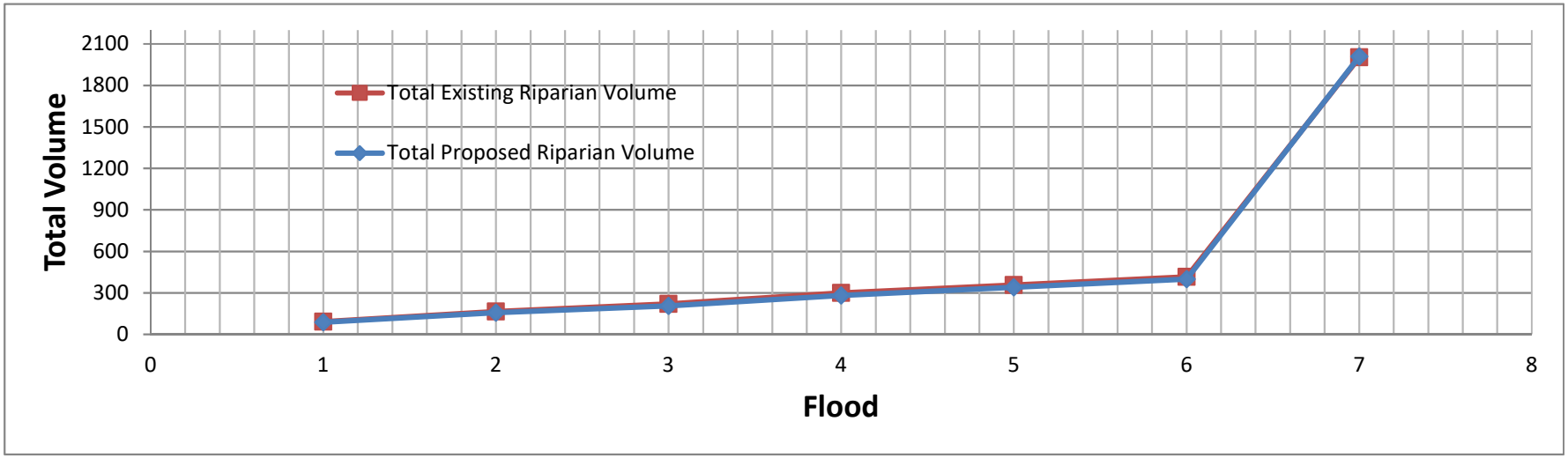
HYDRAULICS CALCULATION
RIPARIAN VOLUME COMPARISON

urbantech

Project Name: Mayfield West Phase 2
Municipality: Town of Caledon
Project No.: 15-483
Date: 12-Apr-19

Prepared by: D.L.
Checked by: A.F.
Submission #:

COMPARISON OF TOTAL RIPARIAN VOLUME



Flood	① Existing Riparian Volume (1000m³)				② Proposed Riparian Volume (1000m³)				Comparison	Percentage
	Main Channel	Branch 1	Branch 2	Total	Main Channel	Branch 1	Branch 2	Total	②-①	
2 year	59.03	8.86	23.66	91.55	59.28	8.64	19.96	87.88	-3.67	-4%
5 year	113.2	11.90	39.85	164.95	111.09	11.39	34.08	156.56	-8.39	-5%
10 year	152.34	13.91	53.25	219.50	147.88	13.36	44.99	206.23	-13.27	-6%
25 year	207.08	20.45	72.51	300.04	198.55	19.36	63.18	281.09	-18.95	-6%
50 year	246.55	23.70	86.98	357.23	241.91	23.03	75.23	340.17	-17.06	-5%
100 year	286.48	27.73	101.34	415.55	283.08	27.22	88.61	398.91	-16.64	-4%
Regional	1362.36	162.20	477.90	2002.46	1420.68	144.76	443.10	2008.54	6.08	0.3%

APPENDIX C

WSP Geotechnical Report, 2018

SLOPE STABILITY AND STREAMBANK EROSION ANALYSIS AT FIVE AREAS ALONG ETOBICOKE CREEK, MAYFIELD WEST PHASE 2, CALEDON, ONTARIO

MAYFIELD WEST PHASE 2 LANDOWNERS GROUP
C/O GLENN SCHNARR & ASSOCIATION INC.

FINAL REPORT

PROJECT NO.: 161-01403-00
DATE: NOVEMBER 23, 2018

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I LIMITATIONS OF REPORT

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Mayfield West Phase 2 Landowners Group c/o Glenn Schnarr & Association Inc. to undertake a slope stability investigation at five (5) locations of the site with the valley slopes associated with Etobicoke Creek between Chinguacousy Road and Hurontario Street, in the Town of Caledon, Region of Peel, Ontario.

Based on the drawings provided to us and our understanding of the project, the locations of the five (5) sites along the Etobicoke Creek are described as follows:

Site 1. Along both banks of the Etobicoke Creek, and is stretched from Chinguacousy Road to about 150 m towards east;
Site 2. Proposed Stormwater Management Pond 5, and is located at about 250 m east of Chinguacousy Road;
Site 3. Proposed Stormwater Management Pond 6, and is located at about 400 m west of McLaughlin Road;
Site 4. Proposed Stormwater Management Pond 7, and is located on west side of OBRY Railway line;
Site 5. Proposed Stormwater Management Pond 5, and is located at about 650 m west of Hurontario Street.

The purpose of the current investigation was to determine the subsurface soil and groundwater conditions along the slope and conduct an assessment of the stability of the valley slope, and provide geotechnical engineering recommendations for the long-term stable slope crest location to help facilitate the establishment of development limits/stormwater management pond limits adjacent to the slope.

This report is provided on the basis of the terms of reference presented above and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Mayfield West Phase 2 Landowners Group c/o Glenn Schnarr & Association Inc. and their designers. Third party use of this report without WSP Canada Inc. consent is prohibited.

2 PUBLISHED GEOLOGICAL INFORMATION REVIEW

The primarily current use of the sites between Chinguacousy Road and Hurontario Road, in the Town of Caledon are for agricultural purpose.

The sites are located in the physiographic region known as the South Slope, and physiographic landform referred to as Till Plains (Drumlinized)[1]. Quaternary Geology mapping of the area indicates that the overburden consists of Halton Till – predominantly a silt to silty clay matrix, high in matrix carbonate content and clast poor[2].

The bedrock underlying the site is part of the Queenston Formation bedrock. The Queenston Formation bedrock is reddish brown, thinly bedded, fissile shale (mudstone) containing seams and bands of light grey limy shale and limestone/siltstone.

[1] L.J. Chapman and D.F. Putnam, The Physiography of Southern Ontario, Third Edition, 1984.
[2] Barnett, P.J., Cowan, W.R. and Henry, A.P. 1991. Quaternary geology of Ontario, southern sheet; Ontario Geological Survey, Map 2556, scale 1:1000 000.

3 PREVIOUS GEOTECHNICAL INFORMATION

Soil Engineers Ltd. had carried out a geotechnical investigation in 2016 and documented their findings in a report bearing Reference No. 1604-S017, dated July 2016. Borehole location plan and relevant Borehole logs BH2 and BH3 (for proposed Stormwater Management Pond 6 area) from this report are enclosed in **Appendix C**. Both the boreholes were drilled on the tableland associated with valley slope. The boreholes were drilled to a depth of 10.4 m below existing grade.

We were also provided borehole location plan and borehole logs prepared by Terrapobe. The borehole location plan and borehole logs bears File No. 1-08-3053. The nearest borehole log nearest to Storm water Management Pond 9 is enclosed in **Appendix D**.

In 2016, WSP carried out a geotechnical investigation for subdivision development and documented findings in a report bearing Project No. 10002883, dated May 6, 2016. Boreholes BH101 and BH102 were drilled within the footprints of proposed Stormwater Management Pond 5. The borehole logs and borehole location plan are enclosed in **Appendix E**.

SPL's and WSP's previous boreholes revealed that the subsurface soils generally consisted of a layer of topsoil over stiff to hard silty clay to clayey silt till, which is underlain by stiff to very silty clay to clayey silt deposits. The bedrock was not encountered in SPL's and WSP's previous investigation.

The approximate locations of the previous boreholes are presented on **Drawing Nos. 2** and **3** together with the boreholes drilled by WSP during the present investigation.

4 FIELD AND LABORATORY WORKS

The current field investigation by WSP consisted of drilling eight (8) boreholes (BH17-1 to BH17-8) on May 26 and 29, 2017. The boreholes were drilled to depths ranging from 3.7 m to 9.8 m below existing ground surface at areas shown on **Drawings 2** and **3,** and as described below:

- At Site 1 (Stretch extending from Chinguacousy Road to about 150 m towards east), three boreholes were drilled to depth ranging from 3.7 m to 5.2 m below existing ground surface;
- At Site 2 (Stormwater Management Pond 5), one borehole was drilled to a depth of 9.8 m below existing ground surface;
- At Site 3 (Stormwater Management Pond 6), one borehole was drilled to a depth of 8.2 m below existing ground surface;
- At Site 4 (Stormwater Management Pond 7), two borehole were drilled to a depth of 9.8 m below existing ground surface; and
- At Site 5 (Stormwater Management Pond 8), one borehole was drilled to a depth of 9.8 m below existing ground surface;

Drilling was conducted with hollow stem continuous flight auger equipment, supplied and operated by a drilling sub-contractor under the direction and supervision of WSP Canada Inc. personnel. Samples were retrieved at regular intervals of about 0.75 m and 1.5 m with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (ASTM D 1586) method. This sampling method recovers samples from the soil strata, and the number of blows required to drive the sampler 0.3m depth into the undisturbed soil (SPT 'N'-values) gives an indication of the compactness condition or consistency of the sampled soil material. The SPT 'N' values are indicated on the Borehole Logs.

Groundwater conditions in the boreholes were observed during and upon completion of drilling. The long-term groundwater levels were measured in all the installed piezometers (BH17-1 and BH17-8).

As well as visual examination in the laboratory, all soil samples were tested for moisture contents. Eight (8) selected soil samples were subjected to grain size analysis, six (6) samples for Atterberg Limits tests and results are presented on **Figures B1** to **B9** in **Appendix B**.

Survey of the elevations and location of the boreholes was undertaken by WSP personnel. Ground surface elevations were referenced to the City of Brampton Horizontal Control Monument Record, Monument No. 042050257 with Geodetic Elevation of 254.978 m. This benchmark is located 24 m north of centreline of Mayfield Road and 15 m east of Rebertson Davies Drive in Brampton. Elevations at the borehole locations are presented on the Record of Borehole sheets attached in **Appendix A**.

5 GEOTECHNICAL INVESTIGATION FINDINGS

The geotechnical soil and groundwater conditions at each site are summarized separately.

The approximate borehole locations are shown on **Drawing Nos. 2** and **3**. Notes on soil sample descriptions are presented in **Appendix A**. The subsurface conditions at the boreholes (BH17-1 and BH17-8) are presented on the individual Borehole Logs in **Appendix A**.

The results of the water (moisture) content tests of the soil samples are shown on the borehole logs. The test results of grain size distributions and Atterberg Limits are shown on the respective borehole logs and presented in **Appendix B**.

The soil and groundwater conditions are summarized in the following sections.

5.1 SITE 1 (BOREHOLES BH17-1 TO BH17-3)

5.1.1 TOPSOIL

A layer of surficial topsoil ranging from 350 mm to 450 mm in thickness was encountered at each of the borehole locations. It should be noted that topsoil quantities should not be calculated from the borehole information, as large variations in depth may exist between boreholes.

5.1.2 DISTURBED/WEATHERED SOILS

Below the topsoil, a layer of disturbed/weathered soils extends to depths ranging from 0.8 m to 1.5 m below the existing ground surface. The disturbed soils consisted of silty clay materials with inclusions of topsoil/organics. The disturbed/weathered soil was typically in a soft to firm consistency.

5.1.3 SILTY CLAY TILL TO CLAYEY SILT TILL

Beneath the weathered/disturbed soil, a silty clay till to clayey silt till deposit was encountered at each borehole location. This deposit extended to the explored depths ranging from 3.7 m to 5.2 m below the existing ground surface. Occasional sand seams were observed within the cohesive till.

SPT 'N' values in the cohesive till were in the range of 14 to 32 blows per 300 mm of penetration, corresponding to stiff to hard consistency. Water contents ranged from 10% to 18%.

Two (2) samples (BH17-1/SS3 and BH17-3/SS4) contain 2% to 6% gravel, 27% to 33% sand, 49% to 51% silt and 12% to 20% clay size particles. The grain size distribution curves for the samples are presented on **Figures 1** and **2** in **Appendix B**.

Consistency (Atterberg) limits tests on two (2) samples (BH17-1/SS3 and BH17-SS4) indicate Liquid Limits of 16 to 25, Plastic Limits of 12 to 14 and Plasticity Indices of 4 to 11. The results are shown on **Figure 9** in **Appendix B**.

5.1.4 GROUNDWATER CONDITIONS

All the three (3) boreholes were installed with piezometers for the longer-term monitoring of groundwater level. The piezometric levels were measured on June 1 and 5, 2017 at depths of 0.93 to 1.31 m below existing grade (Elev. 258.14 to 256.27 m).

Groundwater level in the piezometers is shown on the attached borehole logs and also summarized on **Table 5.1**.

Table 5.1 Measured Water Levels in Piezometers (BH17-1 to BH17-3)

WELL ID	GROUND SURFACE ELEV. (m)	DATE OF PIEZOMETER INSTALLATION	DATE OF MEASUREMENT	WATER LEVEL DEPTH (m)	WATER LEVEL ELEVATION (m)
BH17-1	257.48	May 26, 2017	June 1, 2017	0.93	256.55
			June 5, 2017	0.93	256.55
BH17-2	257.58	May 26, 2017	June 1, 2017	1.31	256.27
			June 5, 2017	1.31	256.27
BH17-3	259.21	May 26, 2017	June 1, 2017	1.30	257.91
			June 5, 2017	1.07	258.14

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

5.2 SITE 2 (BOREHOLE BH17-4)

5.2.1 TOPSOIL

A layer of surficial topsoil, approximately 200 mm in thickness was encountered at the borehole location.

5.2.2 DISTURBED/WEATHERED SOILS

Below the topsoil, a layer of disturbed/weathered soil extends to a depth of 0.8 m below the existing ground surface. The disturbed soil consist of silty clay materials with inclusions of topsoil/organics. The disturbed/weathered soil was typically in a firm consistency.

5.2.3 SILTY CLAY TILL

Beneath the weathered/disturbed soil, a silty clay till deposit was encountered which extends to the explored depth of 9.8 m below the existing ground surface. Occasional sand seams were observed within the cohesive till. A saturated sandy silt interbed, about 0.8 m thick was present within this deposit at a depth of 5.6 m below existing ground surface.

SPT 'N' values in the cohesive till were in the range of 11 to 29 blows per 300 mm of penetration, corresponding to stiff to very stiff consistency. Water contents in the test samples range from 11% to 23%.

One (1) sample (BH17-4/SS4) contains 1% gravel, 8% sand, 44% silt and 47% clay size particles. The grain size distribution curve for the sample is presented on **Figure 3** in **Appendix B**.

Consistency (Atterberg) limits test on one (1) sample (BH17-1/SS4) indicate Liquid Limit 42, Plastic Limit of 19 and Plasticity Index of 23. The result is shown on **Figure 9** in **Appendix B**.

5.2.4 GROUNDWATER CONDITIONS

Borehole BH17-4 was installed with a piezometer for the longer-term monitoring of groundwater level. The piezometric levels were measured on June 1 and 5, 2017 at depths of 1.99 to 2.37 m below existing grade (Elev. 258.02 to 257.64 m).

Groundwater level in the piezometers is shown on the attached borehole logs and also summarized on **Table 5.2**.

Table 5.2 Measured Water Levels in Piezometers (BH17-4)

WELL ID	GROUND SURFACE ELEV. (m)	DATE OF PIEZOMETER INSTALLATION	DATE OF MEASUREMENT	WATER LEVEL DEPTH (m)	WATER LEVEL ELEVATION (m)
BH17-4	260.01	May 26, 2017	June 1, 2017	1.99	258.02
			June 5, 2017	2.37	257.64

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

5.3 SITE 3 (BOREHOLE BH17-5)

5.3.1 TOPSOIL

A layer of surficial topsoil, approximately 200 mm in thickness was encountered at the borehole location.

5.3.2 DISTURBED/WEATHERED SOILS

Below the topsoil, a layer of disturbed/weathered soil extends to a depth of 0.8 m below the existing ground surface. The disturbed soil consist of silty clay materials with inclusions of topsoil/organics. The disturbed/weathered soil was typically in a stiff consistency.

5.3.3 SILTY CLAY TILL

Beneath the weathered/disturbed soil, a silty clay till deposit was encountered which extends to a depth of 4.1 m below the existing ground surface. Occasional sand seams were observed within the cohesive till.

SPT 'N' values in the cohesive till were in the range of 12 to 32 blows per 300 mm of penetration, corresponding to stiff to hard consistency. Water contents in the test samples ranged from 11% to 20%.

5.3.4 SANDY SILT

Underlying the silty clay till, a layer of sandy silt was encountered, which extends to a depth of 5.6 m below the existing ground surface. The sandy silt was generally moist, with a dense compactness.

5.3.5 SILTY CLAY

Below the sandy silt materials, a layer of silty clay was encountered which extends to a depth of 7.2 m below the existing ground surface. The silty clay was generally very moist, with a very stiff consistency.

5.3.6 SILT

Below the silty clay, a deposit of silt was encountered which extends to the explored depth of 8.2 m below the existing ground surface. The silt was saturated, with a compact compactness.

One (1) sample (BH17-4/SS4) contains 8% sand, 83% silt and 9% clay size particles. The grain size distribution curve for the sample is presented on **Figure 4** in **Appendix B**.

5.3.7 GROUNDWATER CONDITIONS

Borehole BH17-5 was installed with a piezometer for the longer-term monitoring of groundwater level. The piezometric levels were measured on June 1 and 5, 2017 at depths of 3.24 to 3.30 m below existing grade (Elev. 256.35 to 256.29 m).

Groundwater level in the piezometers is shown on the attached borehole logs and also summarized on **Table 5.3**.

Table 5.3 Measured Water Levels in Piezometers (BH17-5)

WELL ID	GROUND SURFACE ELEV. (m)	DATE OF PIEZOMETER INSTALLATION	DATE OF MEASUREMENT	WATER LEVEL DEPTH (m)	WATER LEVEL ELEVATION (m)
BH17-5	259.59	May 26, 2017	June 1, 2017	3.24	256.35
			June 5, 2017	3.30	256.29

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

5.4 SITE 4 (BOREHOLE BH17-6 AND BH17-7)

5.4.1 TOPSOIL

A layer of surficial topsoil ranging from 350 mm to 450 mm in thickness was encountered at both borehole locations.

5.4.2 DISTURBED/WEATHERED SOILS

Below the topsoil, a layer of disturbed/weathered soils extends to a depth of 0.8 m below the existing ground surface. The disturbed soils consisted of silty clay materials with inclusions of topsoil/organics. The disturbed/weathered soil was typically in a soft consistency.

5.4.3 SILTY CLAY TILL TO CLAYEY SILT TILL

Beneath the weathered/disturbed soil, a silty clay till to clayey silt till deposit was encountered at both borehole locations. This deposit extended to an explored depth of 9.8 m below the existing ground surface. Occasional sand seams were observed within the cohesive till. A saturated sandy silt interbed, ranging from 1.6 m to 3.1 m in thickness was present within this deposit at a depth of 4.1 m to 5.6 m below existing ground surface, and will be described in Section 5.4.4.

SPT 'N' values in the cohesive till were in the range of 14 to 58 blows per 300 mm of penetration, corresponding to stiff to hard consistency. Water contents in the test samples ranged from 10% to 18%.

Two (2) samples (BH17-6/SS4 and BH17-7/SS3) contain 2% to 4% gravel, 10% to 22% sand, 42% to 47% silt and 16% to 27% clay size particles. The grain size distribution curves for the samples are presented on **Figures 5** and **6** in **Appendix B**.

Consistency (Atterberg) limits tests on two (2) samples (BH17-6/SS4 and BH17-7/SS3) indicate Liquid Limits of 29 to 41, Plastic Limits of 14 to 19 and Plasticity Indices of 15 to 22. The results are shown on **Figure 9** in **Appendix B**.

5.4.4 SILTY SAND

An interbedded layer of saturated sandy silt, ranging from 1.6 m to 3.1 m in thickness was present within clayey silt till to silty clay till unit at a depth of 4.1 m to 5.6 m below existing ground surface.

SPT 'N' values in the sandy silt were in the range of 12 to 28 blows per 300 mm of penetration, corresponding to compact compactness. Water contents in the test samples to range from 11% to 21%.

One (1) sample (BH17-4/SS4) contains 8% sand, 83% silt and 9% clay size particles. The grain size distribution curve for the sample is presented on **Figure 7** in **Appendix B**.

5.4.5 GROUNDWATER CONDITIONS

Both boreholes (BH17-6 and BH17-7) were installed with piezometers for the longer-term monitoring of groundwater level. The piezometric levels were measured on June 1 and 5, 2017 at depths of 3.02 to 3.35 m below existing grade (Elev. 256.19 to 255.99 m).

Groundwater level in the piezometers is shown on the attached borehole logs and also summarized on **Table 5.4**.

Table 5.4 Measured Water Levels in Piezometers (BH17-6 and BH17-7)

WELL ID	GROUND SURFACE ELEV. (m)	DATE OF PIEZOMETER INSTALLATION	DATE OF MEASUREMENT	WATER LEVEL DEPTH (m)	WATER LEVEL ELEVATION (m)
BH17-6	259.48	May 29, 2017	June 1, 2017	3.02	256.46
			June 5, 2017	3.18	256.30
BH17-7	259.34	May 29, 2017	June 1, 2017	3.15	256.19
			June 5, 2017	3.35	255.99

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

5.5 SITE 5 (BOREHOLE BH17-8)

5.5.1 TOPSOIL

A layer of surficial topsoil, approximately 200 mm in thickness was encountered at the borehole location.

5.5.2 DISTURBED/WEATHERED SOILS

Below the topsoil, a layer of disturbed/weathered soil extends to a depth of 0.8 m below the existing ground surface. The disturbed soil consist of silty clay materials with inclusions of topsoil/organics. The disturbed/weathered soil was typically in a soft consistency.

5.5.3 SILTY CLAY TILL

Beneath the weathered/disturbed soil, a silty clay till deposit was encountered which extends to the explored depth of 9.8 m below the existing ground surface. Occasional sand seams were observed within the cohesive till.

SPT 'N' values in the cohesive till were in the range of 20 to 53 blows per 300 mm of penetration, corresponding to very stiff to hard consistency. Water contents in the test samples ranged from 9% to 19%.

One (1) sample (BH17-8/SS4) contains 6% gravel, 25% sand, 47% silt and 22% clay size particles. The grain size distribution curve for the sample is presented on **Figure 8** in **Appendix B**.

Consistency (Atterberg) limits test on one (1) sample (BH17-8/SS4) indicate Liquid Limit of 24, Plastic Limit of 13 and Plasticity Index of 11. The result is shown on **Figure 9** in **Appendix B.**

5.5.4 GROUNDWATER CONDITIONS

Borehole BH17-8 was installed with a piezometer for the longer-term monitoring of groundwater level. The piezometric levels were measured on June 1 and 5, 2017 at depths of 1.82 to 1.86 m below existing grade (Elev. 257.05 to 257.01m).

Groundwater level in the piezometers is shown on the attached borehole logs and also summarized on **Table 5.5**.

Table 5.5 Measured Water Levels in Piezometers (BH17-8)

WELL ID	GROUND SURFACE ELEV. (m)	DATE OF PIEZOMETER INSTALLATION	DATE OF MEASUREMENT	WATER LEVEL DEPTH (m)	WATER LEVEL ELEVATION (m)
BH17-8	258.87	May 29, 2017	June 1, 2017	1.86	257.01
			June 5, 2017	1.82	257.05

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

6 SLOPE STABILITY ASSESSMENT

6.1 GENERAL

A site specific slope stability study was carried out based on the current and previous geotechnical investigations. This study included a visual inspection of the slopes at the five (5) sites along the Etobicoke Creek shown on **Drawing 1** and described below to assess the existing slope conditions with respect to any obvious signs of instability concerns. Slope stability analysis of selected slope cross-sections utilizing computer software SLIDE (Ver. 7.024), were carried out.

Site 1. Along both banks of the Etobicoke Creek, and is extended from Chinguacousy Road to about 150 m towards east;
Site 2. Proposed Stormwater Management Pond 5, located at about 250 m east of Chinguacousy Road;
Site 3. Proposed Stormwater Management Pond 6, located at about 400 m west of McLaughlin Road;
Site 4. Proposed Stormwater Management Pond 7, located on west side of OBRY Railway line;
Site 5. Proposed Stormwater Management Pond 8, located at about 650 m west of Hurontario Street.

6.2 MAPPING

The topographic information was provided by Urbantech Consulting. Twenty (20) inferred slope profiles at the 5 study sites were prepared based on the topographic information and our visit to site. Following cross sections were inferred at each site:

- Site 1: Three cross-sections (CA-CA', CB-CB' and CC-CC') were inferred;
- Site 2: Four cross-sections (P5A-P5A', P5B-P5B', P5C-P5C' and P5D-P5D') were inferred;
- Site 3: Five cross-sections (P6A-P6A', P6B-P6B' P6C-P6C', P6D-P6D' and P6E-P6E') were inferred;
- Site 4: Three cross-sections (P7A-P7A', P7B-P7B' and P7C-P7C') were inferred; and
- Site 5: Nine cross-sections (P8A-P8A', P8B-P8B' P8C-P8C', P8D-P8D', P8E-P8E', P8F-P8F', P8G-P8G', P8H-P8H' and P8I-P8I') were inferred.

The cross-section locations were selected on the basis of the slope height and inclination to represent the critical slope condition present within the study area. The sections included a portion of the tableland extending across the slope down to flood plain and/or creek. The locations of the selected slope cross-sections are presented on **Drawing Nos. 2 and 3**, and slope profile details are included on **Drawing Nos. 9** to **32**.

6.3 SLOPE INSPECTION

The subject five sites/areas are located along the Etobicoke Creek between Chinguacousy Road and Hurontario Street, in the Town of Caledon, Region of Peel, Ontario. The lands adjoining the valley slope/creek are generally flat to gently rolling

Visual inspections of the subject slopes at five sites were conducted on May 8, 2017. General information pertaining to existing slope features such as slope profiles, slope drainage, watercourse features, vegetation cover, structures in the vicinity of the slopes, as well as erosion and slope slide features were obtained during the inspection. Photographs of the sites taken during our site visit are shown in **Appendix G** of this report. A brief summary of the results of the visual inspection for each site are presented below.

6.3.1 SITE 1 (BOTH BANKS OF ETOBICOKE CREEK, CHINGUACOUSY ROAD TO ABOUT 150 M TOWARDS EAST)

The meandering portion of the Etobicoke Creek in the study area is aligned in a north-south direction. The bankfull width of the creek varies from about 8.0 to 11.0 m. At the time of our inspection, water was observed ponded below and near the culvert (on Chinguacousy Road, refer **Photograph 2**, **Appendix G**), however, within the study area, the depth of water varied from about 0.5 to 1.0 m. The ground to the west side of the creek was relatively flat and on the east side was gently rolling. The creek banks and bed were noted to be generally vegetated with grass and weed growth. In summary, there was no obvious sign of active bank erosion or undercutting within the study area (refer to enclosed photographs).

6.3.2 SITE 2 (STORMWATER MANAGEMENT POND 5)

The existing valley slope at Site 2 is gentle with maximum height of about 4.0 m. The inclination of the slope generally varied from 4.6 horizontal : 1 vertical (4.6 H : 1 V) to 9.5 horizontal : 1 vertical (9.5 H : 1 V).

The slope surface is generally densely covered with grass, weed and bush growth, as well as young to mature trees (refer to enclosed photographs). Although, a few leaning and fallen trees were noted, the trunk growth of majority of the trees was noted to be generally straight and upright, and there was no evidence of significant root or trunk creep. The slope in this area appears to be stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides. Further, there was no evidence of any significant surface or rill erosion, as the slope surface was noted to be generally covered with a relatively dense vegetation cover.

The Etobicoke Creek after meandering in north-south direction, turns its direction by about 90 degrees towards east at the slope toe level in the western portion of Site 2. The creek then flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area (refer **Photographs 13** and **14**, **Appendix G**).

6.3.3 SITE 3 (STORMWATER MANAGEMENT POND 6)

The existing valley slope at Site 3 has inclination of the slope generally varying from 2.2 H : 1 V to 4.6 H : 1 V, with a maximum height of about 3.8 m.

The slope surface is generally covered with grass, weed and bush growth and a few trees. Minor rill erosion extending from the tableland to the slope crest was noted (refer **Photograph 17**, **Appendix G**). The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides.

There is a wide floodplain located between the watercourse (Etobicoke Creek) and the slope toe. The floodplain (about 80 to 100 m wide) is vegetated with grass, weed, and bush and tree growth (refer **Photographs 19** and **20**, **Appendix G**).

. Etobicoke Creek is generally entrenched and meanders within a broad floodplain. As noted before, the watercourse and the slope toe are separated by a relatively wide floodplain and there is no watercourse situated within 15 m of the slope toe within the study area. Therefore, the subject slope is not subjected to toe erosion.

6.3.4 SITE 4 (STORMWATER MANAGEMENT POND 7)

The existing valley slope at Site 4 has inclination generally varying from 3.6 H : 1 V to 4.8 H : 1 V, with maximum height of about 5.8 m. A drainage gully located in the western third of the slope and extending from the tableland to the flood plain was noted.

The slope surface is generally covered with grass, weed and bush growth. The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides.

A floodplain is located between the watercourse (Etobicoke Creek) and the slope toe. The floodplain, more than 15 m wide is vegetated with grass (refer **Photograph 28**, **Appendix G**). As the watercourse and the slope toe are separated by a floodplain more than 15 m wide, therefore, the subject slope is not subjected to toe erosion.

6.3.5 SITE 5 (STORMWATER MANAGEMENT POND 8)

The existing valley slope at Site 5 has inclination generally varying from 1.9 H : 1 V to 5.6 H : 1 V, with maximum height of about 6.5 m.

The slope surface is generally densely covered with grass, weed and bush growth, as well as young to mature trees (refer to enclosed photographs). Although, a few leaning and fallen trees were noted, the trunk growth of majority of the trees was noted to be generally straight and upright, and there was no evidence of significant root or trunk creep. The slope in this area appears to be generally stable and there were no obvious signs of slope instability such as slump, scarp, tension cracks or recent slope slides. Further, there was no evidence of any significant surface, as the slope surface was noted to be generally covered with a relatively dense vegetation cover.

The Etobicoke Creek within Study 5 area flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area (refer **Photographs 33** and **34**, **Appendix G**).

6.4 SOIL PARAMETERS AND GROUNDWATER

Based on the borehole information as described in Section 5 of this report, soil parameters were estimated based on public sheet data and empirical relationships. The soil parameters used in the slope stability analyses are given on **Table 6.1**.

Table 6.1 Soil Parameters for Slope Stability Analyses

SOIL TYPE (SEE SECTION 5 FOR SOIL DESCRIPTION)	SOIL DENSITY (kN/m^3)	LONG-TERM STRENGTH	
		c' (kPa)	ϕ' (DEGREE)
Clayey Silt Till (Stiff to Hard)	21.5	10	30
Sandy Silt (Compact to Dense)	21.0	0	36
Silt (Compact)	20.5	0	31

The above soil strength parameters are based on the effective stress analysis for long-term slope stability.

The stabilized groundwater table observed in the piezometers on June 1 and 5, 2017 is as below:

- Site 1 (BH17-1 to BH17-3): 0.93 to 1.31 m below existing grade (Elev. 258.14 to 256.27 m)
- Site 2 (BH17-4): 1.99 to 2.37 m below existing grade (Elev. 258.02 to 257.64 m)
- Site 3 (BH17-5): 3.24 to 3.30 m below existing grade (Elev. 256.35 to 256.29 m)
- Site 4 (BH17-6 and BH17-7): 3.02 to 3.35 m below existing grade (Elev. 256.19 to 255.99 m)
- Site 5 (BH17-8): 1.82 to 1.86 m below existing grade (Elev. 257.05 to 257.01m)

The relevant groundwater table was used in the computer model to simulate normal groundwater table condition.

A higher groundwater table was assumed to simulate any future build-up (elevated groundwater condition) in a hypothetical slope model.

6.5 TOE EROSION ALLOWANCE

All the five study areas/sites are located along the valley slope of Etobicoke Creek.

At Site 1, Etobicoke Creek is generally entrenched and meanders within a broad floodplain. The creek banks and bed were noted to be generally vegetated with grass and weed growth. There was no obvious sign of active bank erosion or undercutting within the study area.

At Site 2, the Etobicoke Creek flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area.

At Site 3, the watercourse and the slope toe are separated by a relatively wide floodplain and there is no watercourse situated within 15 m of the slope toe within the study area. Therefore, the subject slope is not subjected to toe erosion.

At Site 4, the watercourse and the slope toe are separated by a floodplain more than 15 m wide, therefore, the subject slope is not subjected to toe erosion.

At Site 5, the Etobicoke Creek within study area flows along the toe of the slope. Bank undercutting of slope toe was noted at various locations within the study area.

TRCA generally follows the MNR Policy Guidelines for erosion setback. The recommended toe erosion allowance at each site is summarized in **Table 6.2**.

Table 6.2 Recommended Toe Erosion Allowance at Each Site

SITE IDENTIFICATION	SOIL AT SLOPE TOE	EVIDENCE OF ACTIVE TOE EROSION	RECOMMENDED TOE EROSION ALLOWANCE	REMARKS
Site 1	Silty Clay Till	No	2 m	Bankfull width between 5 and 30 m
Site 2	Silty Clay Till	Yes	8 m	Active toe erosion
Site 3	Silty Clay Till	No	Not Applicable	Flood plain > 15 m
Site 4	Silty Clay Till	No	Not Applicable	Flood plain > 15 m
Site 5	Silty Clay Till	Yes	8 m	Active toe erosion

6.6 STABILITY OF EXISTING SLOPE

As stated above, eight (8) boreholes (BH17-1 to BH17-8) were advanced near the slope crests to assess the subsurface soil and groundwater conditions comprising the subject slopes. The borehole data indicate that the site slopes consist of clayey silt till with interbeds of sandy silt.

As noted in Section 6.2, WSP inferred twenty-four (24) slope cross-sections of which Section P5A-P5A' at Site2, Section P6C-P6C' at Site 3, Section P7B-P7B' at Site 4 and P8F-P8F' at Site 5 were the steepest and critical. A detailed engineering analyses of slope stability were carried out for the selected slope cross-sections utilizing computer software (SLIDE by Rocscience). For this study, the GLE\Morgenstern-Price limit equilibrium method of analysis was adopted. This method of analysis permits the calculation of Factors of Safety for generated or assumed failure surfaces.

The analysis was carried out by preparing a model of the slope/site geometry and subsurface conditions, and analyzing numerous failure surfaces in search of the minimum or critical Factor of Safety in order to assess the stability of the slope. The pertinent data obtained from the topographic and borehole information (Sections 6.2 to 6.4 above) were input in the slope stability analyses. Many calculations were carried out to examine the Factors of Safety for varying depths for potential failure surfaces. The minimum factors of safety for the existing slope at Sections P5A-P5A' at Site2, Section P6C-P6C' at Site 3, Section P7B-P7B' at Site 4 and P8F-P8F' at Site 5 are summarized in **Table 6-3** below:

Table 6.3 Computed Factors of Safety for Existing Slope Sections

SITE IDENTIFICATION	SECTION	TYPE OF SLOPE SLIDE	MINIMUM FACTOR OF SAFETY FOR POTENTIAL SLOPE SLIDES (BASED ON BOREHOLE INFORMATION	REMARKS
Site 2	P5A-P5A'	Circular Slope Slide, Deep Seated	3.65	Drawing No. 1, Appendix F
		Circular Slope Slide, Toe Failure	3.91	Drawing No. 1A, Appendix F
Site 3	P6C-P6C'	Circular Slope Slide, Deep Seated	2.75	Drawing No. 2, Appendix F
		Circular Slope Slide, Toe Failure	2.25	Drawing No. 2A, Appendix F
Site 4	P7B-P7B'	Circular Slope Slide, Deep Seated	4.01	Drawing No. 3, Appendix F
		Circular Slope Slide, Toe Failure	3.95	Drawing No. 3A, Appendix F
Site 5	P8F-P8F'	Circular Slope Slide, Deep Seated	2.65	Drawing No. 4, Appendix F
		Circular Slope Slide, Toe Failure	2.36	Drawing No. 4A, Appendix F

For land development and planning, the MNR Policy Guidelines allow a minimum Factor of Safety of 1.3 to 1.5 for slope stability. It is recommended that a minimum Factor of Safety of 1.5 be used for long-term slope stability.

The computed factor of safety presented in **Table 6-3** for the slope stability analysis for the long-term of existing slope is considered to be adequate and satisfies the TRCA and MNR Policy Guidelines and industry standard practice.

WSP also carried out a slope stability analyses on a hypothetical section, with slope height of 6 m at inclination of 2.0 H : 1.0 V, to find out the minimum required long term stable slope inclination. The slope was modeled with silty clay till, which is representative of site soil conditions. A groundwater level, at about 1.0 m below ground surface was input to the model. The computed factors of safety for this hypothetical section were 1.95 for deep seated slope failure and 1.75 for slope toe failure. Therefore, a slope inclination of 2.0 H to 1 V or flatter is required for the long-term stability of the overburden slope.

6.7 LONG TERM STABLE SLOPE

The Long-term Stable Slope Top of Slope (LTSTOS) locations were calculated based on the applicable erosion and stability setbacks in accordance with the Toronto Region and Conservation Authority guidelines. The slope stability analysis on a hypothetical slope section completed in Section 6.6 concludes that a slope inclination of 2.0 H : 1 V or flatter is required for the long-term stability of the slope.

For Site 1 where the Etobicoke Creek is entrenched within the relatively flat to gently sloping ground, only the erosion component will be applicable. **Drawings 9** to **11,** and **Drawing 4** present the estimated location of the Long-term Stable Top of Slope Line/Long-Term Erosion Hazard Line in sections and plan (S1-S2-S3 on west side of creek and S4-S5-S6 on east side of creek).

For Sites 2 where the creek is in contact with the toe of the slope, both toe erosion and stability components will be applicable. **Drawings 12** to **15,** and **Drawing 5** present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S7-S8-S9-S10).

For Sites 3 where a flood plain more than 15 m wide separates the toe of the slope from creek, only stability component will be applicable. **Drawings 16** to **20,** and **Drawing 6** present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S11-S12-S13-S14-S15).

For Sites 4 where a flood plain more than 15 m wide separates the toe of the slope from creek, only stability component will be applicable. **Drawings 21** to **23,** and **Drawing 7** present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S16-S17-S18).

For Site 5 where the creek is in contact with the toe of the slope, both toe erosion and stability components will be applicable. **Drawings 24** to **32,** and **Drawing 8** present the estimated location of the Long-term Stable Top of Slope Line in sections and plan (S19-S20-S21-S22-S23-S24-S25-S26-S27).

In general, where the existing slope inclination is gentler than the computed stable slope inclination of 2 H : 1 V, the existing top of slope is the Long-term Stable Top of Slope Line.

6.8 DEVELOPMENT SETBACK

In addition to the stability and erosion setbacks, an access allowance/development setback is typically required from the identified slope hazard area (long-term Stable Top of Slope Line location) to take into account possible external conditions which could have an adverse effect on the existing natural condition of the slope, and to provide access to the slope in emergencies. This setback generally varies depending upon the policies of individual authorities. The determination of the setback value depends on a number of factors including but not limited to, the watershed classification, type of development, site specific conditions and available access to the slope. The minor structures may be allowed to be located closer to the long-term Stable Top of Slope Line but only if approved by the concerned conservation authority.

6.9 REVIEW OF PROPOSED STORMWATER MANAGEMENT POND DRAWINGS

WSP was provided drawings of the proposed stormwater management pond (Ponds 5 through Pond 8, refer **Appendix H**), to comment on the impact of proposed grading on the Long-Term Stable Top of Slope (LTSTOS). A review of these drawings indicates that all the four ponds (Pond 5, Pond 6, Pond 7 and Pond 8) will be constructed in cut and will not result in a grade raise adjacent to the LTSTOS. Considering that there will be no grade raise in vicinity of LTSTOS, no impacts are anticipated on the LTSTOS.

6.10 GENERAL COMMENTS

Additional comments related to any future construction at this property, and in terms of slope stability at the site are as follows:

- To reduce the risks of soil erosion on the slope surface, the vegetation and trees on the existing slopes must be preserved. Surface water must be either directed away from the slope or intercepted and diverted down the slope in a controlled fashion by using lined ditches, conduits and the like.
- Structures must be founded behind the setback/long term stable top of slope line.
- The configuration of the slope should not be altered without prior consultation with a geotechnical engineer. In particular, the slope should not be steepened.
- Snow must not be piled near the top of the slope.
- Additional fill cannot be placed beyond Long-term Stable Top of Slope Line as indicated in Drawings 4 to 8.

6.11 LIMITATIONS OF REPORT

This report is subject to the Statement of Limitations attached in **Appendix I**.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours very truly,

WSP CANADA INC.

SIGNATURES



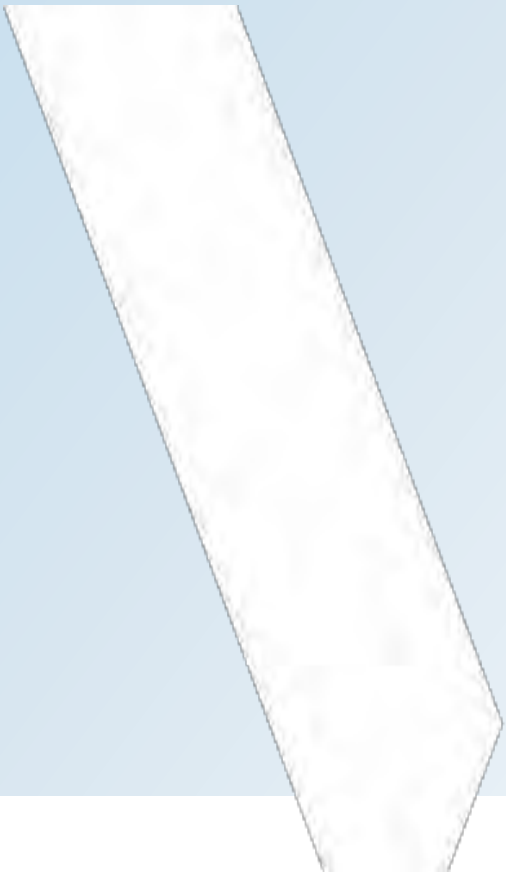
Kulbir Singh, M.Eng., P.Eng.
Senior Geotechnical Engineer

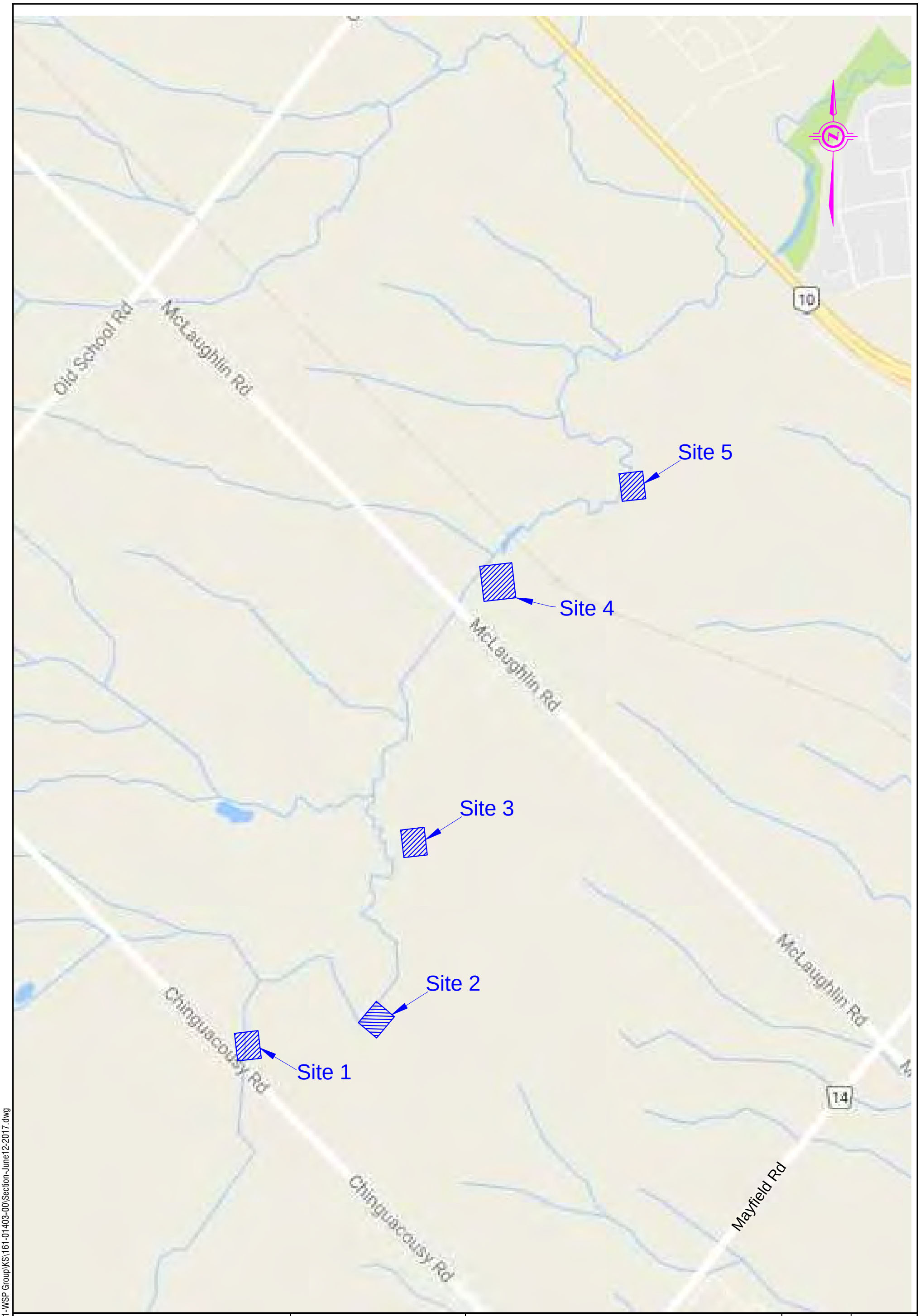


Laifa Cao, Ph.D., P.Eng.
Principal Geotechnical Engineer

DRAWINGS

- SITE LOCATION PLAN (DRAWING 1)
- BOREHOLE, SLOPE, AND PHOTOGRAPH LOCATION PLAN (DRAWINGs 2 and 3)
- LONG-TERM STABLE TOP OF SLOPE LINE LOCATION (DRAWINGs 4 to 8)
- EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION (DRAWINGS 9 THROUGH 32)





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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 1
TITLE: SITE LOCATION PLAN		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: June 12, 2017	SCALE: N.T.S
		ORIGINAL SIZE: TABLOID	REV. # N/A

GREENBELT PLAN AREA

GREENBELT PLAN AREA

CHINGUACOUSY ROAD

BH17-1

BH17-2

BH17-3

BH17-4

BH17-5

BH102

BH101

SWM POND 5

SWM POND 6

GREENBELT LIMIT

PROPOSED REGIONAL FLOOD LINE

FP MAYFIELD WEST (CALEDON) INC

MAYFIELD DEVELOPMENTS INC

CALEDON DEVELOPMENT GENERAL PARTNER LTD

CALEDON ROAD 24

1 2 3 4 5 6 7 8 10 11 12 13 14 15 17 18 19 20

5Om 0 50 100 150m

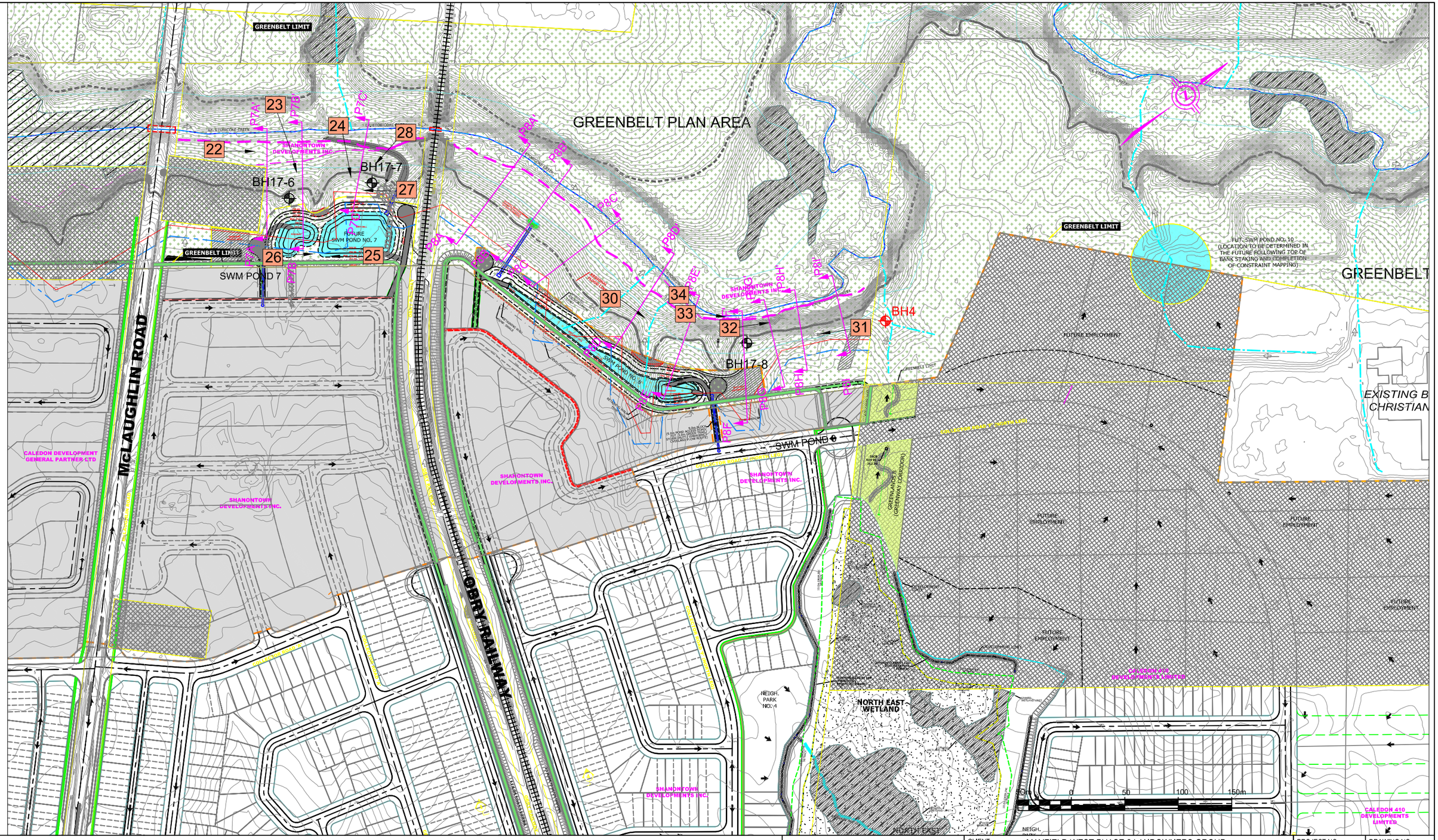
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- EX CONTOUR @ 25cm INTERVAL (BASED ON AVAILABLE LIDAR AND GROUND SURVEY INFORMATION)
- EX REACH/WATERCOURSE
- STAKED DRIPLINE (TRCA-SEPTEMBER 15, 2015)
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- EXISTING TOE OF SLOPE (URBANTECH-2017)
- APPROXIMATE LOCATIONS OF BOREHOLE BY WSP FOR SLOPE STABILITY
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY WSP
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY SOIL ENGINEERS LTD.
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY TERROPROBE
- SLOPE LINE LOCATION
- 1 PHOTOGRAPH LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 2
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: JUNE 1, 2017	SCALE: AS SHOWN
		ORIGINAL SIZE: TABLOID	REV. # N/A

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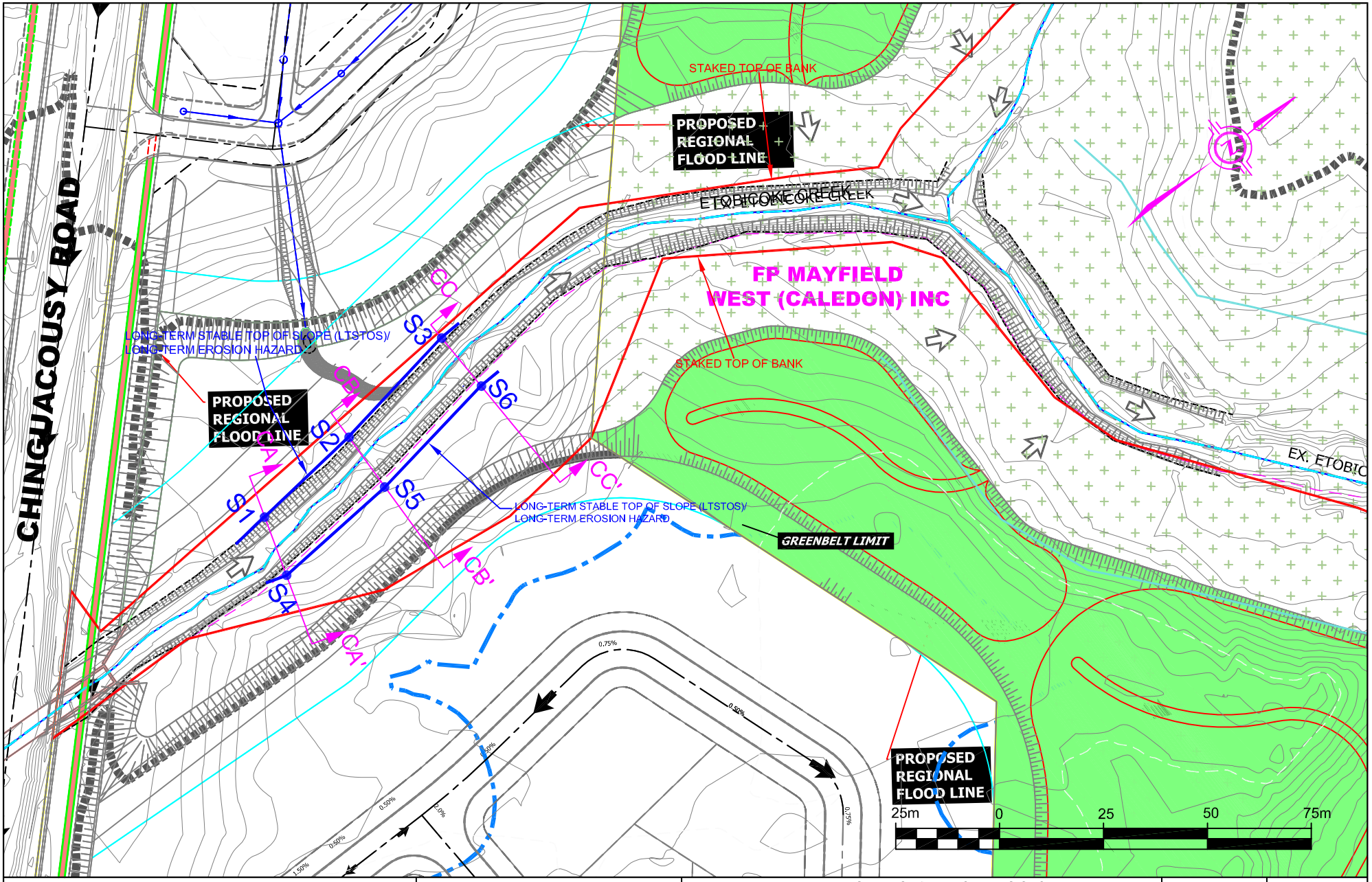
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- EX REACH/WATERCOURSE
- STAKED DRIPLINE (TRCA-SEPTEMBER 15, 2015)
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- EXISTING TOE OF SLOPE (URBANTECH-2017)
- APPROXIMATE LOCATIONS OF BOREHOLE BY WSP FOR SLOPE STABILITY
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY WSP
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY SOIL ENGINEERS LTD.
- APPROXIMATE LOCATIONS OF PREVIOUS BOREHOLE BY TERROPROBE
- SLOPE LINE LOCATION
- 1 PHOTOGRAPH LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 3
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: JUNE 1, 2017	SCALE: AS SHOWN
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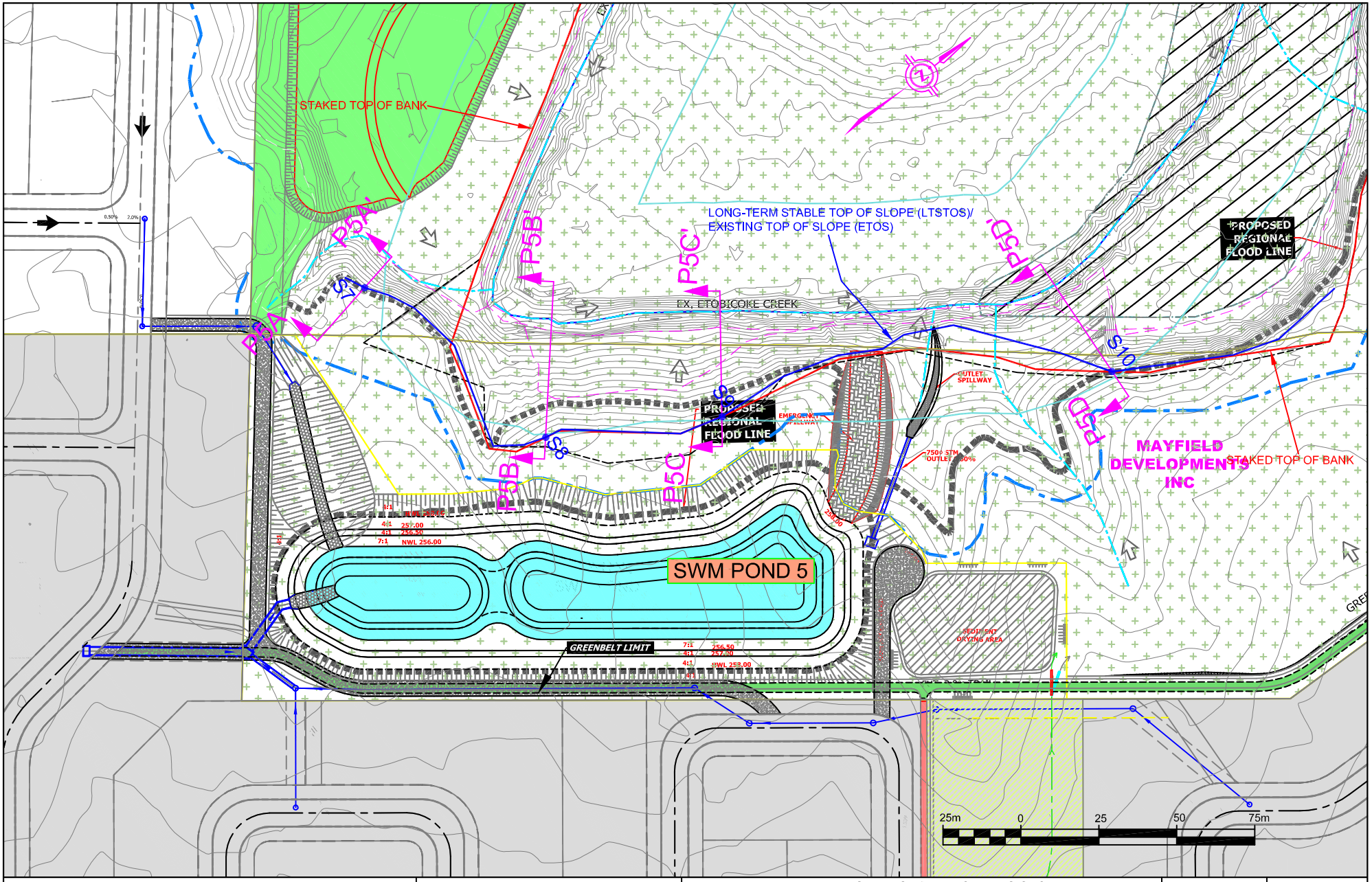
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- LONG-TERM STABLE TOP OF SLOPE (LTSTOS) / LONG-TERM EROSION HAZARD
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- SLOPE LINE LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 4
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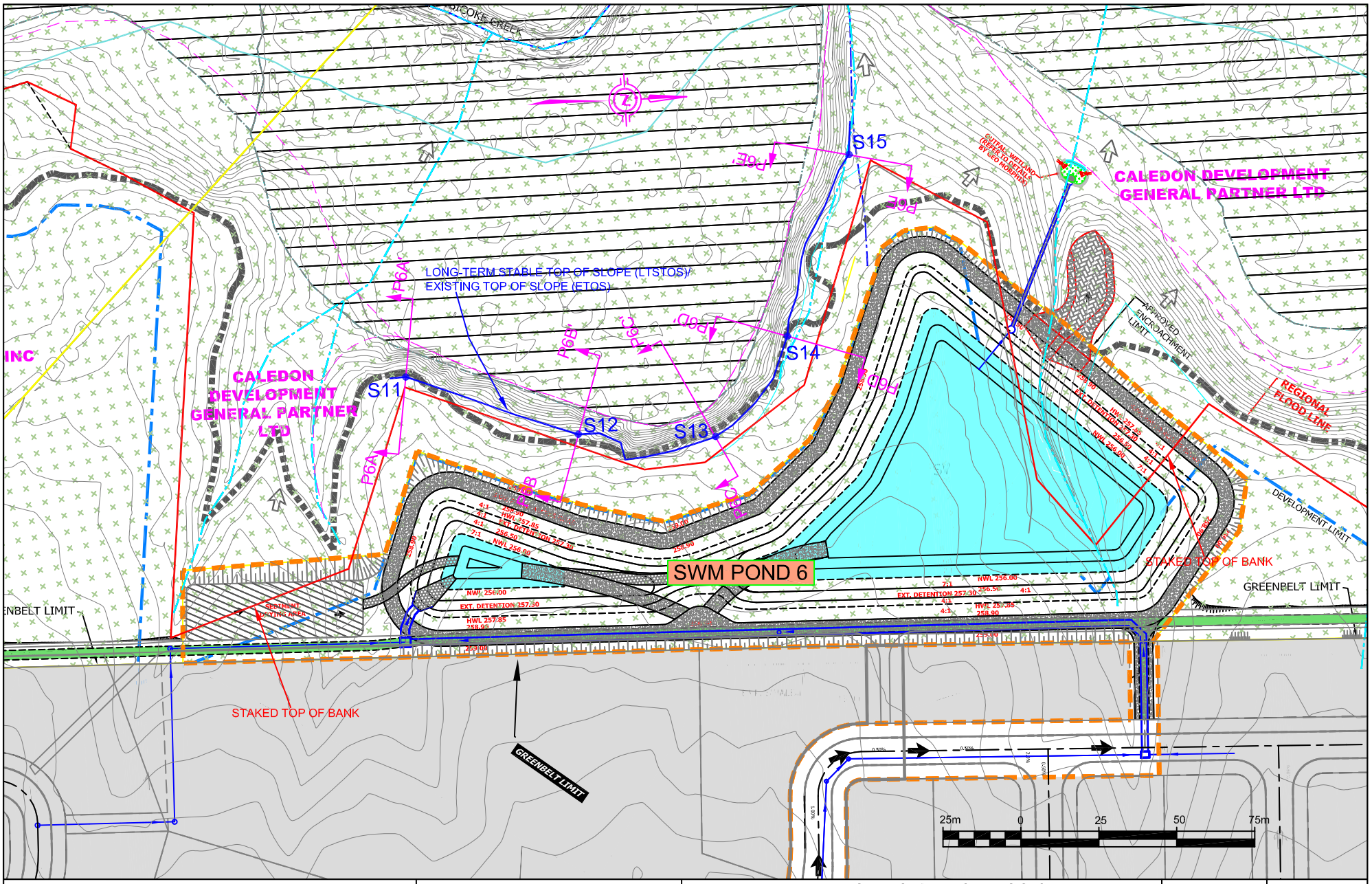
LEGEND:

- LONG-TERM STABLE TOP OF SLOPE (LTSTOS)
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- SLOPE LINE LOCATION

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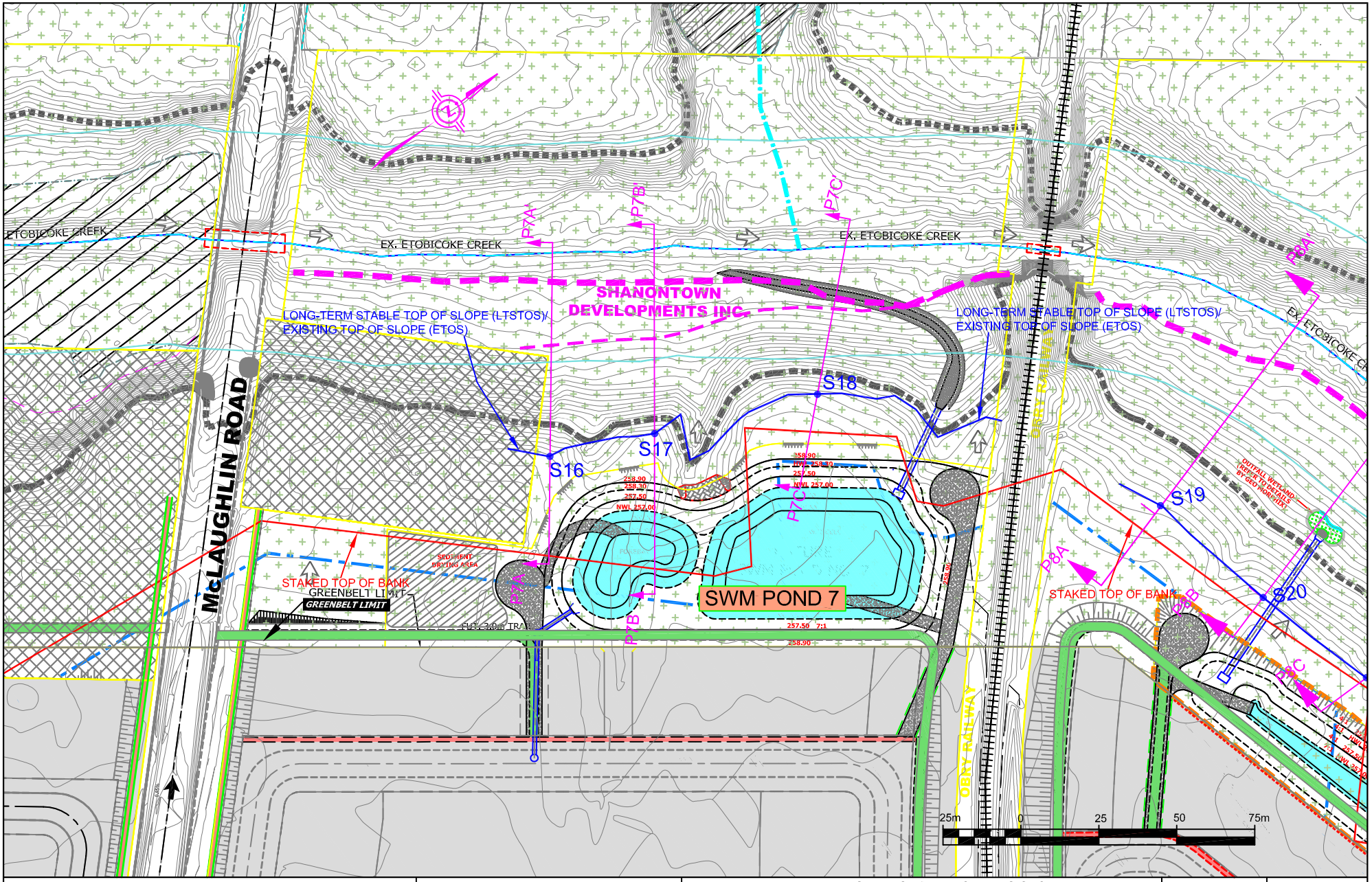
- LONG-TERM STABLE TOP OF SLOPE (LTSTOS)
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- SLOPE LINE LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 6
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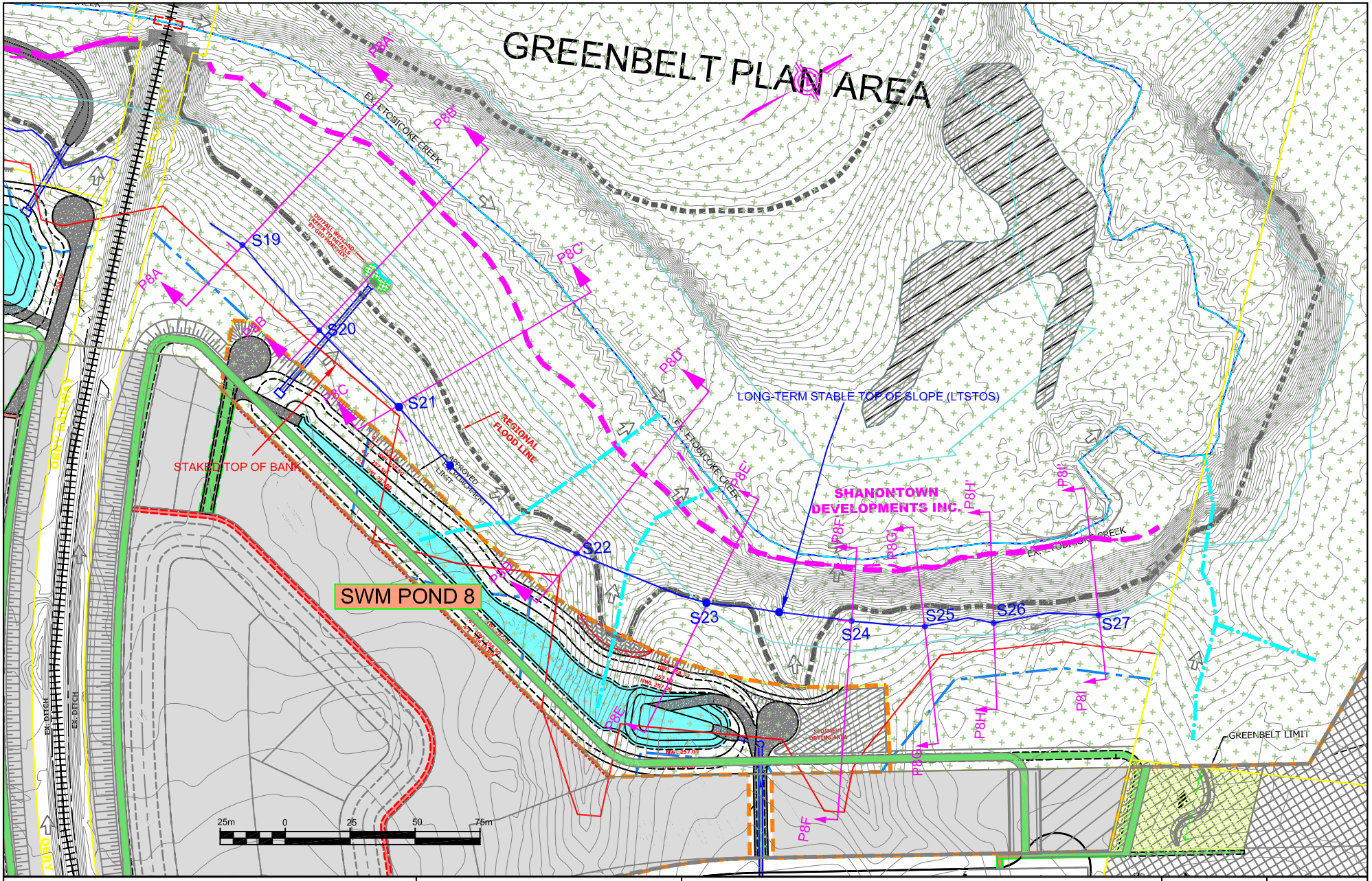
- LONG-TERM STABLE TOP OF SLOPE (LTSTOS)
- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- SLOPE LINE LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 7
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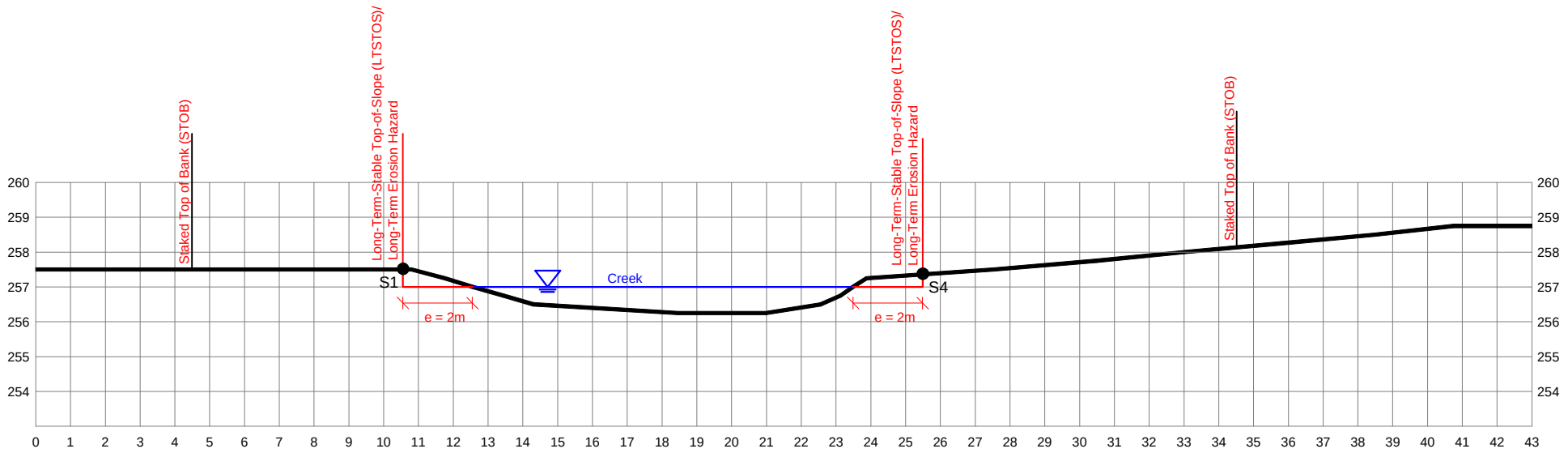
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- STAKED TOP OF BANK (TRCA-JULY 4, 2011)
- SLOPE LINE LOCATION

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 8
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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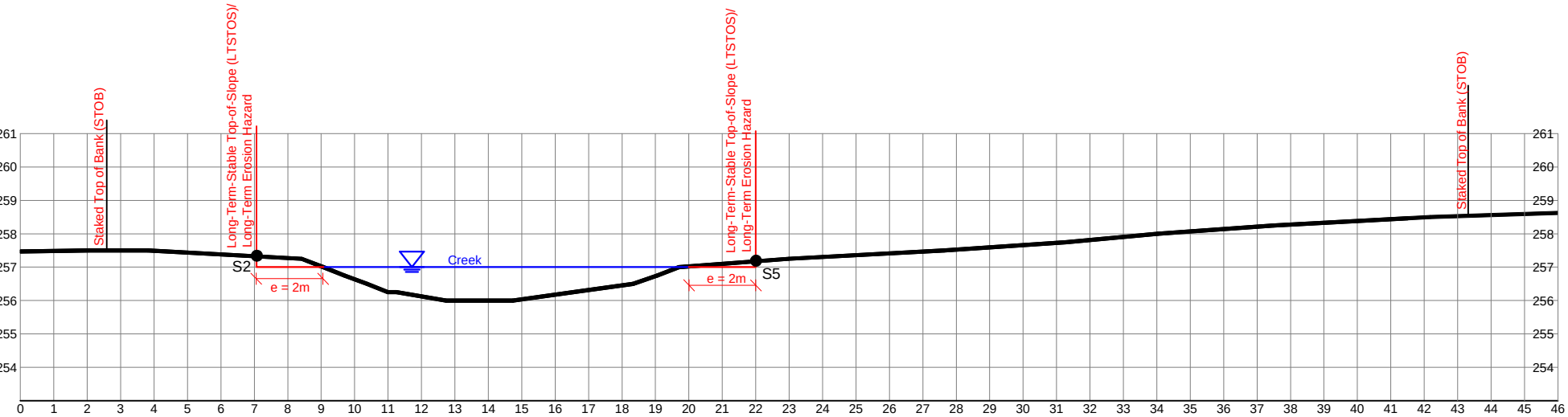
Note:
e = erosion allowance

SECTION CA-CA'

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 9
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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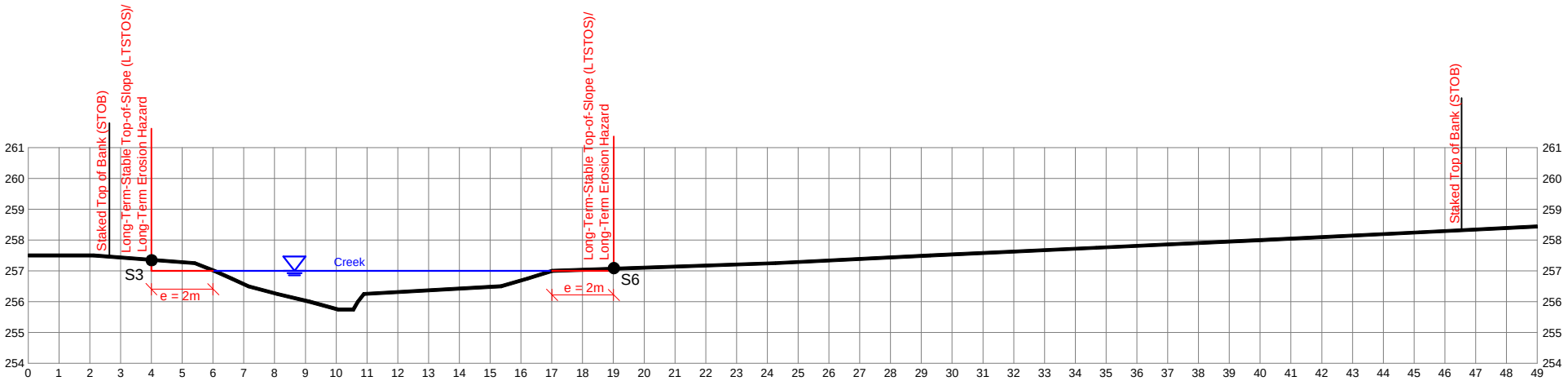
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SECTION CB-CB'

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 10
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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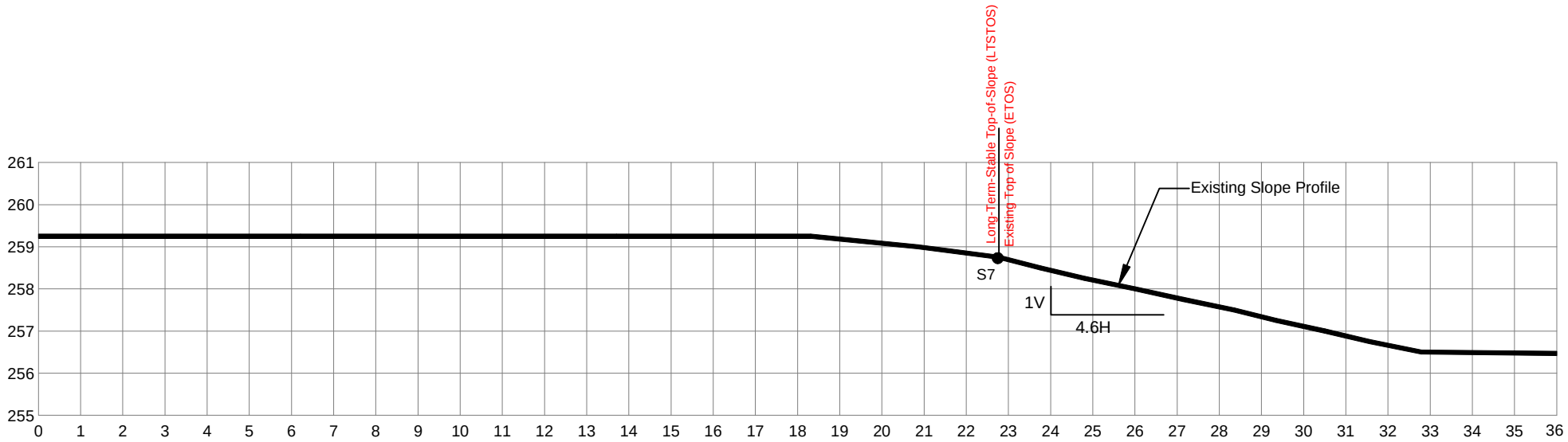
Note:
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SECTION CC-CC'

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 11
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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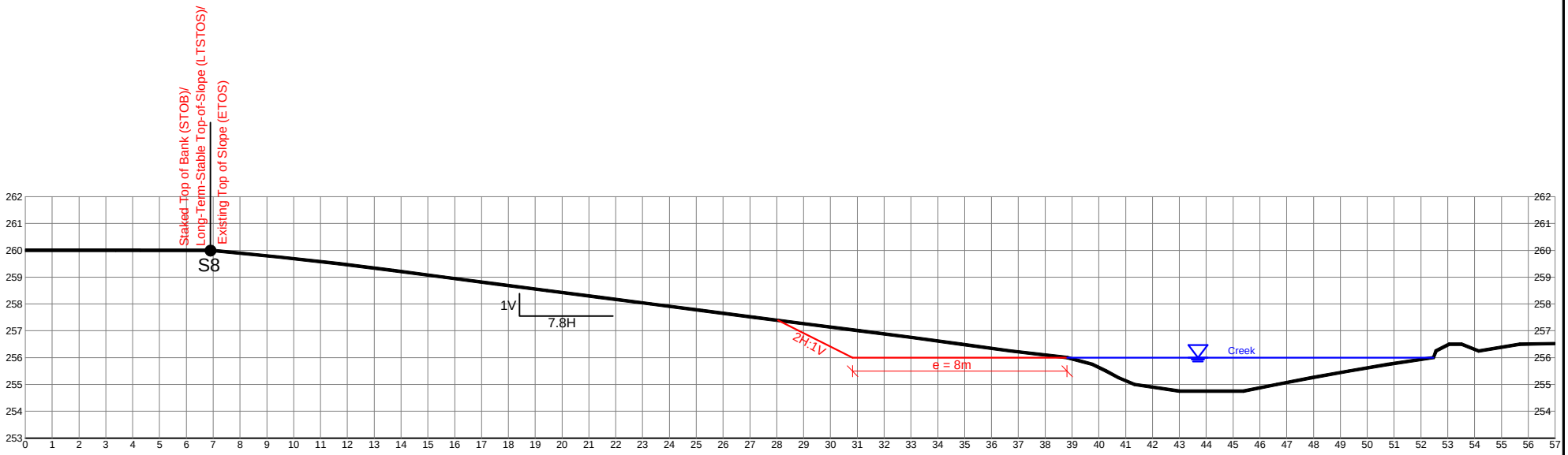


SECTION P5A-P5A' (SWM POND 5)

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TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 12
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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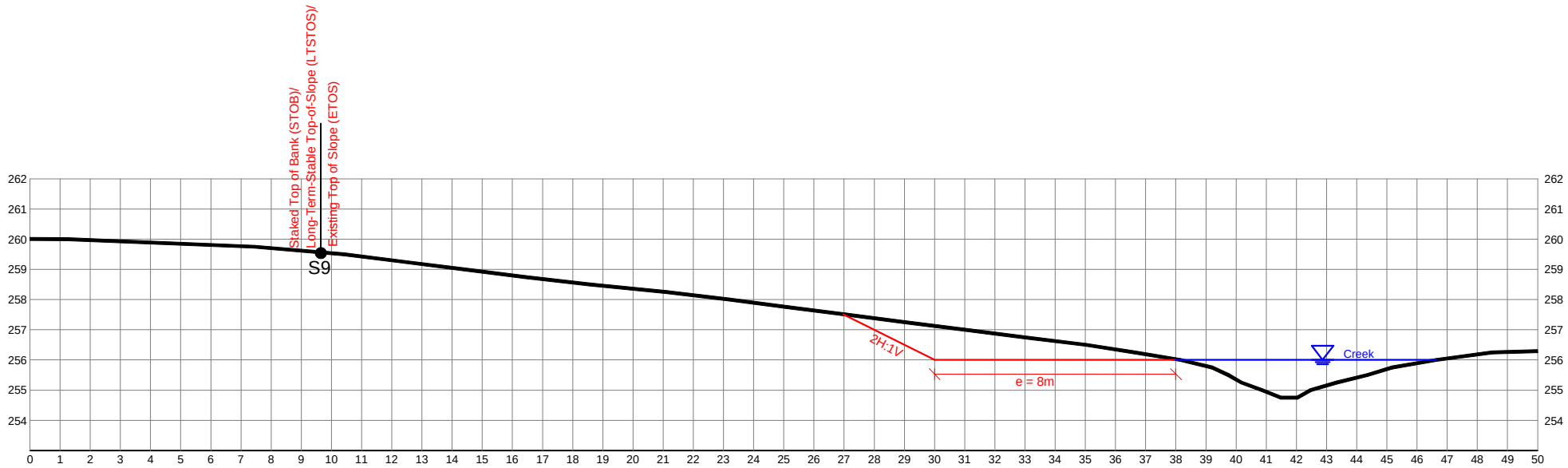
Note:
e = erosion allowance

SECTION P5B-P5B' (SWM POND 5)

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CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 13
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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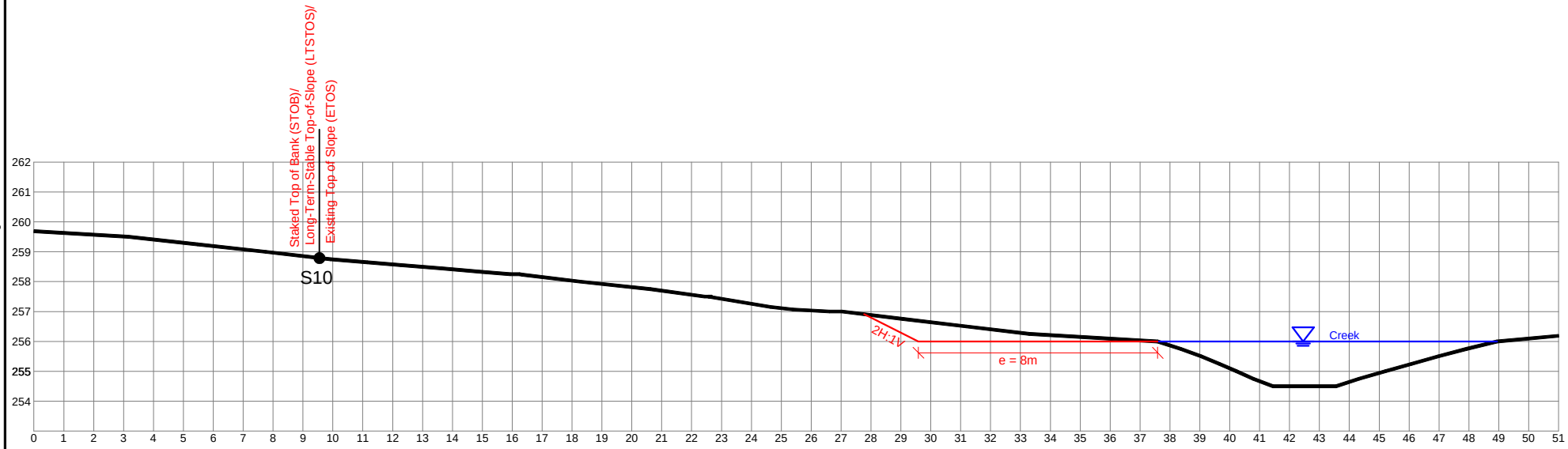
Note:
e = erosion allowance

SECTION P5C-P5C' (SWM POND 5)

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TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 14
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PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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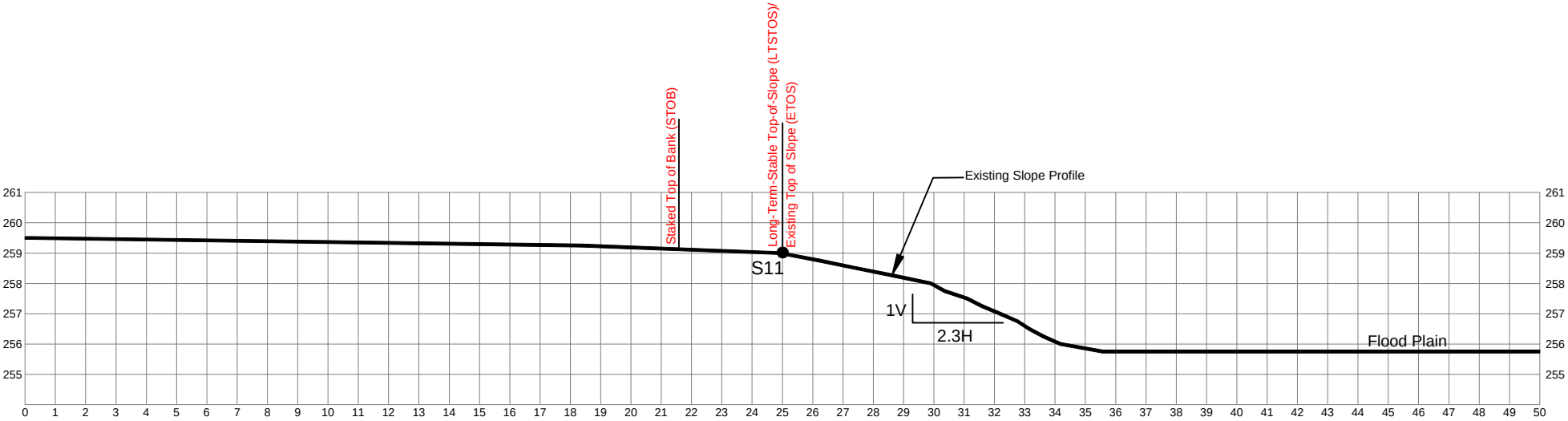
Note:
e = erosion allowance

SECTION P5D-P5D' (SWM POND 5)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 15
TITLE: SECTION P5D-P5D' (SWM POND 5) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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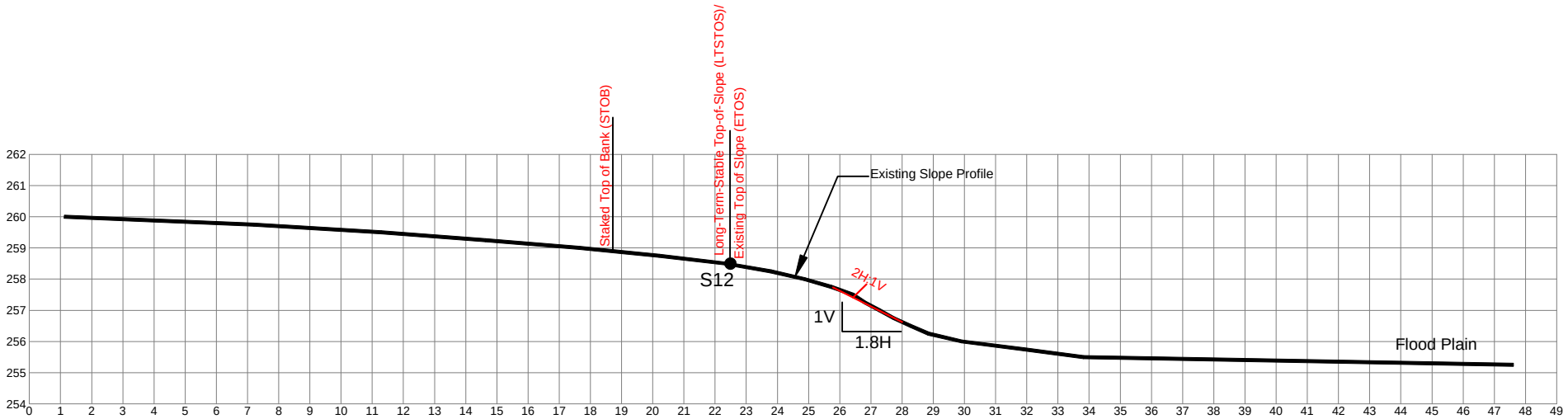


SECTION P6A-P6A' (SWM POND 6)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 16
TITLE: SECTION P6A-P6A' (SWM POND 6) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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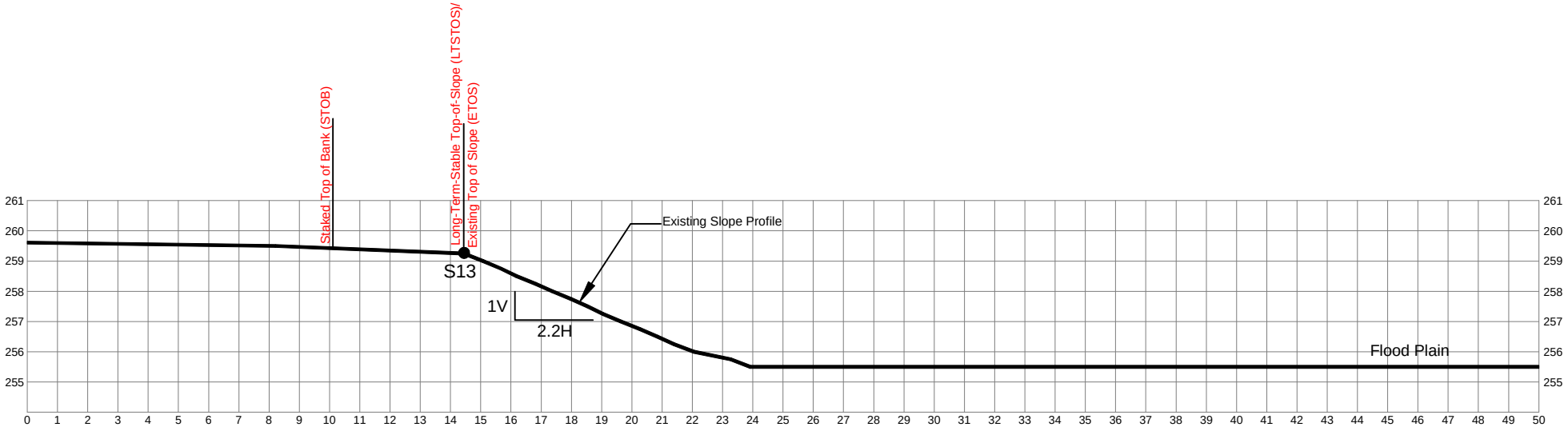


SECTION P6B-P6B' (SWM POND 6)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 17
TITLE: SECTION P6B-P6B' (SWM POND 6) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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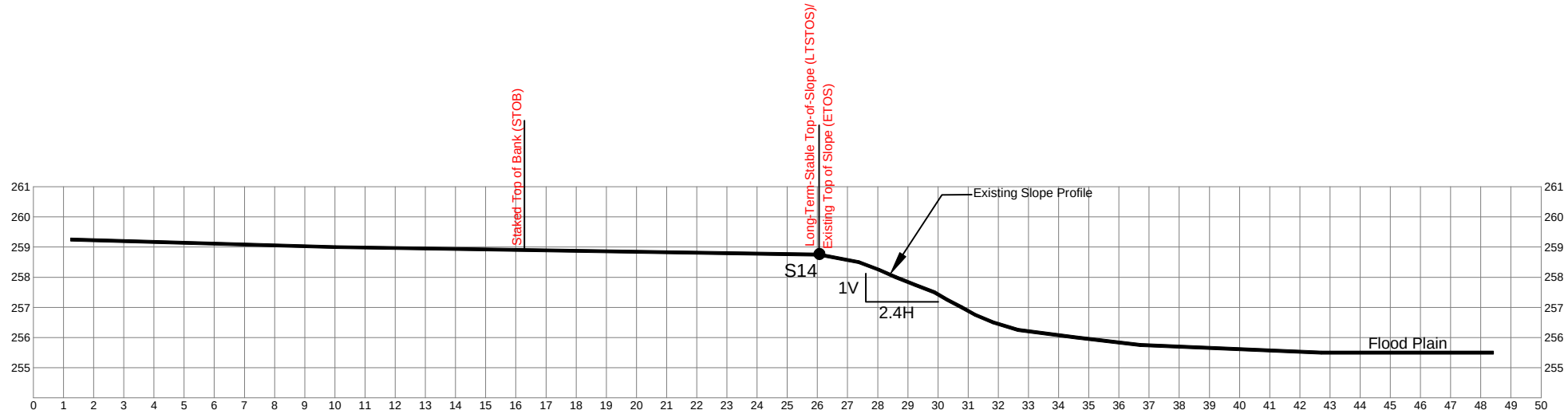


SECTION P6C-P6C' (SWM POND 6)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 18
TITLE: SECTION P6C-P6C' (SWM POND 6) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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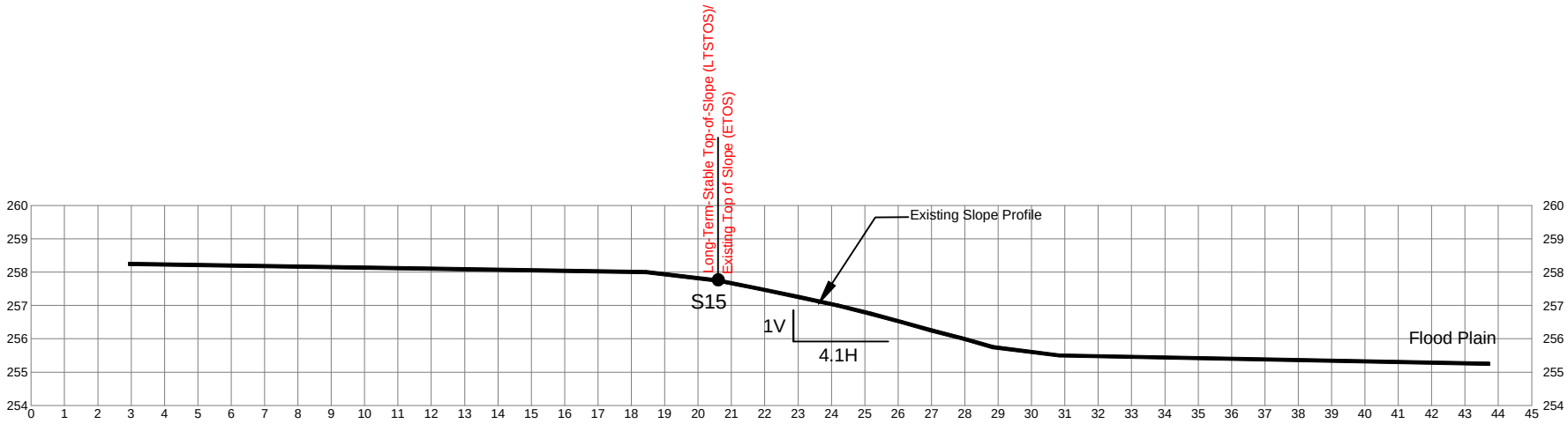


SECTION P6D-P6D' (SWM POND 6)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 19
TITLE: SECTION P6D-P6D' (SWM POND 6) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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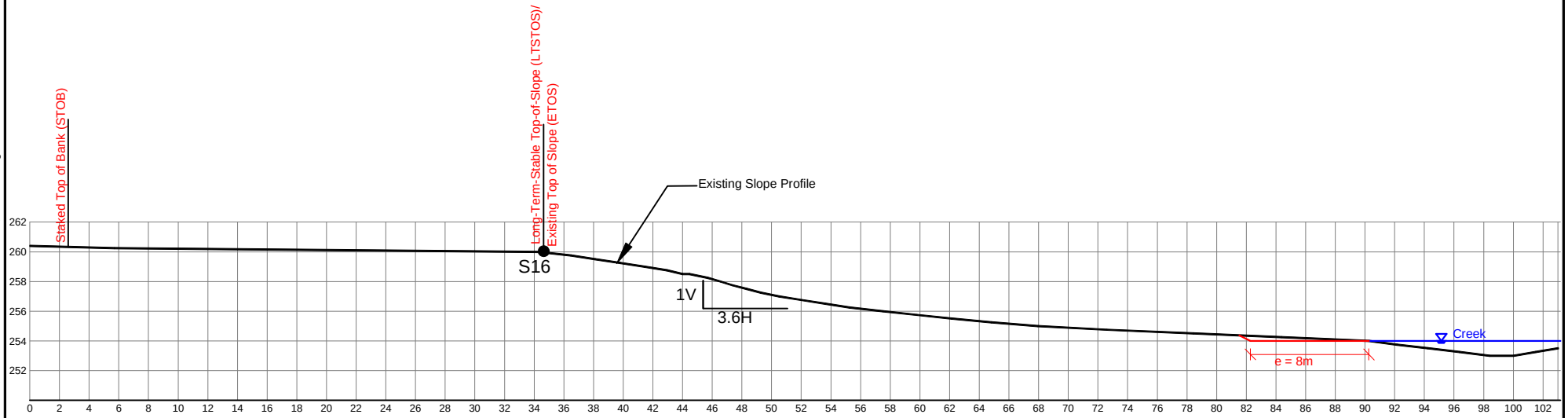


SECTION P6E-P6E' (SWM POND 6)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 20
TITLE: SECTION P6E-P6E' (SWM POND 6) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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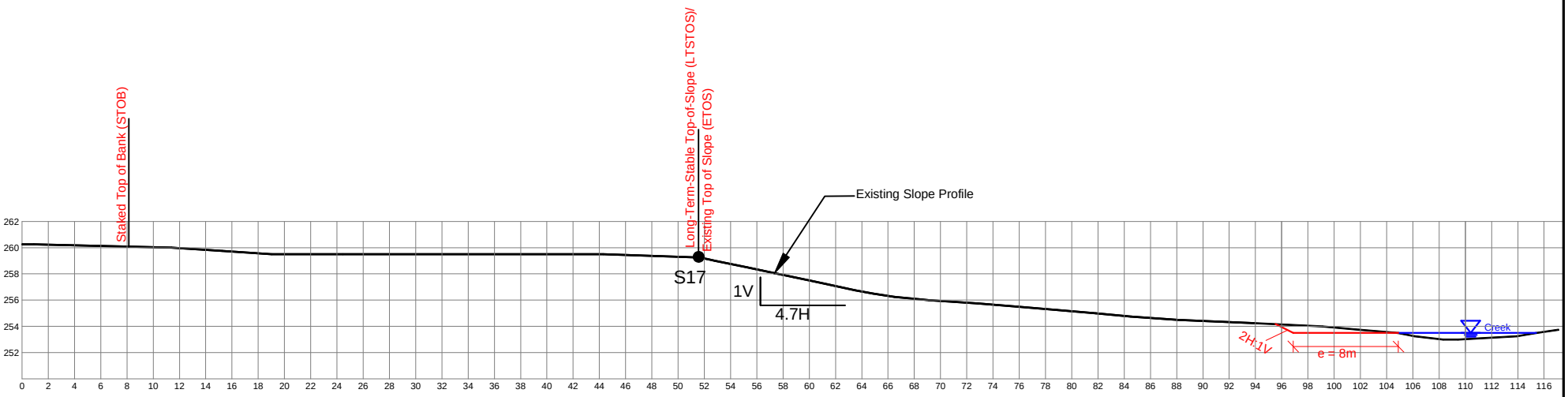


SECTION P7A-P7A' (SWM POND 7)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 21
TITLE: SECTION P7A-P7A' (SWM POND 7) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
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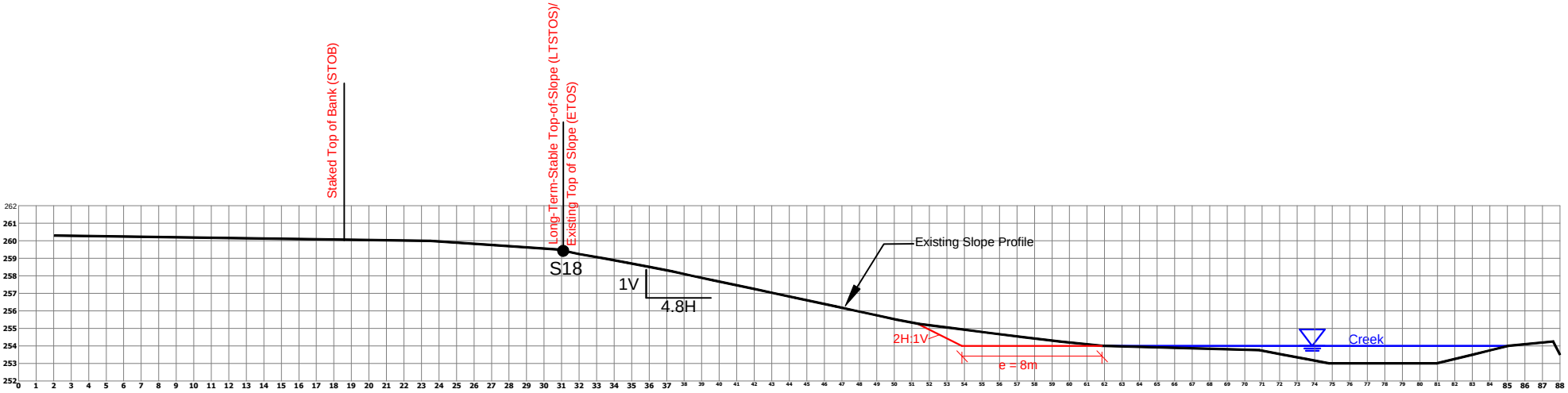


SECTION P7B-P7B' (SWM POND 7)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 22
TITLE: SECTION P7B-P7B' (SWM POND 7) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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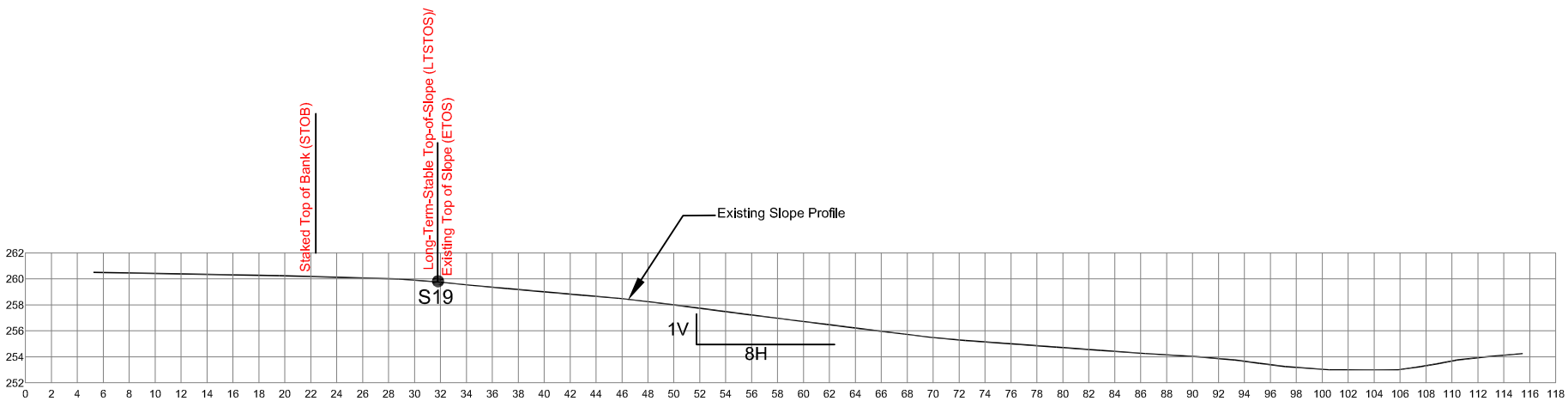
SECTION P7C-P7C' (SWM POND 7)

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51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 23
TITLE: SECTION P7C-P7C' (SWM POND 7) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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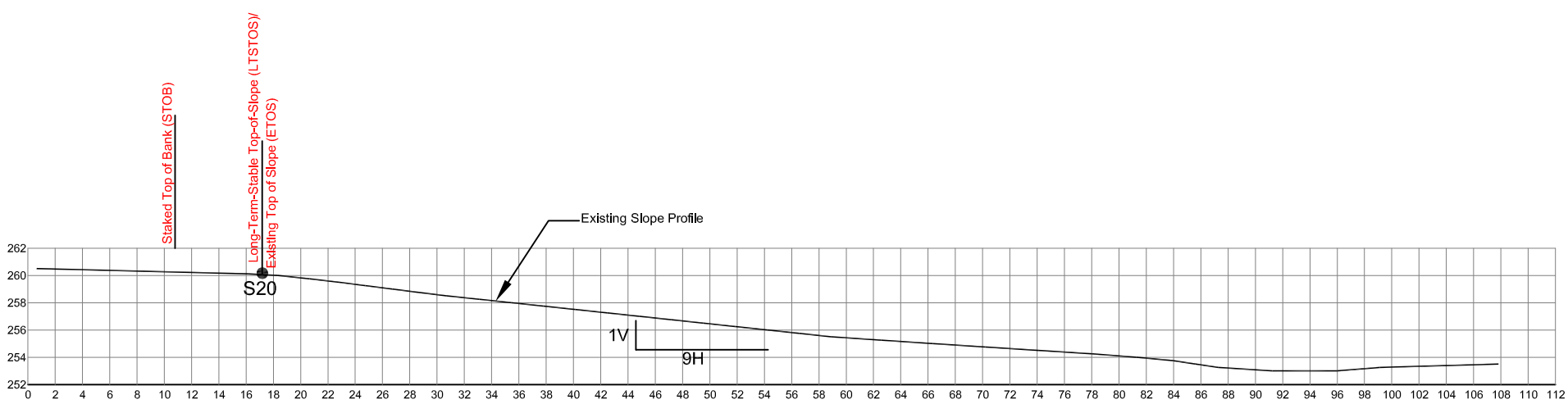


SECTION P8A-P8A' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 24
TITLE: SECTION P8A-P8A' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

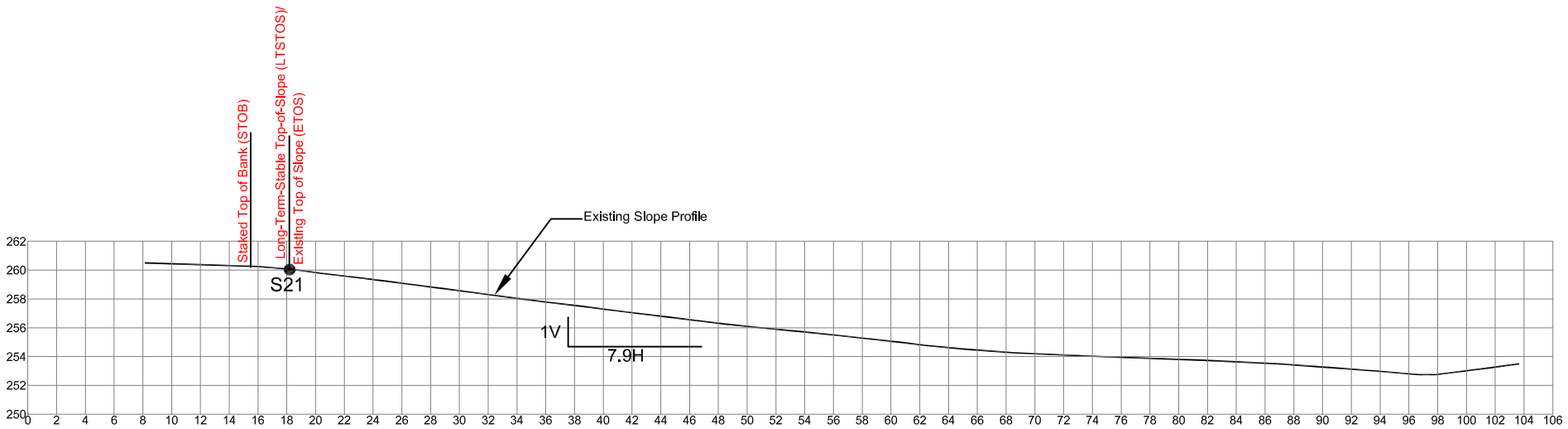
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SECTION P8B-P8B' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 25
TITLE: SECTION P8B-P8B' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

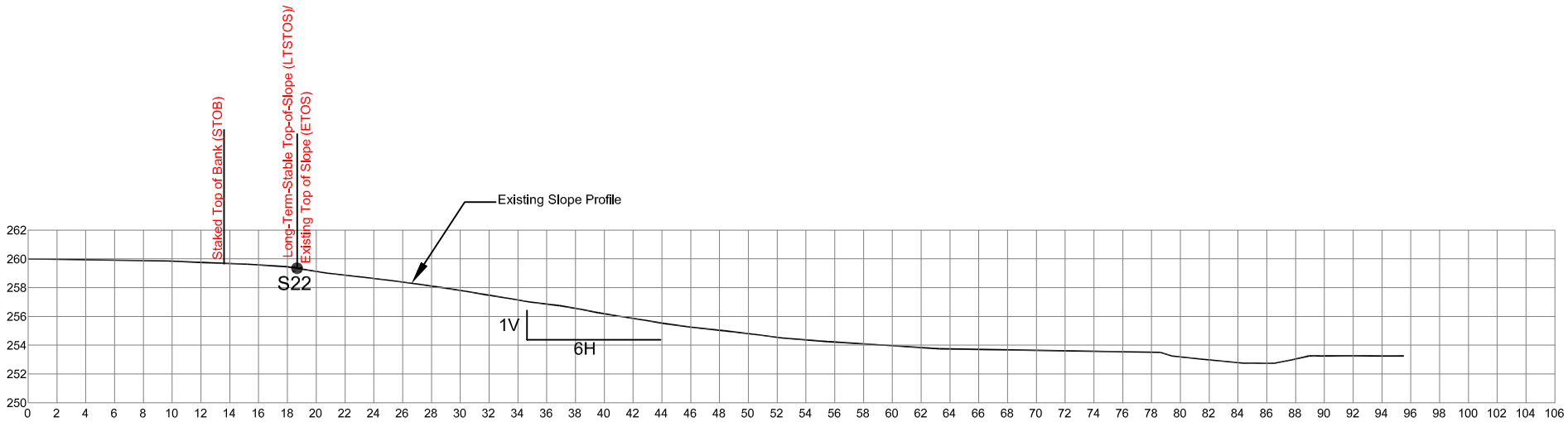


SECTION P8C-P8C' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 26
TITLE: SECTION P8C-P8C' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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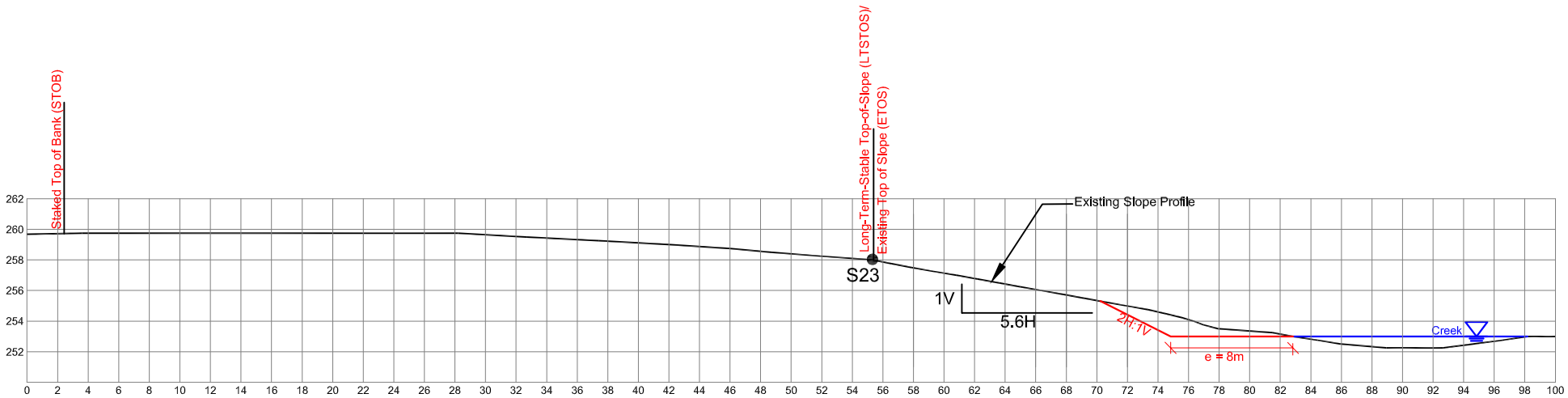
SECTION P8D-P8D' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 27
TITLE: SECTION P8D-P8D' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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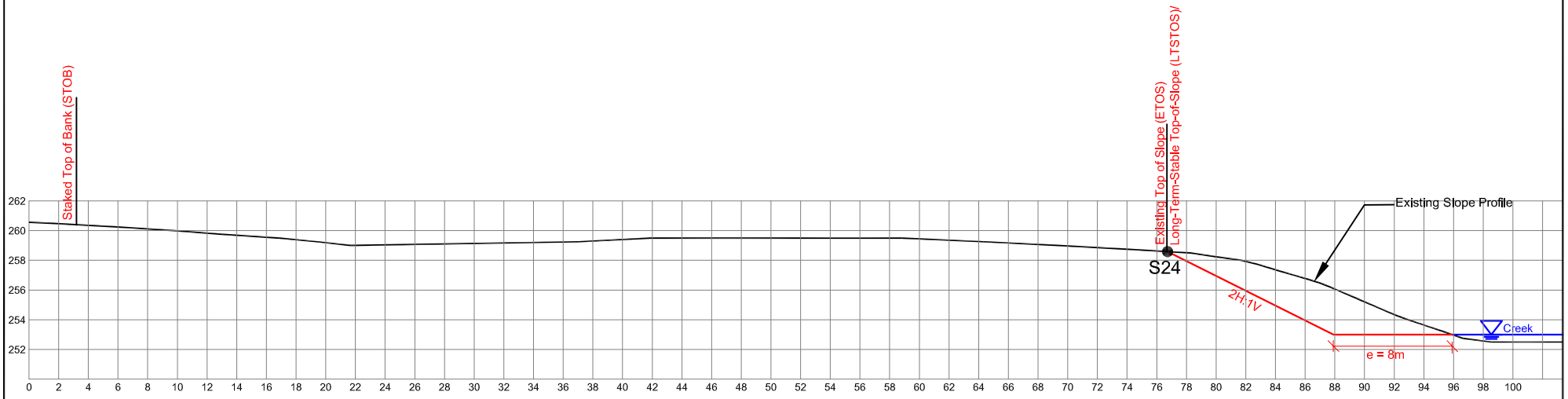


SECTION P8E-P8E' (SWM POND 8)

Note:
e = erosion allowance

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 28
TITLE: SECTION P8A-P8A' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A



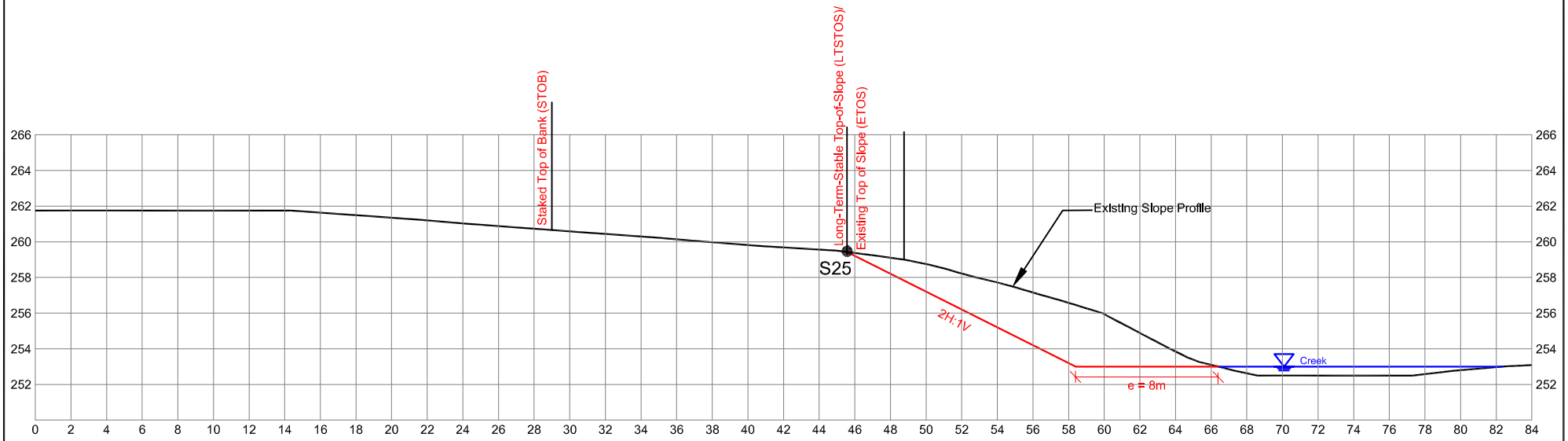
Note:
e = erosion allowance

SECTION P8F-P8F' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 29
TITLE: SECTION P8B-P8B' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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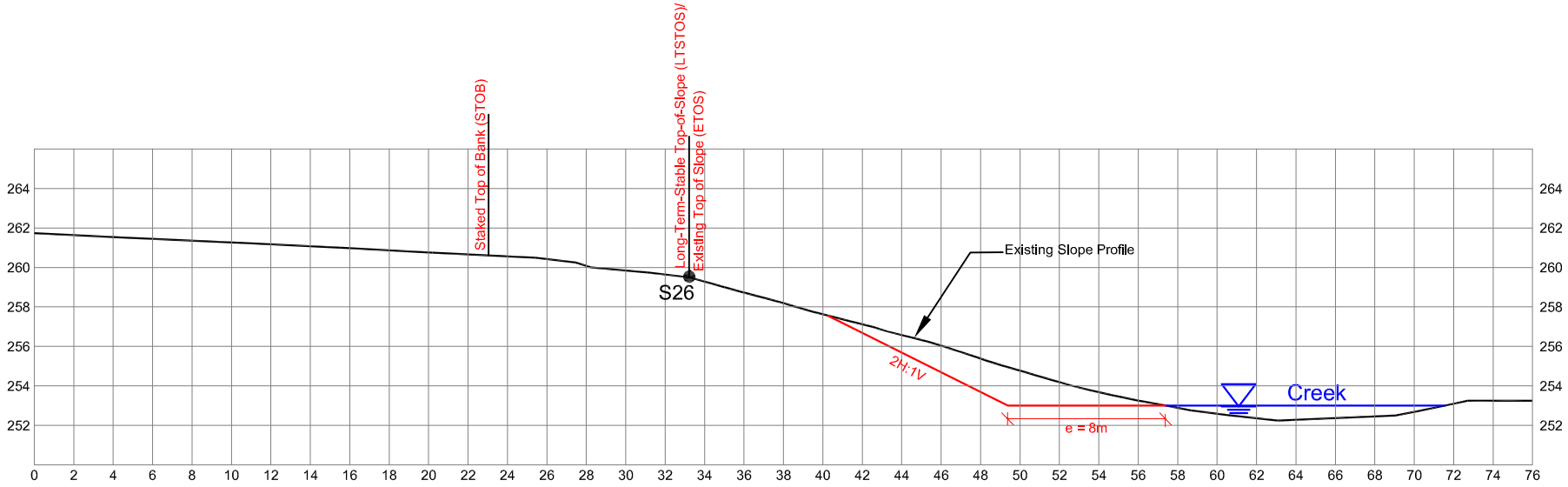
Note:
e = erosion allowance

SECTION P8G-P8G' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 30
TITLE: SECTION P8C-P8C' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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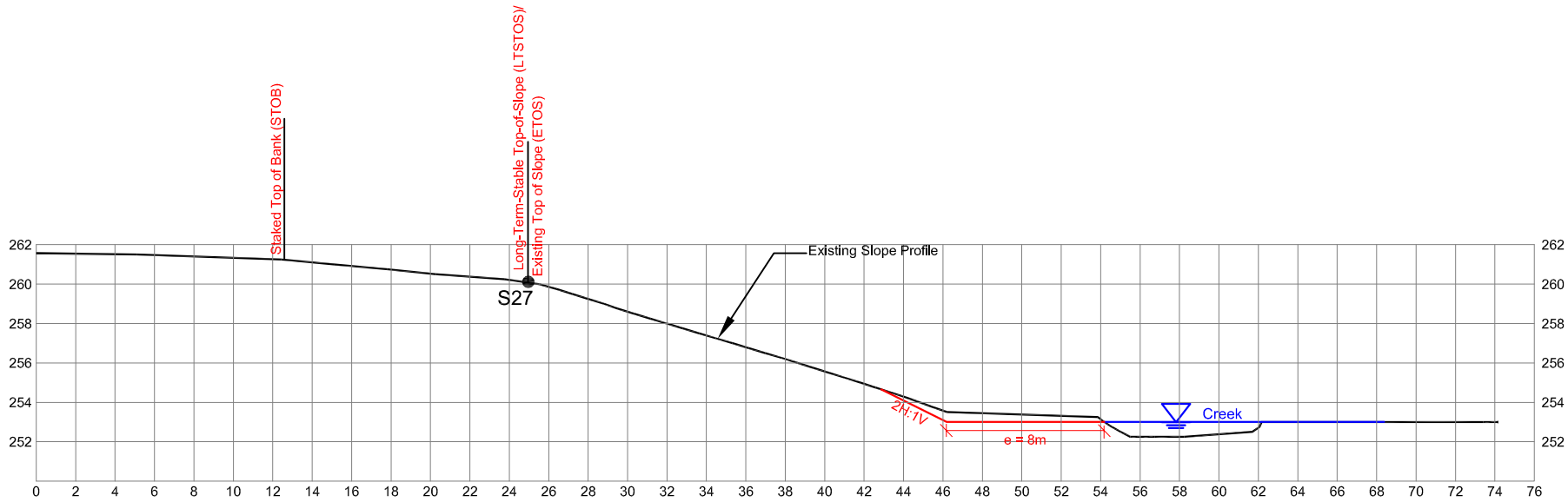
Note:
e = erosion allowance

SECTION P8H-P8H' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 31
TITLE: SECTION P8D-P8D' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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Note:
e = erosion allowance

SECTION P8I-P8I' (SWM POND 8)

51 CONSTELLATION COURT
TORONTO, ONTARIO CANADA M9W 1K4
TEL.: 416-798-0065 | FAX: 416-798-0518 | WWW.WSP.COM

CLIENT: MAYFIELD WEST PHASE 2 LANDOWNERS GROUP C/O GLENN SCHNARR & ASSOCIATES INC.		PROJECT NO: 161-01403-00	DRAWING NO: 32
TITLE: SECTION P8E-P8E' (SWM POND 8) EXISTING SLOPE PROFILE & LONG-TERM STABLE TOP OF SLOPE LINE LOCATION		DRAWN BY: ZMO	CHECKED BY: KS
PROJECT: SLOPE STABILITY ANALYSIS - MAYFIELD WEST, PHASE 2, CALEDON, ONTARIO		DATE: October 15, 2018	SCALE: AS SHOWN
		ORIGINAL SIZE: LETTER	REV. # N/A

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APPENDIX

A

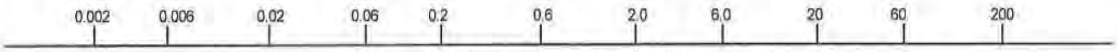
NOTES ON SAMPLE DESCRIPTIONS
LOGS OF BOREHOLES (BH17-1 THROUGH BH17-8)

Drawing 1A: Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by SPL also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

LOG OF BOREHOLE BH17-1

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON. REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc. Method: Solid Stem Augers ENCL NO.: A1

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1) Diameter: 115mm ORIGINATED BY EY

DATUM: Geodetic Date: May/26/2016 COMPILED BY FL

BH LOCATION: Along Etobicoke Creek, extending from Chinguacousy Road to about 150 m east, N 4841819 E 591928.4 CHECKED BY KS

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.48	Ground Surface												
0.00 / 257.03	**TOPSOIL:** 450mm		1	SS	4		Rising Up				41		
0.45 / 256.72	**SILTY CLAY:** sandy, trace gravel, trace organics, grey, moist, firm. (disturbed/weathered)						257						
0.76	**SILTY CLAY TILL:** sandy, trace gravel, occassional sand seams, grey, moist, very stiff to hard.		2	SS	17	▽	Holeplug W. L. 256.55 m Jun 05, 2017				>225		
1	trace to some sand, brownish grey below 1.5m		3	SS	32		Sand 256				>225		2 27 51 20
2	trace sand below 2.3m		4	SS	20		Screen 255				>225		
3	grey below 2.7m		5	SS	26		254				>225		
253.82													
3.66	**END OF THE BOREHOLE**												

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	0.93
June 5, 2017	0.93

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH17-2

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON. REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc. Method: Solid Stem Augers ENCL NO.: A2

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1) Diameter: 115mm ORIGINATED BY EY

DATUM: Geodetic Date: May/26/2016 COMPILED BY FL

BH LOCATION: Along Etobicoke Creek, extending from Chinguacousy Road to about 150 m east, N 4841875.7 E 591924.8 CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.58	Ground Surface										
0.00 / 257.23	**TOPSOIL:** 350mm		1	SS	5		Rising Up				
0.35	**SILTY CLAY:** some sand to sandy, trace gravel, trace organics, dark brown to brown, moist, firm. (disturbed/weathered)		2	SS	4		257 Holeplug			50	
256.06							W. L. 256.27 m Jun 05, 2017				
1.52	**SILTY CLAY TILL:** trace to some sand, trace gravel, occassional sand seams, brown, moist, very stiff.		3	SS	20		Screen			>225	
	brownish grey below 2.3m		4	SS	17		255			>225	wet spoon
	grey below 3.05m		5	SS	15					>225	
253.92							254				
3.66	**END OF THE BOREHOLE**										

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	1.31
June 5, 2017	1.31

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH17-3

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON. REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc. Method: Solid Stem Augers ENCL NO.: A3

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1) Diameter: 115mm ORIGINATED BY EY

DATUM: Geodetic Date: May/26/2016 COMPILED BY FL

BH LOCATION: Along Etobicoke Creek, extending from Chinguacousy Road to about 150 m east, N 4841849.4 E 591977.9 CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.21	Ground Surface											
0.00 / 258.76	**TOPSOIL:** 450mm		1	SS	2		259					
0.45 / 258.21	**SILTY CLAY:** trace sand, trace gravel, mixed with topsoil, dark brown, moist, soft (disturbed/weathered)		2	SS	14	▽						
1.00	**CLAYEY SILT TILL:** sandy, trace gravel, brown, moist, stiff to very stiff.											
			3	SS	19					>225		
	silty sand seams below 2.3m						257					
256.16			4	SS	27					>225		6 33 49 12
3.05	**SILTY CLAY TILL:** trace to some sand, trace gravel, grey, moist, very stiff.		5	SS	28		256			>225		
							255					
254.03			6	SS	19					>225		
5.18	**END OF THE BOREHOLE**											

Rising Up

W. L. 258.14 m Jun 05, 2017

Holeplug

Sand

Screen

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	1.30
June 5, 2017	1.07

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH17-4

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON.
REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc.
Method: Solid Stem Augers
ENCL NO.: A4

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1)
Diameter: 115mm
ORIGINATED BY EY

DATUM: Geodetic
Date: May/26/2016
COMPILED BY FL

BH LOCATION: Stormwater Management Pond 5, N 4841882.7 E 592322.7
CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
260.01 / 0.00	Ground Surface				
259.81 / 0.20	**TOPSOIL:** 200mm				
	SILTY CLAY: sandy, trace gravel, trace organics, brown, moist, firm. (disturbed/weathered)	1	SS	7	
259.25 / 0.76	**SILTY CLAY TILL:** trace sand, trace gravel, brown, moist, stiff to very stiff.	2	SS	22	259
	contains sand/silty sand seams /layers below 1.5m	3	SS	29	258
		4	SS	25	
	grey below 3.0m	5	SS	11	256
		6	SS	15	255
254.41 / 5.60	**SANDY SILT:** trace gravel, trace clay, grey, saturated, compact.	7A	SS	23	
253.61 / 6.40	**SILTY CLAY TILL:** trace sand, trace gravel, grey, moist, very stiff.	7B			
	contains silt seams /layers below 7.6m	8	SS	23	252
		9	SS	25	251
250.26 / 9.75	**END OF THE BOREHOLE**				

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	1.99
June 5, 2017	2.37

GROUND WATER CONDITIONS: Rising Up; W. L. 257.64 m Jun 05, 2017; Holeplug; Sand; Screen

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
>225		
>225		
>225		1 8 44 47
100		
150		
>225		
100		

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3%: Strain at Failure

LOG OF BOREHOLE BH17-5

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON.
REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc.
Method: Solid Stem Augers
ENCL NO.: A5

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1)
Diameter: 115mm
ORIGINATED BY EY

DATUM: Geodetic
Date: May/26/2016
COMPILED BY FL

BH LOCATION: Stormwater Management Pond 6, N 4842423.4 E 592485.8
CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.59	Ground Surface											
259.39 0.00	**TOPSOIL:** 200mm						Rising Up					
0.20	**SILTY CLAY:** sandy, trace gravel, trace organics, brown, moist, stiff. (disturbed/weathered)		1	SS	8							
258.83							259					
0.76	**SILTY CLAY TILL:** sandy, trace gravel, brown, moist, stiff to very stiff.		2	SS	12					150		
1												
			3	SS	23		258			>225		
2												
	contains sand/silty sand seams /layers below 2.3m		4	SS	32		257			>225		
3							Holeplug					
			5	SS	14	▽	W. L. 256.29 m Jun 05, 2017			175		
255.49												
4.10	**SANDY SILT:** trace gravel, trace clay, contains clayey silt layers, trace limestone fragments, grey to reddish brown, moist, dense.						255					
5			6	SS	32							
253.99							254					
5.60	**SILTY CLAY:** interbedded with silt layers, trace sand, grey, very moist, very stiff.						Sand					
6			7	SS	23		253					
							Screen					
7 252.43												
7.16	**SILT:** trace clay, trace sand, occasional gravel, grey, saturated, compact.						252					
8			8	SS	28							0 8 83 9
251.36												
8.23	**END OF THE BOREHOLE**											

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	3.24
June 5, 2017	3.30

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH17-6

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON.
REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc.
Method: Solid Stem Augers
ENCL NO.: A6

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1)
Diameter: 115mm
ORIGINATED BY EY

DATUM: Geodetic
Date: May/29/2016
COMPILED BY FL

BH LOCATION: Stormwater Management Pond 6, N 4843183 E 592661.5
CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
259.48	Ground Surface				
0.00 / 259.13	**TOPSOIL:** 350mm	1	SS	4	Rising Up
0.35 / 258.72	**SILTY CLAY:** trace sand, trace gravel, mixed with topsoil, brown, moist, firm. (disturbed/weathered)				259
0.76	**SILTY CLAY TILL:** sandy, trace gravel, brown, moist, stiff to hard.	2	SS	14	
	occassional sand/silty sand seams /layers below 1.5m	3	SS	17	258
		4	SS	37	257
					Holeplug
		5	SS	21	W. L. 256.30 m Jun 05, 2017
		6	SS	24	255
253.88					254
5.60	**SANDY SILT:** trace clay, contains clayey silt seams /layers, grey, saturated, compact.				Sand
		7	SS	28	253
252.32					Screen
7.16	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, grey to reddish brown, moist to wet, hard.				252
		8	SS	38	
					251
	contains limestone fragments below 9.1m	9	SS	36	250
249.73					
9.75	**END OF THE BOREHOLE**				

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	3.02
June 5, 2017	3.18

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
>225		
>225		4 22 47 27
>225		
>225		
>225		
>225		

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
$+^{3}$, $\times^{3}$: Numbers refer to Sensitivity
○ $^{\varepsilon_f}$=3% Strain at Failure

LOG OF BOREHOLE BH17-7

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON. REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc. Method: Solid Stem Augers ENCL NO.: A7

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1) Diameter: 115mm ORIGINATED BY EY

DATUM: Geodetic Date: May/29/2016 COMPILED BY FL

BH LOCATION: Stormwater Management Pond 7, N 4843253.1 E 592697.7 CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION	POCKET PEN. (Cu) (kPa)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.34	Ground Surface						
0.00 / 258.89	**TOPSOIL:** 450mm	1	SS	4	259		
0.45	**SILTY CLAY:** trace sand, trace gravel, trace organics, dark brown, moist, firm. (disturbed/weathered)	2	SS	6			
257.82					258		
1.52	**SILTY CLAY TILL:** trace to some sand, trace gravel, brown, moist, very stiff to hard.	3	SS	20		>225	2 10 42 16
	occassional sand/silt seams /layers below 2.3m	4	SS	58	Holeplug 257		
		5	SS	37	256 W. L. 255.99 m Jun 05, 2017	>225	
255.24							
4.10	**SANDY SILT:** trace clay, brown to grey, saturated, compact.	6	SS	17	255 Sand Screen		0 20 75 5
	trace gravel, some clay	7	SS	12	253		
252.18	contains silty clay till layers below 6.6m						
7.16	**SILTY CLAY TILL:** trace to some sand, trace gravel, grey, moist, hard to very stiff.	8	SS	33	252 Holeplug		
		9	SS	19	251 250	225	
249.59							
9.75	**END OF THE BOREHOLE**						

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	3.15
June 5, 2017	3.35

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%): 10 20 30

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-8

PROJECT: Slope Stability and Streambank Erosion Analysis, Mayfield West Phase 2, Caledon, ON. REF. NO.: 161-01403-00

CLIENT: Mayfield Station Landowners Group Inc. Method: Solid Stem Augers ENCL NO.: A8

PROJECT LOCATION: In Vicinity of Etobicoke Creek (refer Drawing 1) Diameter: 115mm ORIGINATED BY EY

DATUM: Geodetic Date: May/29/2016 COMPILED BY FL

BH LOCATION: Stormwater Management Pond 8, N 4843437.9 E 593031.5 CHECKED BY KS

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
258.87	Ground Surface								
258.67 0.00	**TOPSOIL:** 200mm					Rising Up			
0.20	**SILTY CLAY:** trace sand, trace gravel, mixed with topsoil, dark brown, moist, soft.	1	SS	5					
258.11 0.76	(disturbed/weathered)					258			
1	**SILTY CLAY TILL:** sandy, trace gravel, brown, moist, stiff to very stiff. 50mm sandy silt at 0.8m	2	SS	22					
		3	SS	24	▽	W. L. 257.05 m Jun 05, 2017	>225		
2		4	SS	29					6 25 47 22
3	contains sandy silt /silt layers at 3.1m grey below 3.1m	5	SS	29		256	>225		
						Holeplug			
4						255			
5		6	SS	53		254			
6						253			
		7	SS	20			225		
7						252			
						Sand			
	contains sandy silt till layers 7.6m	8	SS	30		251	225		
8						Screen			
9						250			
	contains silt seams /layers 9.1m	9	SS	29					
249.12									
9.75	**END OF THE BOREHOLE**								

Notes:
1) 20mm dia. piezometer was installed upon completion.

Water Level Readings:

Date	W.L.Depth (m)
June 1, 2017	1.86
June 5, 2017	1.82

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100

PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

GROUNDWATER ELEVATIONS Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3$, $\times^3$: Numbers refer to Sensitivity ○ ε_f=3% Strain at Failure

APPENDIX

B

GRAIN SIZE ANALYSES (ENCLS. 1 TO 8)
PLASTICITY CHART (ENCL. 9)

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	3	5	19	51	20

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.50	100		
4.75	98		
2.00	95		
0.85	92		
0.425	90		
0.250	86		
0.150	82		
0.106	77		
0.075	71		
0.0399 mm.	60		
0.0289 mm.	54		
0.0188 mm.	47		
0.0111 mm.	41		
0.0080 mm.	36		
0.0057 mm.	32		
0.0029 mm.	24		
0.0012 mm.	15		

* (no specification provided)

Soil Description

Silty Clay with Sand

Atterberg Limits

PL= 14 LL= 25 PI= 11

Coefficients

D_{90}= 0.4662 D_{85}= 0.2145 D_{60}= 0.0406
D_{50}= 0.0224 D_{30}= 0.0046 D_{15}= 0.0013
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

Source of Sample: Site Drilling **Depth:** 1.52_2.13m
Sample Number: 17-1_SS3 **Date:** May 31, 2017

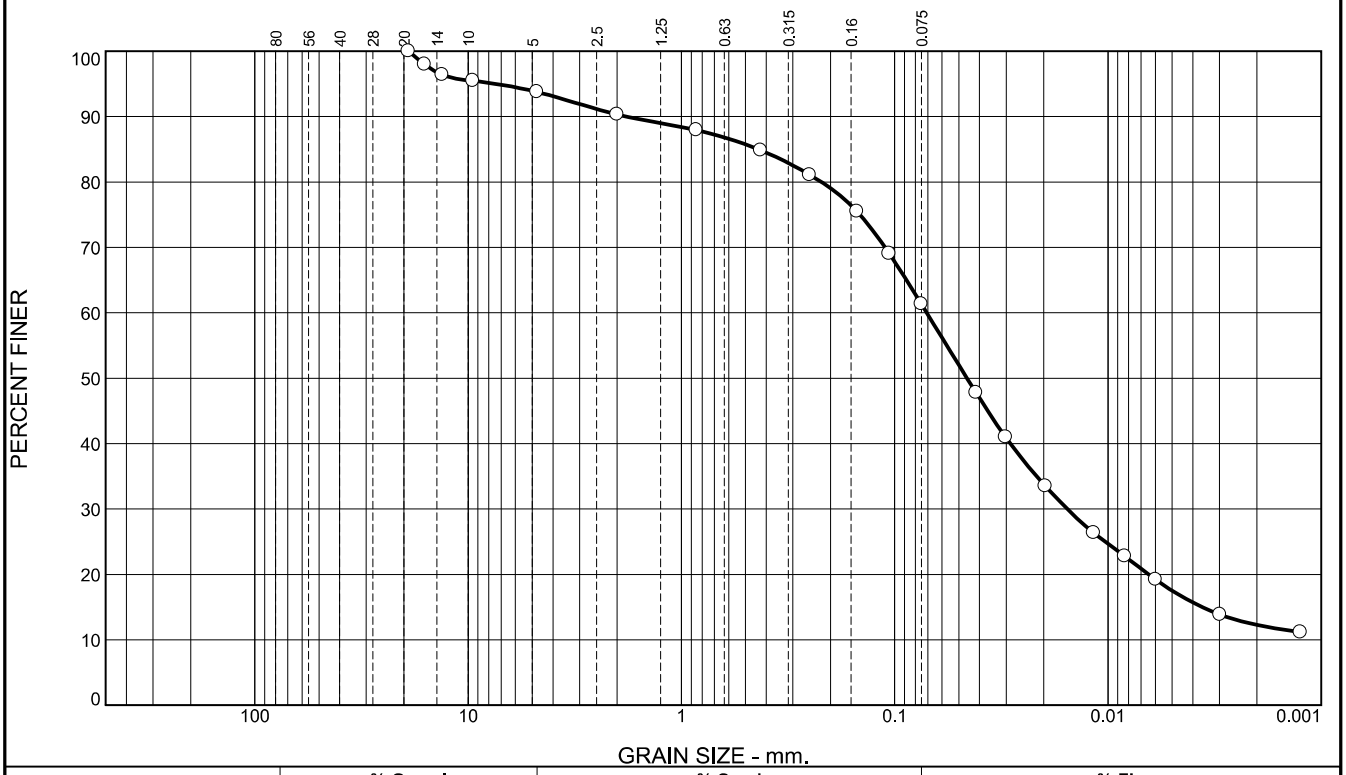
WSP

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B1

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	4	5	24	49	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19.0	100		
16.0	98		
13.2	96		
9.50	95		
4.75	94		
2.00	90		
0.85	88		
0.425	85		
0.250	81		
0.150	75		
0.106	69		
0.075	61		
0.0415 mm.	48		
0.0302 mm.	41		
0.0197 mm.	33		
0.0116 mm.	26		
0.0083 mm.	23		
0.0060 mm.	19		
0.0030 mm.	14		
0.0013 mm.	11		

* (no specification provided)

Soil Description

Clayey Silt with Sand

Atterberg Limits

PL= 12 LL= 16 PI= 4

Coefficients

D_{90}= 1.8109 D_{85}= 0.4361 D_{60}= 0.0708
D_{50}= 0.0458 D_{30}= 0.0155 D_{15}= 0.0036
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

Source of Sample: Site Drilling **Depth:** 2.29_2.90m
Sample Number: 17-3_SS4 **Date:** May 31, 2017

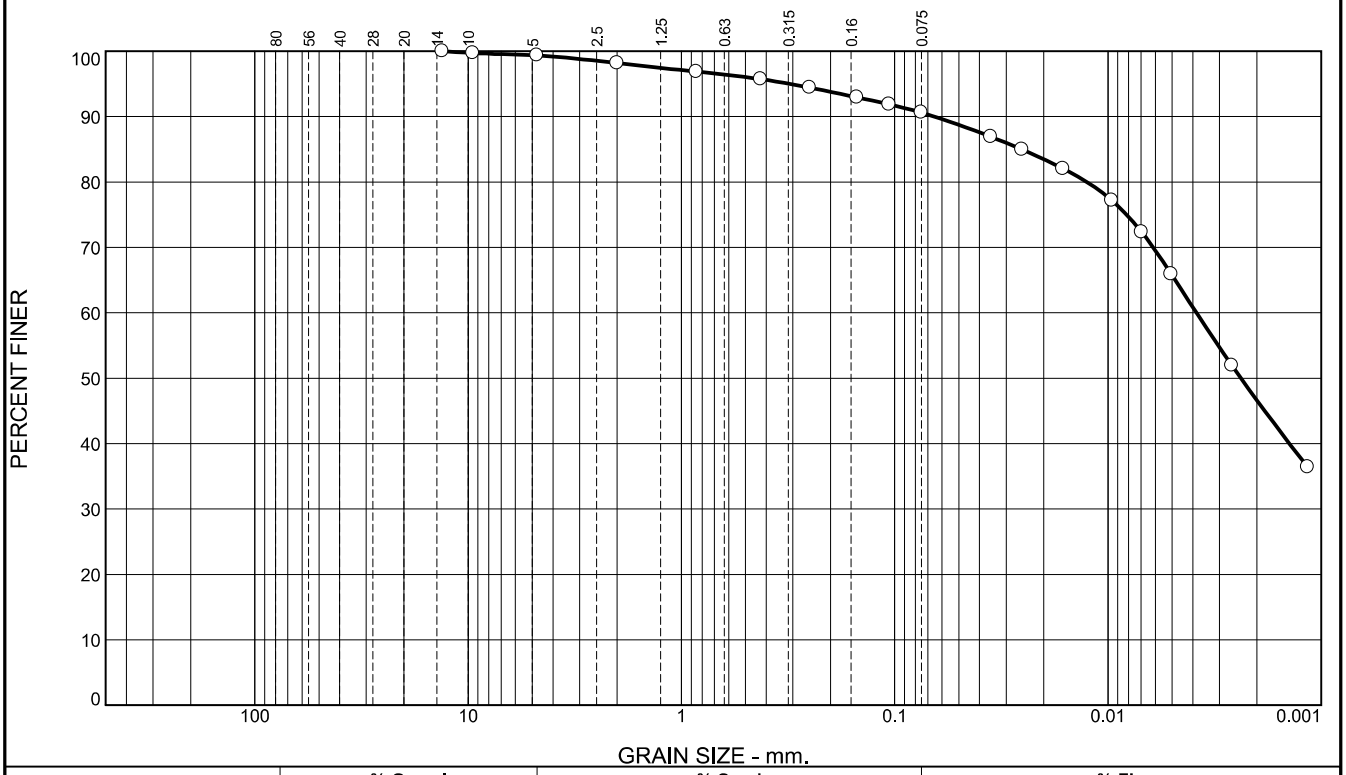
WSP

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B2

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	2	5	44	47

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.20	100		
9.50	100		
4.75	99		
2.00	98		
0.85	97		
0.425	96		
0.250	94		
0.150	93		
0.106	92		
0.075	91		
0.0354 mm.	87		
0.0253 mm.	85		
0.0162 mm.	82		
0.0096 mm.	77		
0.0069 mm.	72		
0.0051 mm.	66		
0.0026 mm.	52		
0.0012 mm.	36		

* (no specification provided)

Soil Description

Silty Clay

Atterberg Limits

PL= 19 LL= 42 PI= 23

Coefficients

D_{90}= 0.0650 D_{85}= 0.0255 D_{60}= 0.0038
D_{50}= 0.0024 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(22)

Remarks

Source of Sample: Site Drilling **Depth:** 2.29_2.90m
Sample Number: 17-4_SS4

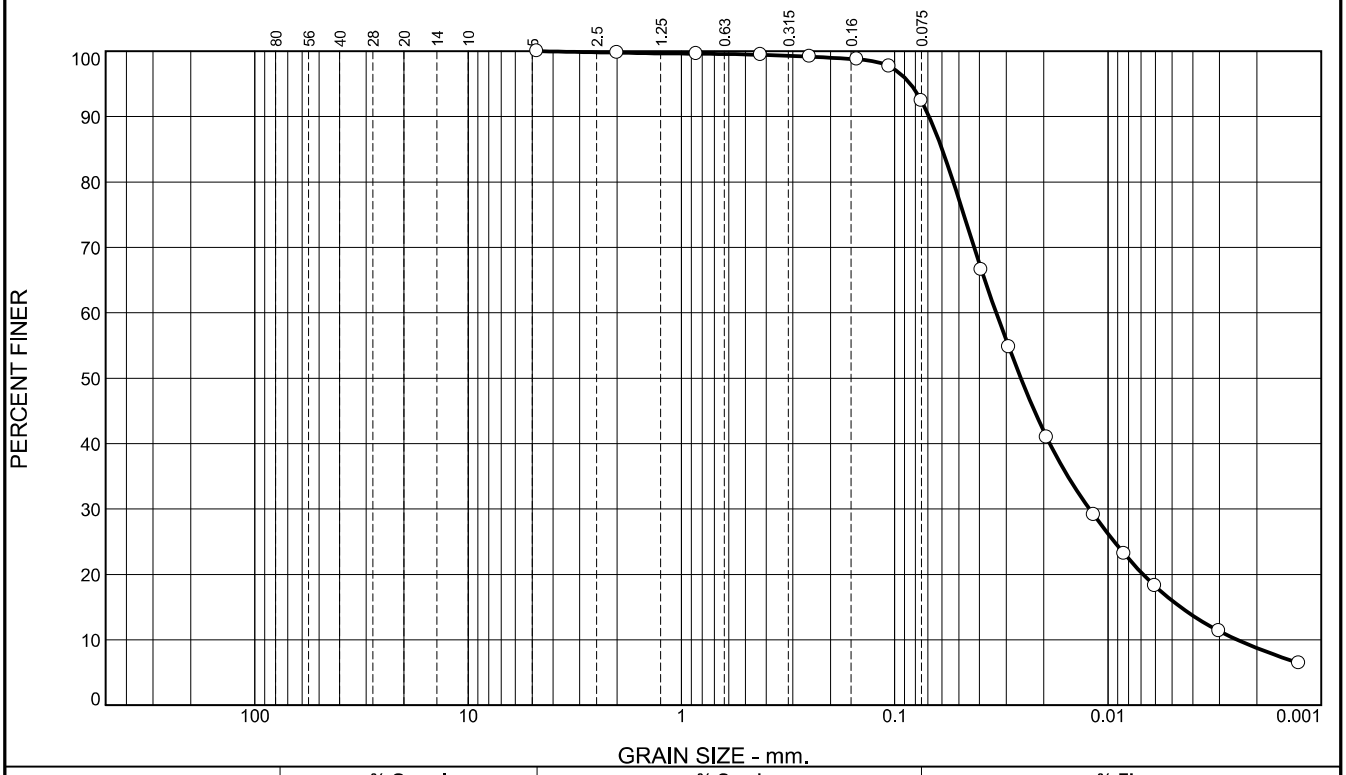
Date: May 31, 2017

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B3

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	7	83	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75	100		
2.00	100		
0.85	100		
0.425	99		
0.250	99		
0.150	99		
0.106	98		
0.075	92		
0.0392 mm.	67		
0.0291 mm.	55		
0.0194 mm.	41		
0.0116 mm.	29		
0.0084 mm.	23		
0.0060 mm.	18		
0.0030 mm.	11		
0.0013 mm.	6.4		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0690 D_{85}= 0.0600 D_{60}= 0.0334
D_{50}= 0.0256 D_{30}= 0.0122 D_{15}= 0.0046
D_{10}= 0.0025 C_u= 13.48 C_c= 1.80

Classification

USCS= AASHTO=

Remarks

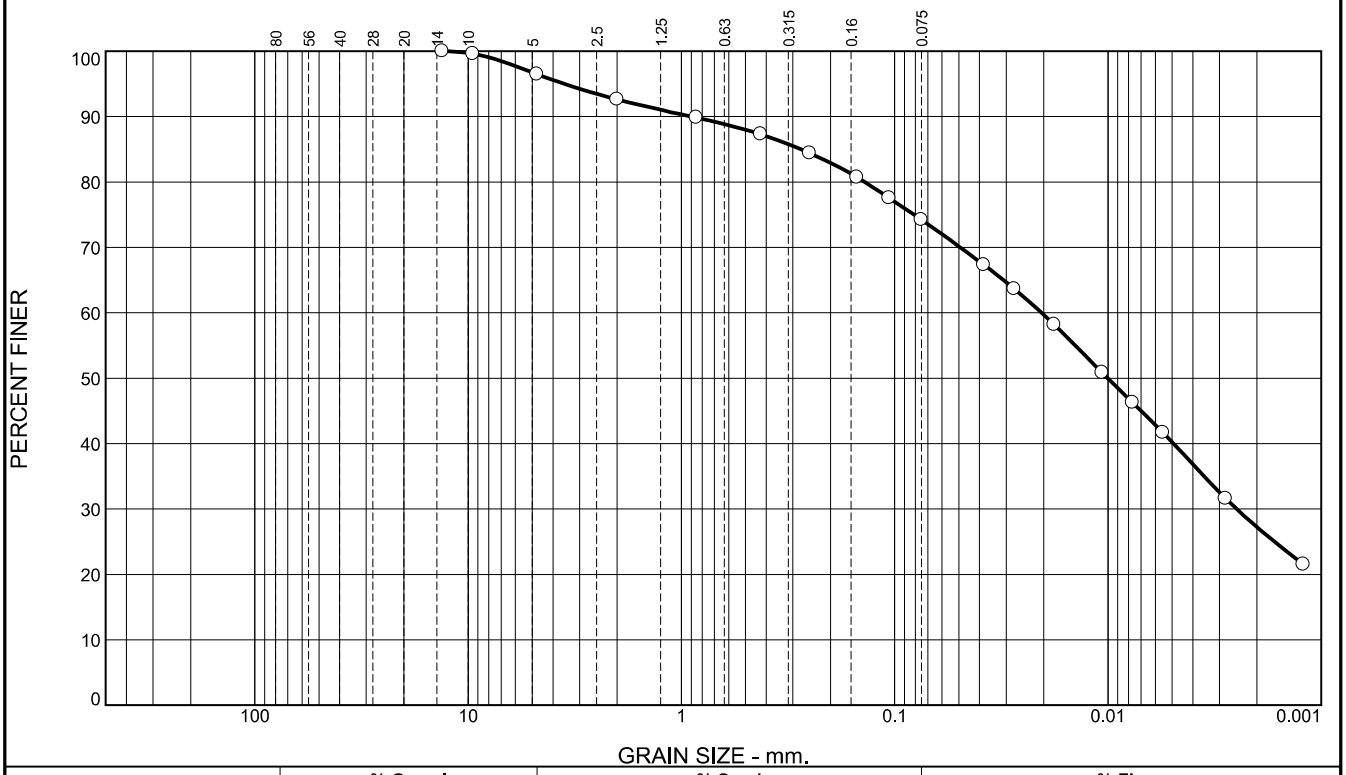
Source of Sample: Site Drilling **Depth:** 7.62_8.230m
Sample Number: 17-5_SS8 **Date:** May 31, 2017

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B4

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	3	6	13	47	27

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.20	100		
9.50	100		
4.75	96		
2.00	93		
0.85	90		
0.425	87		
0.250	84		
0.150	81		
0.106	78		
0.075	74		
0.0382 mm.	67		
0.0275 mm.	64		
0.0178 mm.	58		
0.0106 mm.	51		
0.0077 mm.	46		
0.0055 mm.	42		
0.0028 mm.	32		
0.0012 mm.	22		

* (no specification provided)

Soil Description

Silty Clay

Atterberg Limits

PL= 14 LL= 29 PI= 15

Coefficients

D_{90}= 0.9006 D_{85}= 0.2763 D_{60}= 0.0205
D_{50}= 0.0100 D_{30}= 0.0025 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Source of Sample: Site Drilling **Depth:** 2.29_2.90m
Sample Number: 17-6_SS4

Date: May 31, 2017

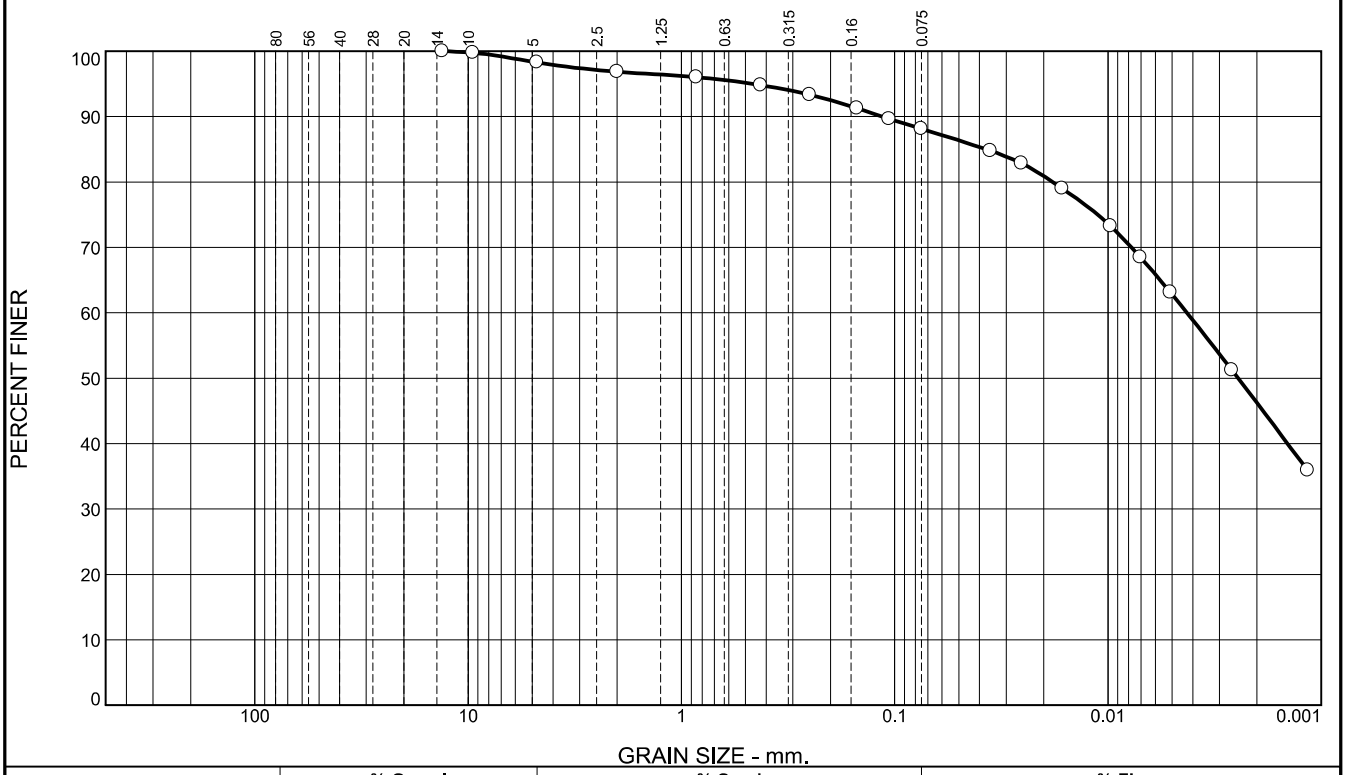
WSP

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B5

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	1	2	7	42	46

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.20	100		
9.50	100		
4.75	98		
2.00	97		
0.85	96		
0.425	95		
0.250	93		
0.150	91		
0.106	90		
0.075	88		
0.0356 mm.	85		
0.0254 mm.	83		
0.0164 mm.	79		
0.0097 mm.	73		
0.0070 mm.	68		
0.0051 mm.	63		
0.0026 mm.	51		
0.0012 mm.	36		

* (no specification provided)

Soil Description

Silty Clay

Atterberg Limits

PL= 19 LL= 41 PI= 22

Coefficients

D_{90}= 0.1145 D_{85}= 0.0374 D_{60}= 0.0043
D_{50}= 0.0025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Source of Sample: Site Drilling **Depth:** 1.52_2.13m
Sample Number: 17-7_SS3 **Date:** May 31, 2017

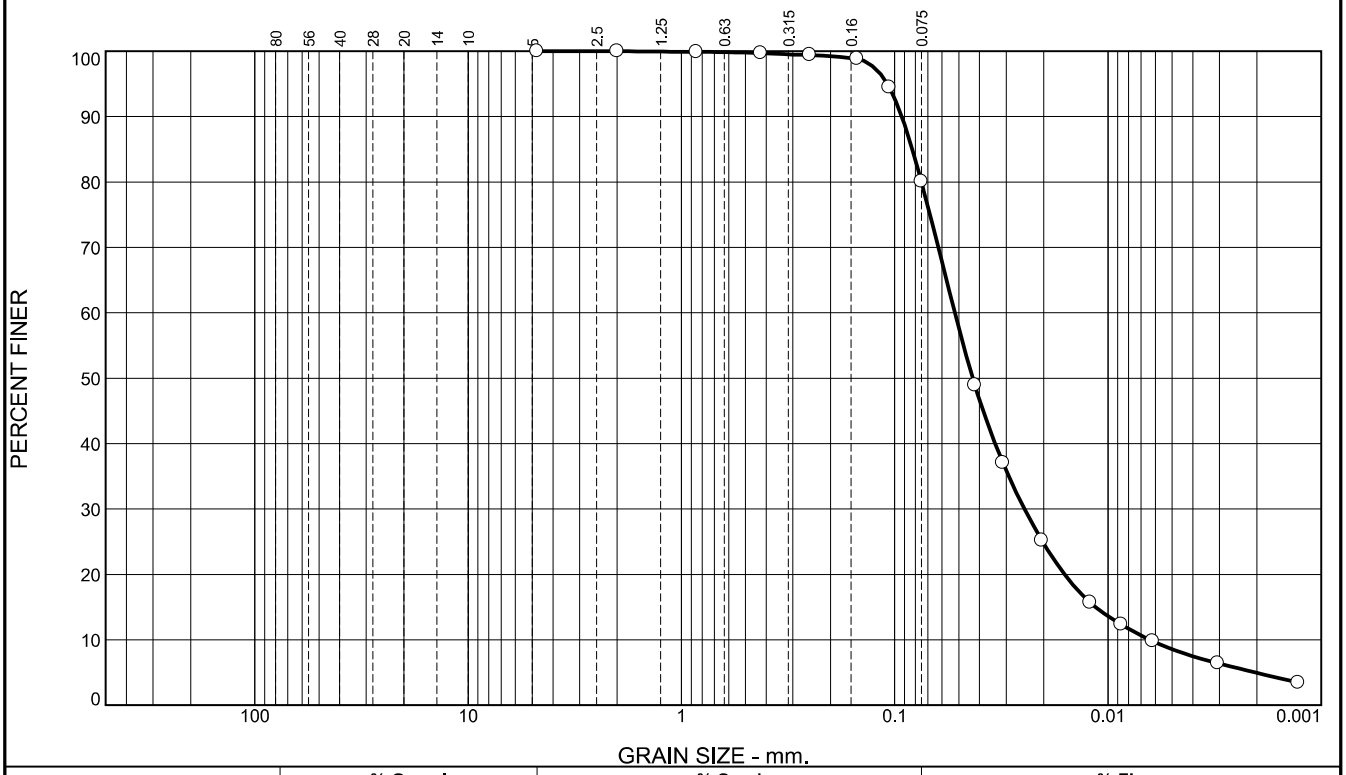
WSP

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B6

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	20	75	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75	100		
2.00	100		
0.85	100		
0.425	100		
0.250	99		
0.150	99		
0.106	94		
0.075	80		
0.0421 mm.	49		
0.0311 mm.	37		
0.0204 mm.	25		
0.0121 mm.	16		
0.0087 mm.	12		
0.0062 mm.	9.8		
0.0031 mm.	6.4		
0.0013 mm.	3.5		

* (no specification provided)

Soil Description

Silt with Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0927 D_{85}= 0.0827 D_{60}= 0.0523
D_{50}= 0.0431 D_{30}= 0.0246 D_{15}= 0.0114
D_{10}= 0.0064 C_u= 8.19 C_c= 1.82

Classification

USCS= AASHTO=

Remarks

Source of Sample: Site Drilling **Depth:** 4.67_5.180m
Sample Number: 17-7_SS6

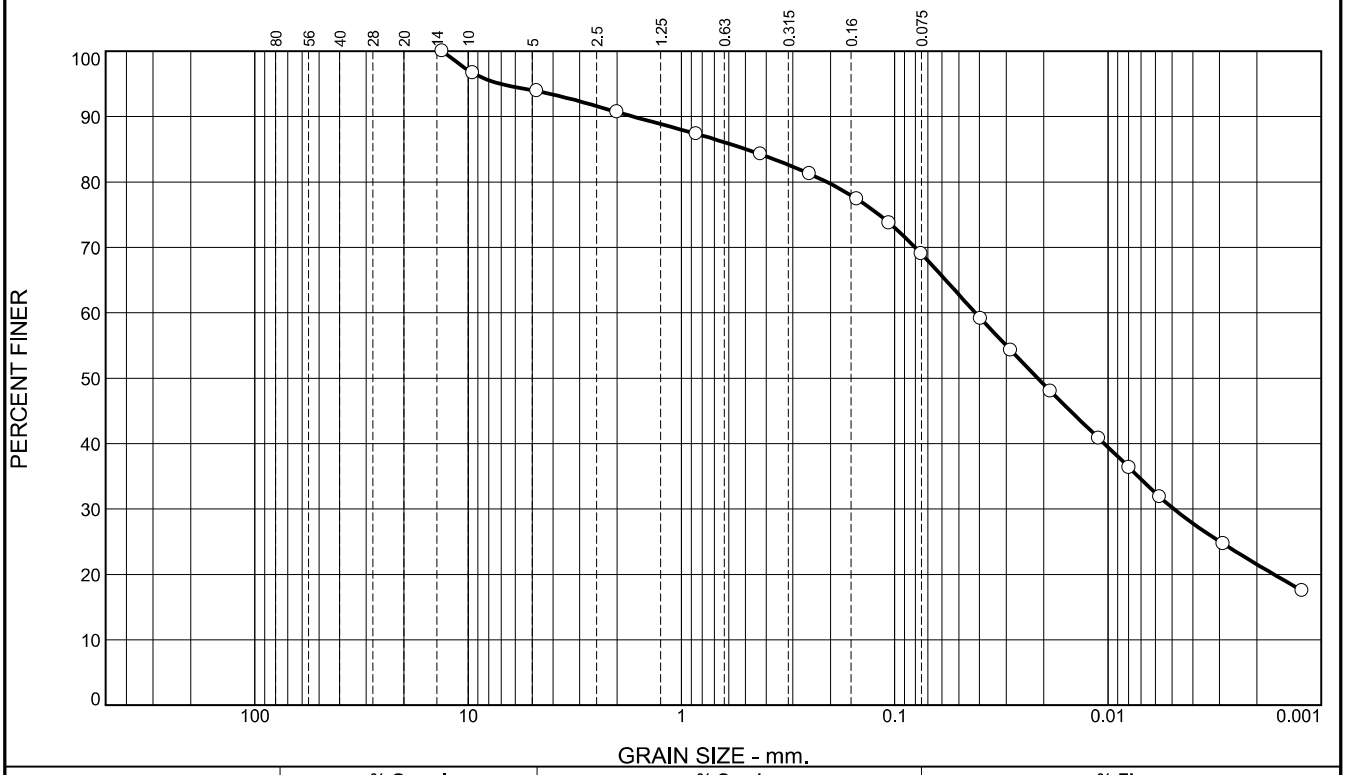
Date: May 31, 2017

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B7

Tested By: Peng

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	6	3	7	15	47	22

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.20	100		
9.50	97		
4.75	94		
2.00	91		
0.85	87		
0.425	84		
0.250	81		
0.150	77		
0.106	74		
0.075	69		
0.0395 mm.	59		
0.0286 mm.	54		
0.0186 mm.	48		
0.0110 mm.	41		
0.0079 mm.	36		
0.0057 mm.	32		
0.0029 mm.	25		
0.0012 mm.	17		

* (no specification provided)

Soil Description

Silty Clay with Sand

Atterberg Limits

PL= 13 LL= 24 PI= 11

Coefficients

D_{90}= 1.6849 D_{85}= 0.4976 D_{60}= 0.0419
D_{50}= 0.0214 D_{30}= 0.0049 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

Source of Sample: Site Drilling **Depth:** 2.29_2.90m
Sample Number: 17-8_AS4

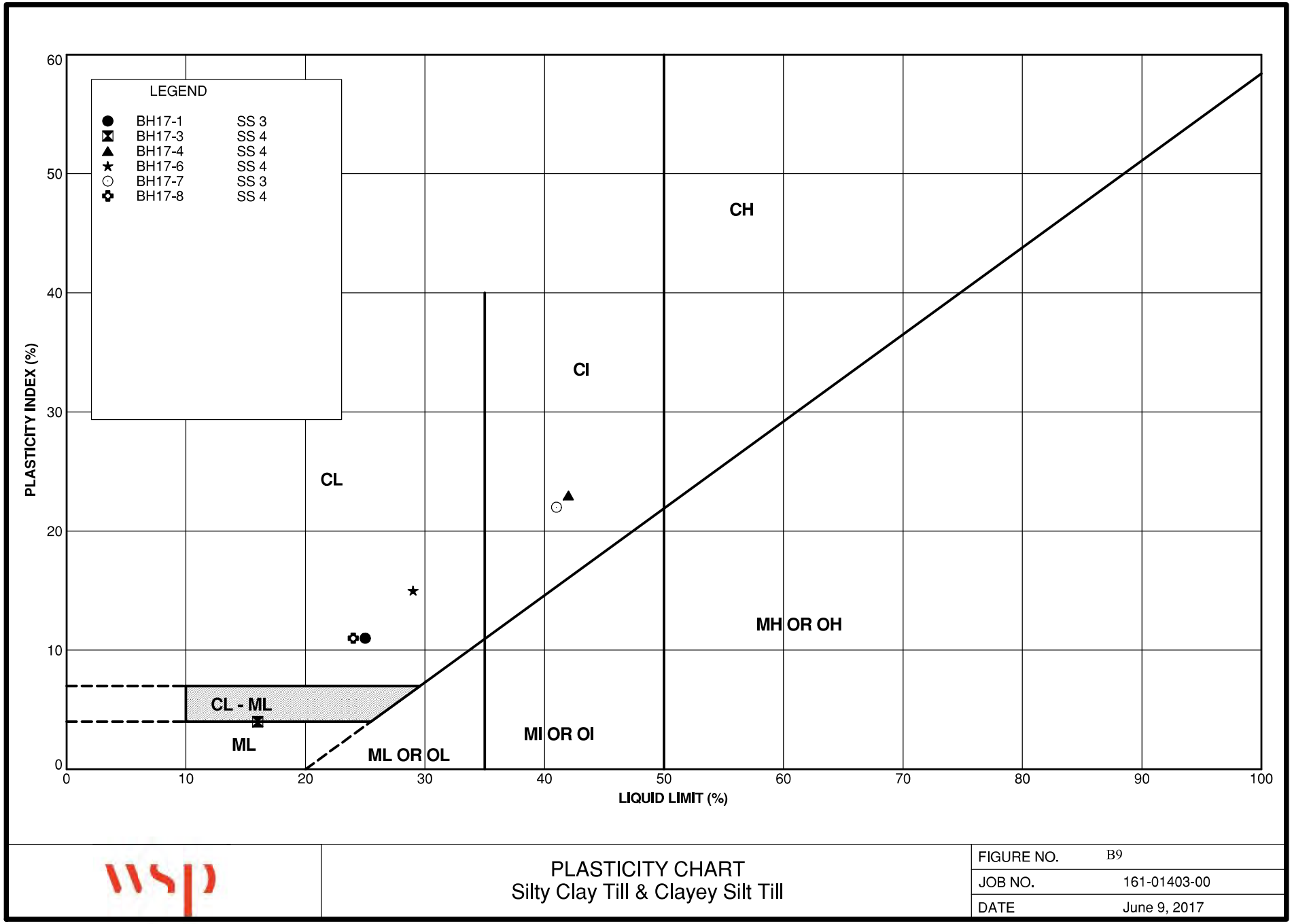
Date: May 31, 2017

WSP

Client: Mayfield West Phase 2 Landowners Group
Project: Slope Stability Investigation, Mayfield West Phase 2, Caledon

Project No: 161-01403-00 **Figure** B8

Tested By: Peng



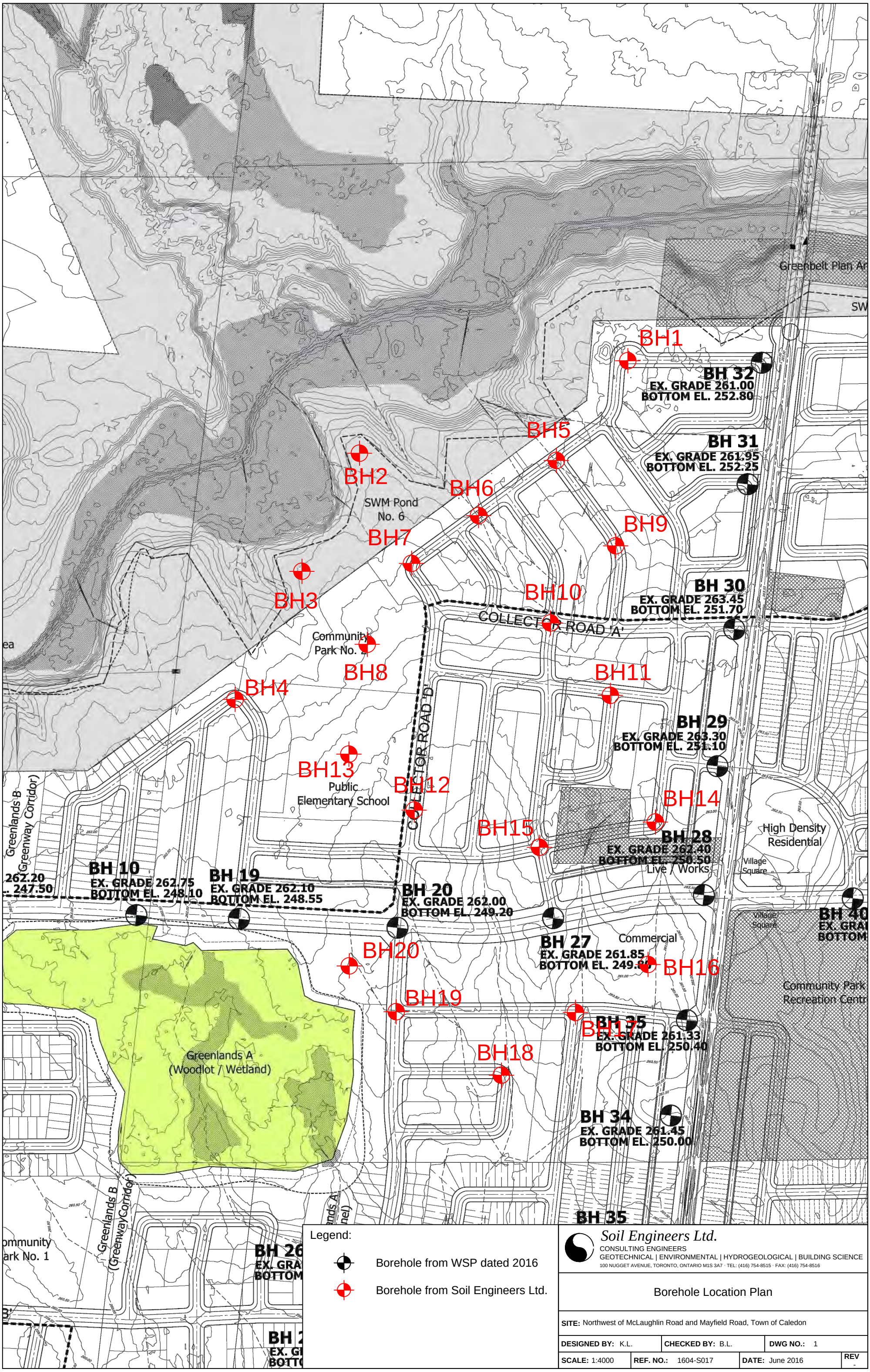
PLASTICITY CHART
Silty Clay Till & Clayey Silt Till

FIGURE NO.	B9
JOB NO.	161-01403-00
DATE	June 9, 2017

APPENDIX

C

BOREHOLE LOCATION PLAN AND BOREHOLE LOG SHEETS
(PREPARED BY SOIL ENGINEERS LIMITED)



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
100 NUGGET AVENUE, TORONTO, ONTARIO M1S 3A7 · TEL: (416) 754-8515 · FAX: (416) 754-8516

Borehole Location Plan

SITE: Northwest of McLaughlin Road and Mayfield Road, Town of Caledon

DESIGNED BY: K.L.	CHECKED BY: B.L.	DWG NO.: 1	
SCALE: 1:4000	REF. NO.: 1604-S017	DATE: June 2016	REV -

JOB NO: 1604-S017

LOG OF BOREHOLE NO: 2

FIGURE NO: 2

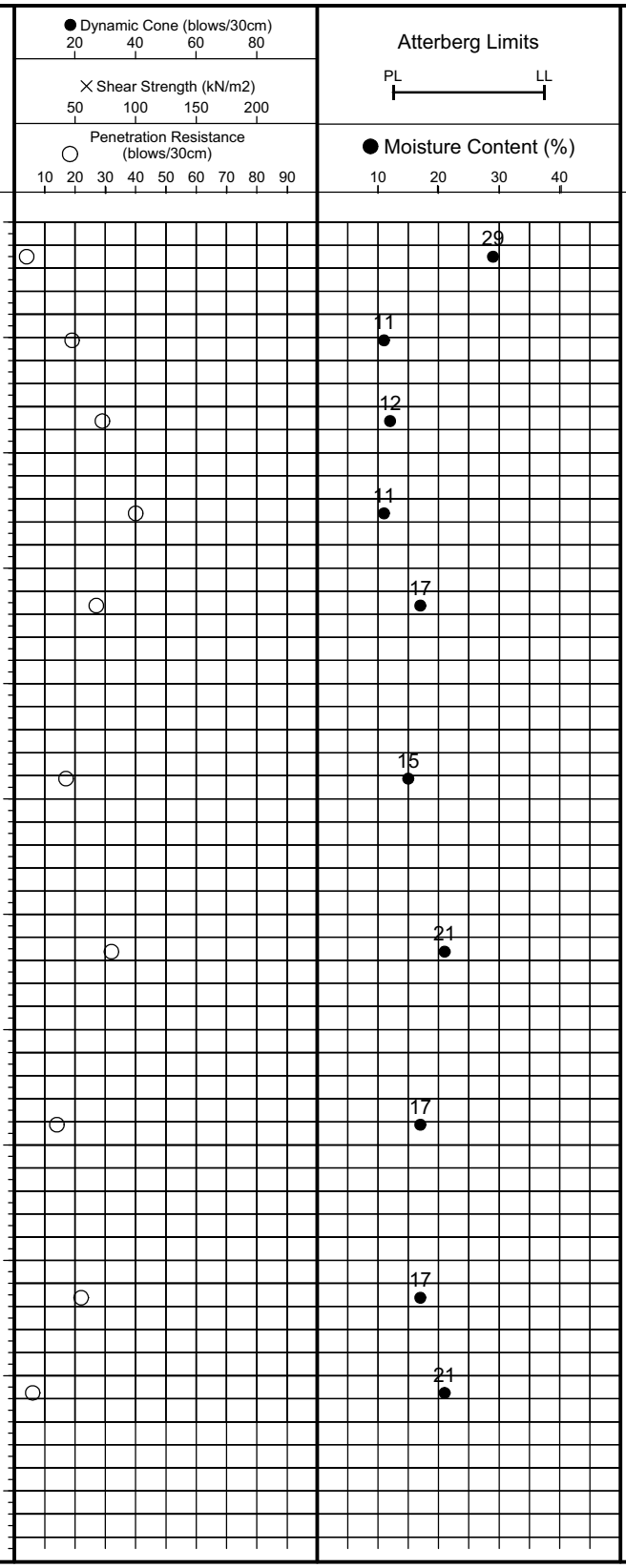
JOB DESCRIPTION: Proposed Subdivision

JOB LOCATION: Northwest of McLaughlin Road and Mayfield Road
Town of Caledon

METHOD OF BORING: Flight Auger

DATE: April 27, 2016

Depth / Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
259.8	**15 cm TOPSOIL**	1	DO	4
	Compact to dense			
	SILT, Till ploughed			
	some sand weathered	2	DO	19
	a trace to some clay			
	occ. sand seams	3	DO	29
		4	DO	40
	brown grey	5	DO	27
		6	DO	17
6.1				
253.7	Grey, compact, wet	7	DO	32
	SILT			
	some sand			
	a trace of clay	8	DO	14
		9	DO	22
		10	DO	6
10.4				
249.4	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO: 1604-S017

LOG OF BOREHOLE NO: 3

FIGURE NO: 3

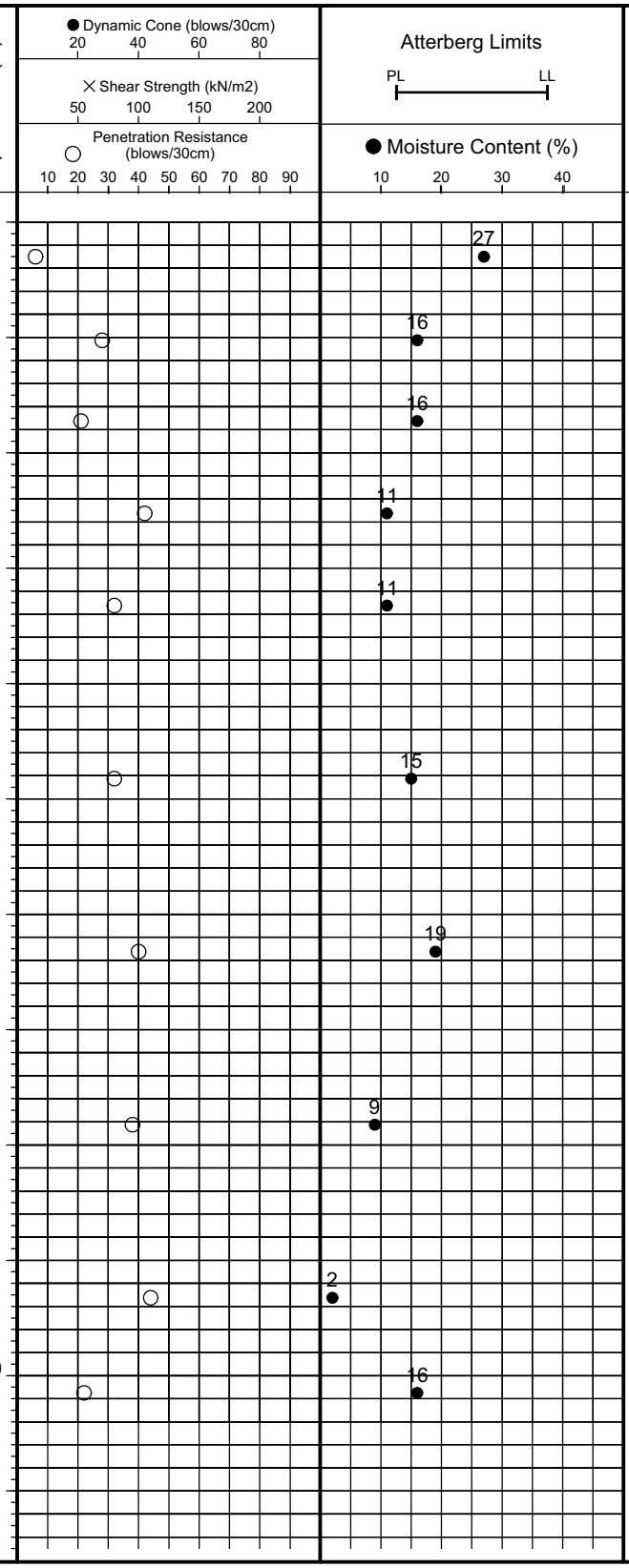
JOB DESCRIPTION: Proposed Subdivision

JOB LOCATION: Northwest of McLaughlin Road and Mayfield Road
Town of Caledon

METHOD OF BORING: Flight Auger

DATE: April 27, 2016

Depth / Elev. (m)	SOIL DESCRIPTION		SAMPLES Number	Type	N-Value
0.0 / 260.9	Ground Surface				
	15 cm TOPSOIL		1	DO	6
	Compact to dense				
	SILT, Till	ploughed	2	DO	28
	some sand a trace to some clay occ. sand seams		3	DO	21
			4	DO	42
		brown grey	5	DO	32
			6	DO	32
		seepage	7	DO	40
			8	DO	38
			9	DO	44
9.5 / 251.4	Grey, compact, wet				
	SILT		10	DO	22
10.4 / 250.5	some sand a trace of clay				
	END OF BOREHOLE				



Soil Engineers Ltd.

APPENDIX

D

BOREHOLE LOCATION PLAN AND BOREHOLE LOG SHEETS
(PREPARED BY TERRAPROBE)

N

10

8

BH 1
256.8m

BH 2
255.7m

9

7

6

5

4

3

BH 5
252.1m

2

1

BH 4
256.4m

LEGEND

Cross Section

Borehole location

CROSS SECTION LOCATION PLAN

TERRAPROBE

File No. 1-08-3053

FIGURE 4

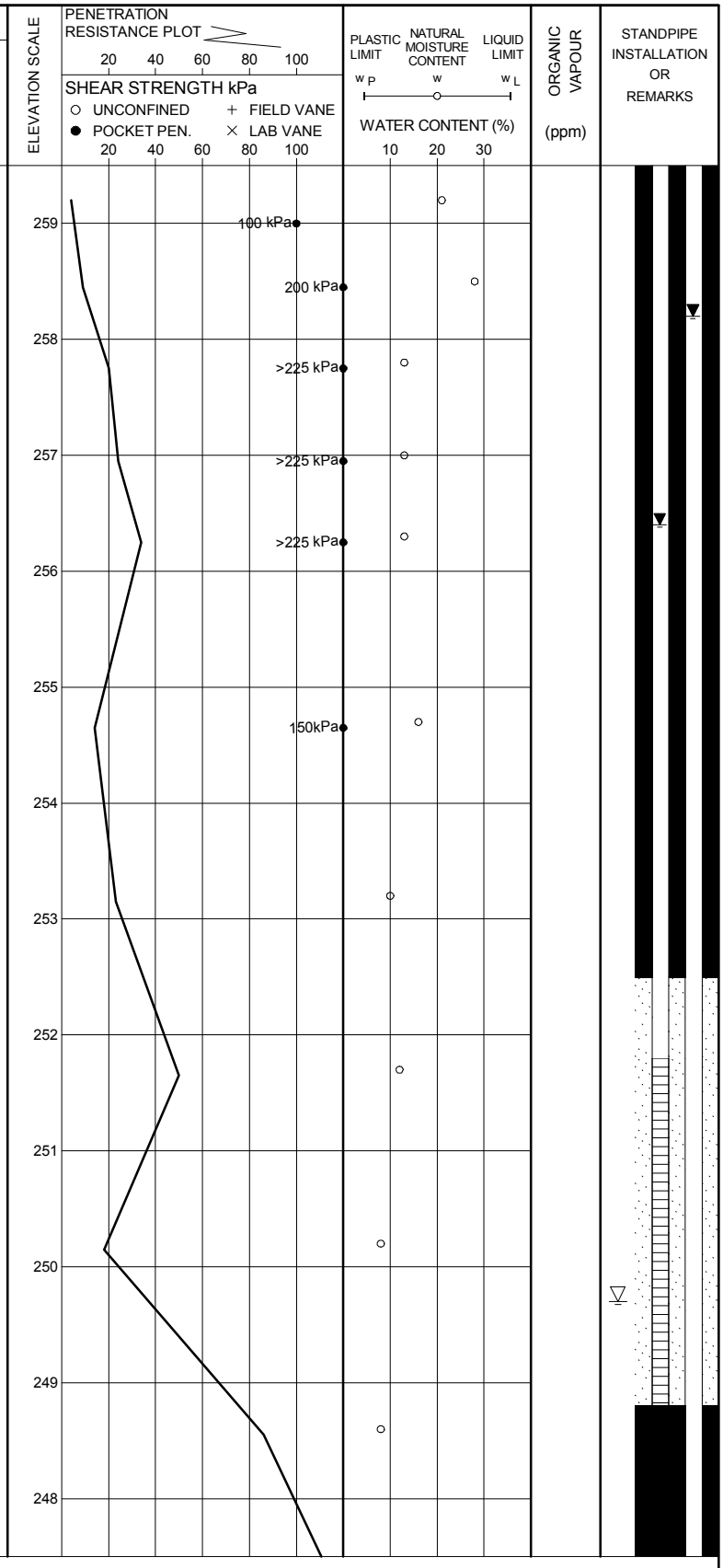
\\Terradocs\FileServer\Terraprobe Limited\Active Projects\2008 File Numbers\1-08-3053 MAYFIELD\A. Dwgs, Logs\AutoCAD\1-08-3053 MAYFIELD WEST.dwg, Kelvin

Terraprobe

LOG OF BOREHOLE 4

PROJECT: Mayfield West
DATE: February 10 & 11, 2009
LOCATION: Caledon, Ontario
EQUIPMENT: Bombardier/Hollow Stem Augers
CLIENT: Philips Engineering Ltd.
ELEVATION DATUM: Geodetic
FILE: 1-08-3053

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
259.5					
0.0 / 259.2	280mm TOPSOIL		1	SS	4
0.3	Weathered, firm ---- CLAYEY SILT embedded sand and gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	9
			3	SS	20
			4	SS	24
			5	SS	34
	---- grey		6	SS	14
			7	SS	23
252.5					
7.0	SILT some sand, trace clay, dense to very dense, grey, moist		8	SS	50
	---------- compact ----------		9	SS	18
	---- damp		10	SS	86



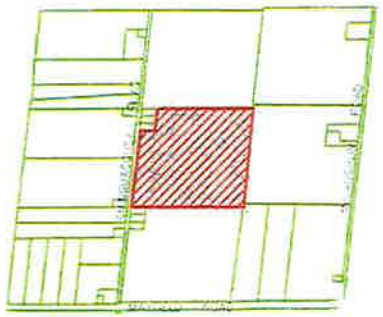
NOTES:
Borehole was open and unstabilized water level at 9.8m upon completion of drilling.
Water level in deep well at 1.3m (Elev. 258.2m) on April 23, 2009.
Water level in shallow well at 3.1m (Elev. 256.4m) on April 23, 2009.

APPENDIX

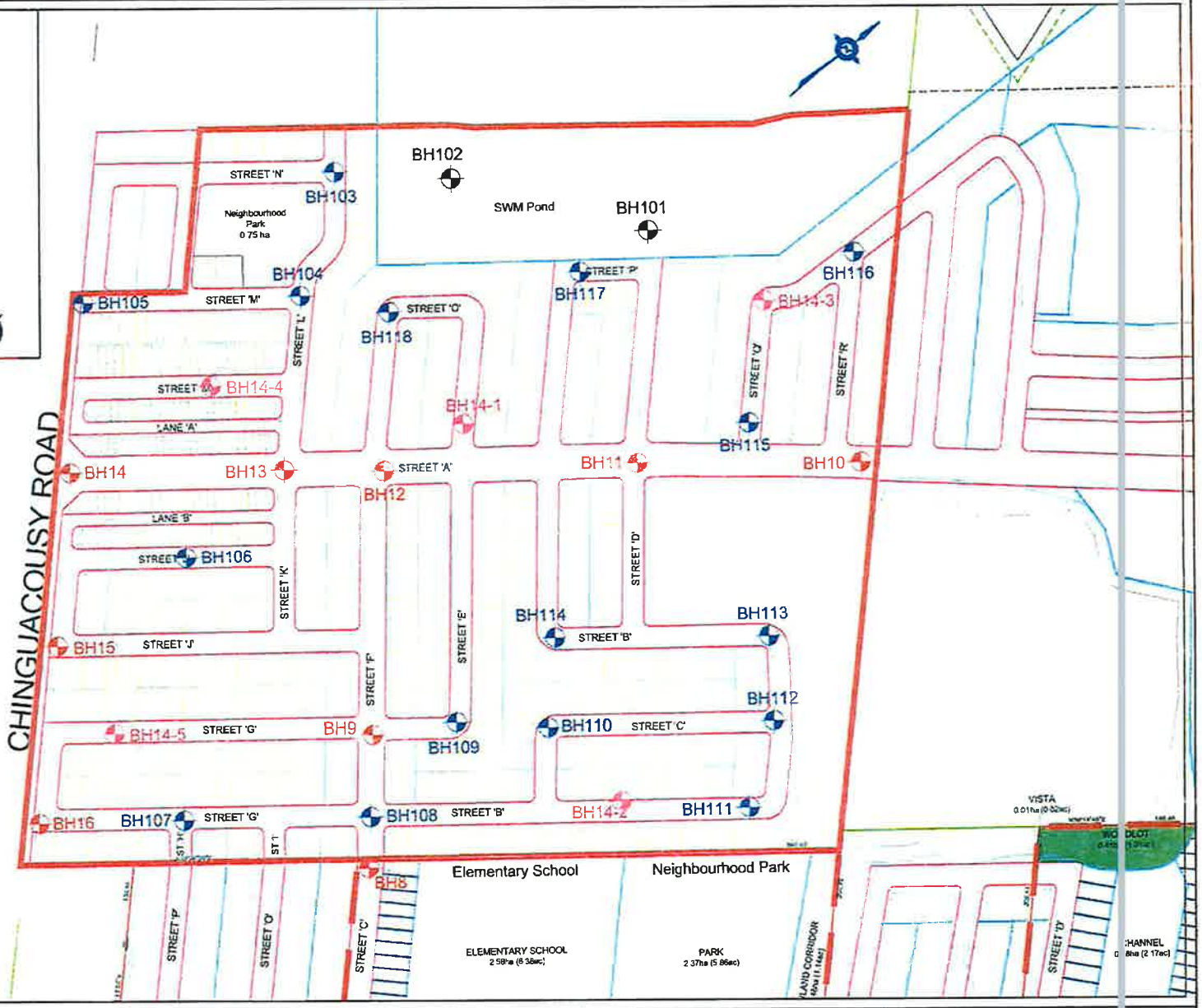
E

BOREHOLE LOCATION PLAN AND BOREHOLE LOG SHEETS
(FROM PREVIOUS INVESTIGATION BY WSP)

T:\Geotech\10 GeoProjects\2001-3000 Projects\10002883 - Cook Property, Caledon\Drawings\10002883-Borehole Location plan



KEY MAP Subject Lands



LEGEND: SCALE 60m 30m 0m 60m 120m 180m 240m

BH14-1	Boreholes Drilled by SPL in 2015
BH8 to BH 16	Boreholes Drilled for Proposed Deep Sewer
BH101 to BH102	Boreholes Drilled for SWMP
BH103 to BH118	Boreholes Drilled for Proposed Subdivision

Client:	MATTAMY HOMES			Project No.: 10002883	Drawing No.: 1
Drawn:	TJ	Approved:	Keith	Title:	BOREHOLE LOCATION PLAN
Date:	March, 2016	Scale:	As shown	Project:	Geotechnical Investigation - Mattamy (Cook Property) Servicing Caledon, ON
Original Size:	Letter	Rev:	N/A	WSP	51 Constellation Court Toronto, Ontario M9W 1K4

LOG OF BOREHOLE BH101

PROJECT: Geotechnical Investigation - Mattamy Development Inc. (Cook Property)
CLIENT: Mattamy Mayfield Limited
PROJECT LOCATION: Cook Property, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/08/2016

REF. NO.: 10002883
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.4										
259.2	**TOPSOIL:** 200mm					Rising Up Casing				
0.2	**SILTY CLAY:** trace sand, trace gravel, trace rootlets, brown, moist, firm to very stiff (Reworked/disturbed)		1	SS	6	Sand	259			
257.9			2	SS	25		258			
1.5	**SILTY CLAY TILL:** some sand, trace gravel, oxidized, brown, moist, very stiff to stiff. contain wet sandy silt layers and silty clay layers between 2.3m to 3.0m. brown to grey below 3.0m		3	SS	27		257	>225		
			4	SS	13	Holeplug		200		
255.3			5	SS	12	W. L. 255.9 m Feb 22, 2016	256	90		
4.1	**SILT:** some sand to sandy, trace gravel, contain silty clay layers, grey, moist, dense.		6	SS	39		255			
253.8						Sand	254			
5.6	**SILTY CLAY TILL:** some sand, trace gravel, grey, moist, very stiff to hard		7	SS	18		253	>225		
251.6						Screen	252			
7.8	**SANDY SILT:** trace clay, dilatant, grey, saturated, dense.		8	SS	49		251			21 68 11
250.7										
8.7	**SILTY CLAY TILL:** some sand, trace gravel, contain sandy silt seams, grey, moist, hard.		9	SS	32	Sand		>225		spoon wet
249.7										
9.8	**END OF BOREHOLE**									

Notes:
1) 50mm dia. monitoring well was installed upon completion.
2) Water Level Readings:

Date	W. L. Depth (m)
Feb. 22, 2016	3.5

SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE
DYNAMIC CONE PENETRATION RESISTANCE PLOT
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)

GROUNDWATER ELEVATIONS
Shallow/ Single Installation 1st ▽ 2nd ▼ Deep/Dual Installation 1st ▼ 2nd ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG-2016-2 WELLS 10002883(FEB 12 2016).GPJ SPL.GDT 4/6/16

LOG OF BOREHOLE BH102

PROJECT: Geotechnical Investigation - Mattamy Development Inc. (Cook Property)
CLIENT: Mattamy Mayfield Limited
PROJECT LOCATION: Cook Property, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150mm
Date: Jan/07/2016

REF. NO.: 10002883
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	ELEVATION	POCKET PEN (Cu) (kPa)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
260.2	**TOPSOIL:** 50mm						
260.1	**SILTY CLAY:** trace sand, trace gravel, trace rootlets, brown, moist, firm to very stiff (Reworked/disturbed)	1	SS	4	260		
1		2	SS	20			
258.7					259		
1.5	**SILTY CLAY TILL:** some sand, trace gravel, oxidized, brown, moist, very stiff	3	SS	28		>225	
2		4	SS	23	258	>225	
257.2							
3.1	**SILTY CLAY:** trace sand, trace gravel, brown to grey, moist, wet sand seams, stiff .	5	SS	10	257	60	
4 256.1							
4.1	**SILTY SAND:** some gravel to gravelly, dilatant, grey, wet, compact.	6	SS	16	256		spoon wet
5							
254.6					255		
5.6	**SILTY CLAY TILL:** some sand, trace gravel, grey, moist, very stiff.						
6	contain silty sand seams/layers between 6.1m to 6.7m	7	SS	22	254		
7							
					253		
	contain silty clay layers between 7.6m to 8.2m	8	SS	25		>225	1 8 60 31
8					252		
9							
	occasional sand pockets below 9.1m	9	SS	28	251	>225	
250.5							
9.8	**END OF BOREHOLE**						

Notes:
1) Groundwater was at 4.1m during drilling

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE — 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

GROUND WATER CONDITIONS

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Shallow/ Single Installation 1st 2nd Deep/Dual Installation 1st 2nd

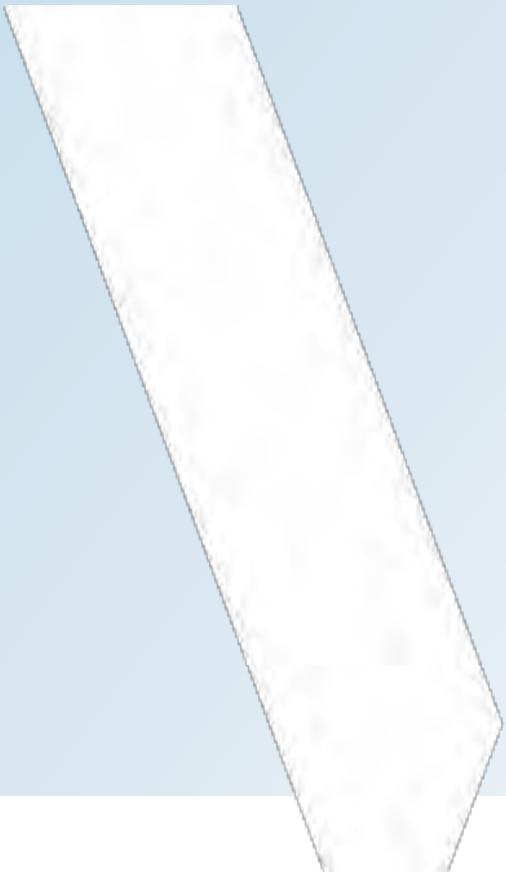
GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity ○ ■=3% Strain at Failure

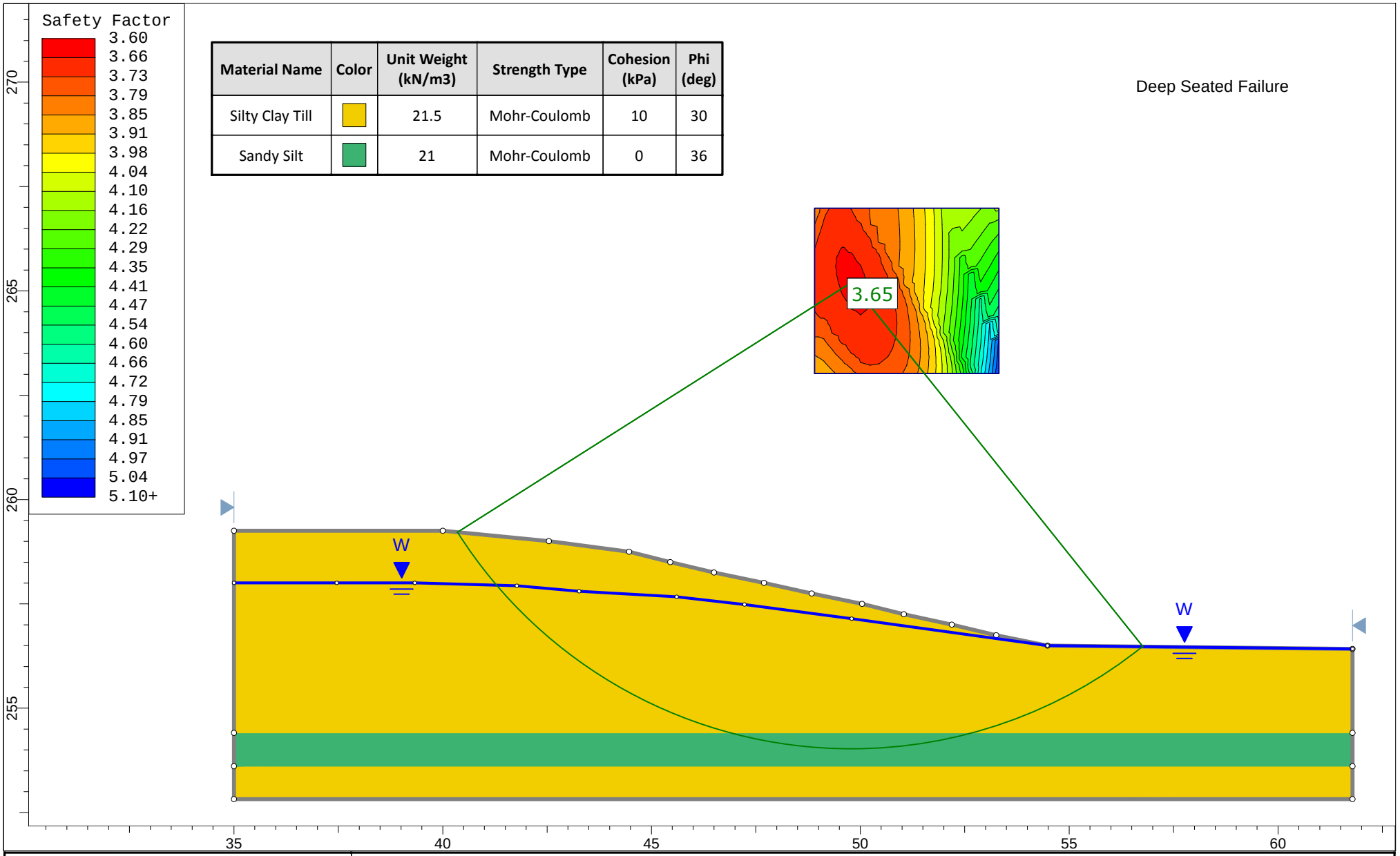
WSP SOIL LOG-2016-2 WELLS 10002883(FEB 12 2016).GPJ SPL.GDT 4/6/16

APPENDIX

F

SLOPE STABILITY ANALYSIS RESULTS (ENCLS. 1 TO 5 AND 1A TO 5A)



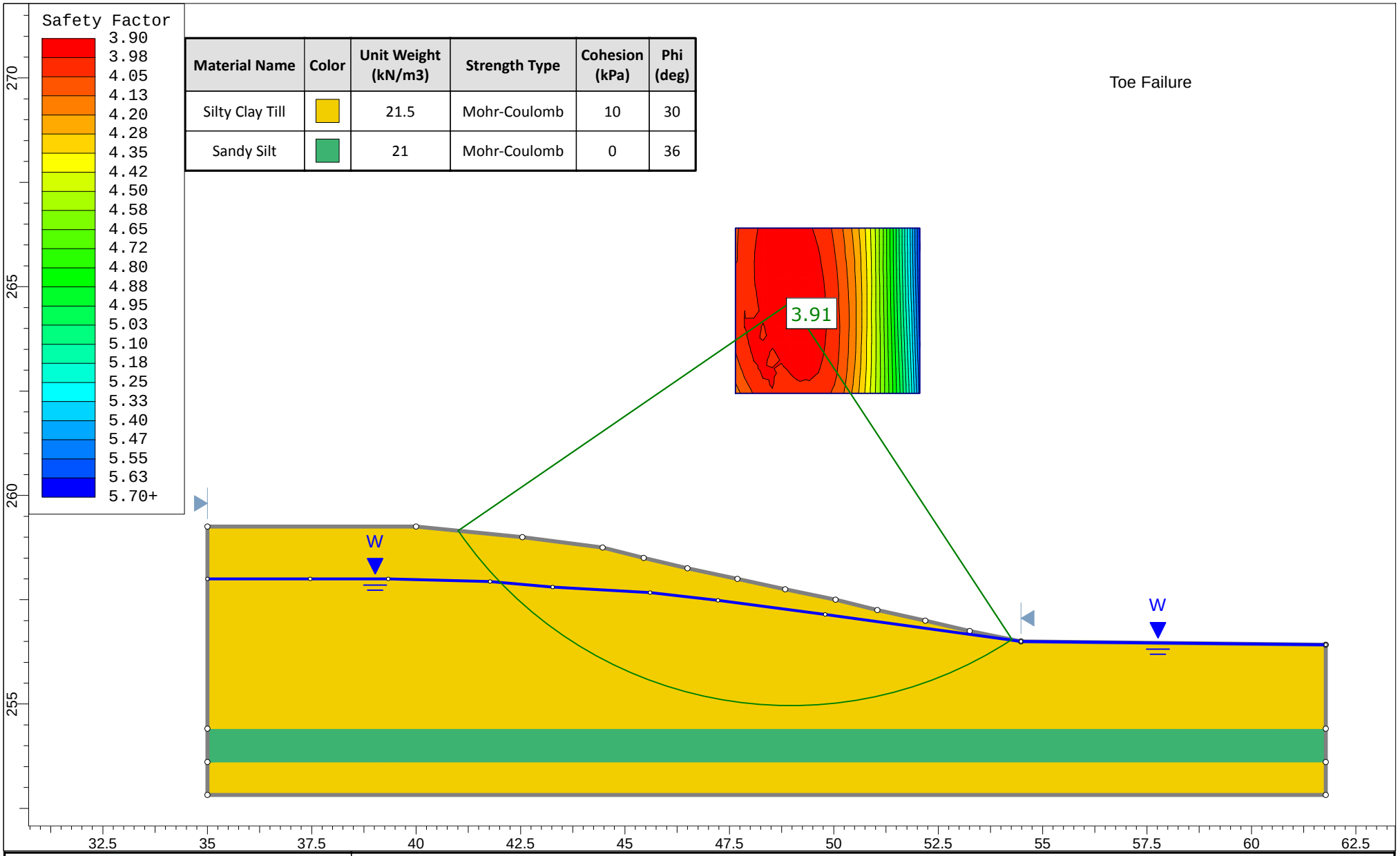


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30
Sandy Silt		21	Mohr-Coulomb	0	36

Deep Seated Failure

SLIDEINTERPRET 7.024

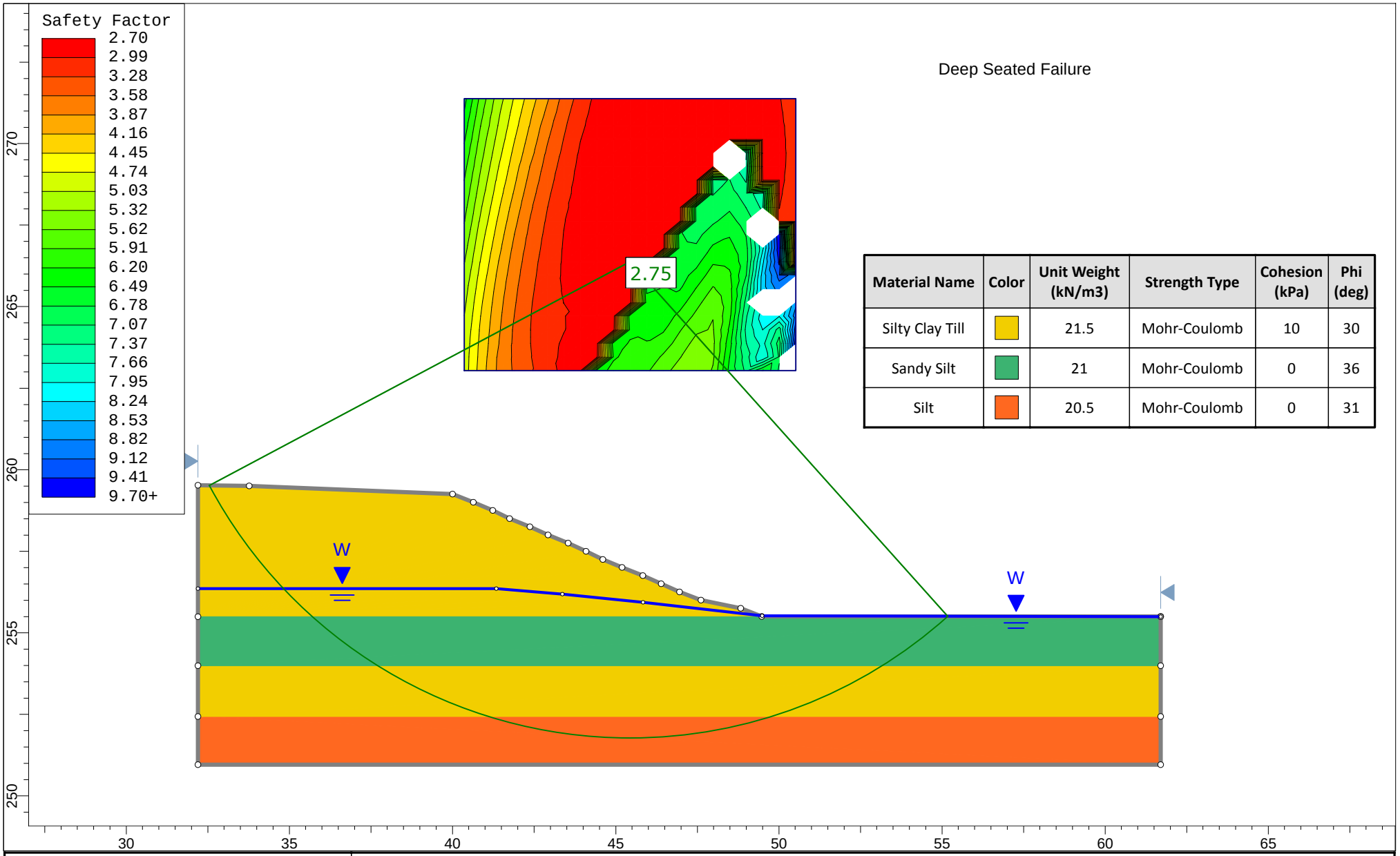
Project	Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON		
Analysis Description	Section P5A-P5A' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method		
Drawing No.	1	Scale 1:125	Company WSP Canada Inc.
Date	June 7, 2017		Location Identification Proposed Stormwater Management Pond 5



WSP

SLIDEINTERPRET 7.024

Project	Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON		
Analysis Description	Section P5A-P5A' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method		
Drawing No.	1A	*Scale* 1:125	*Company* WSP Canada Inc.
Date	June 7, 2017	*Location Identification*	Proposed Stormwater Management Pond 5



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30
Sandy Silt		21	Mohr-Coulomb	0	36
Silt		20.5	Mohr-Coulomb	0	31

SLIDEINTERPRET 7.024

Project
Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON

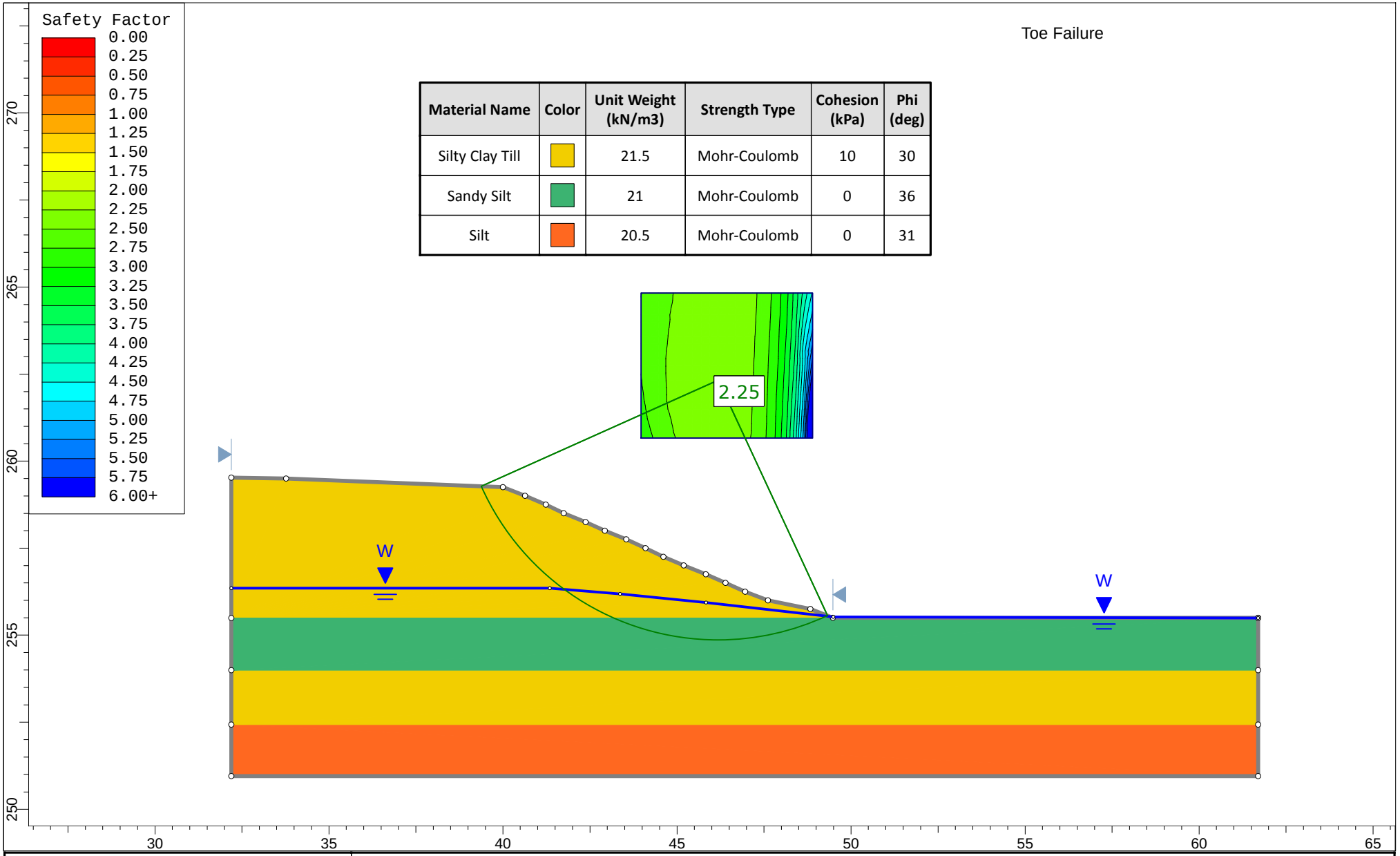
Analysis Description
Section P6C-P6C' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method

Drawing No.	*Scale*	*Company*
2	1:160	WSP Canada Inc.

Date	*Location Identification*
June 7, 2017	Proposed Stormwater Management Pond 6

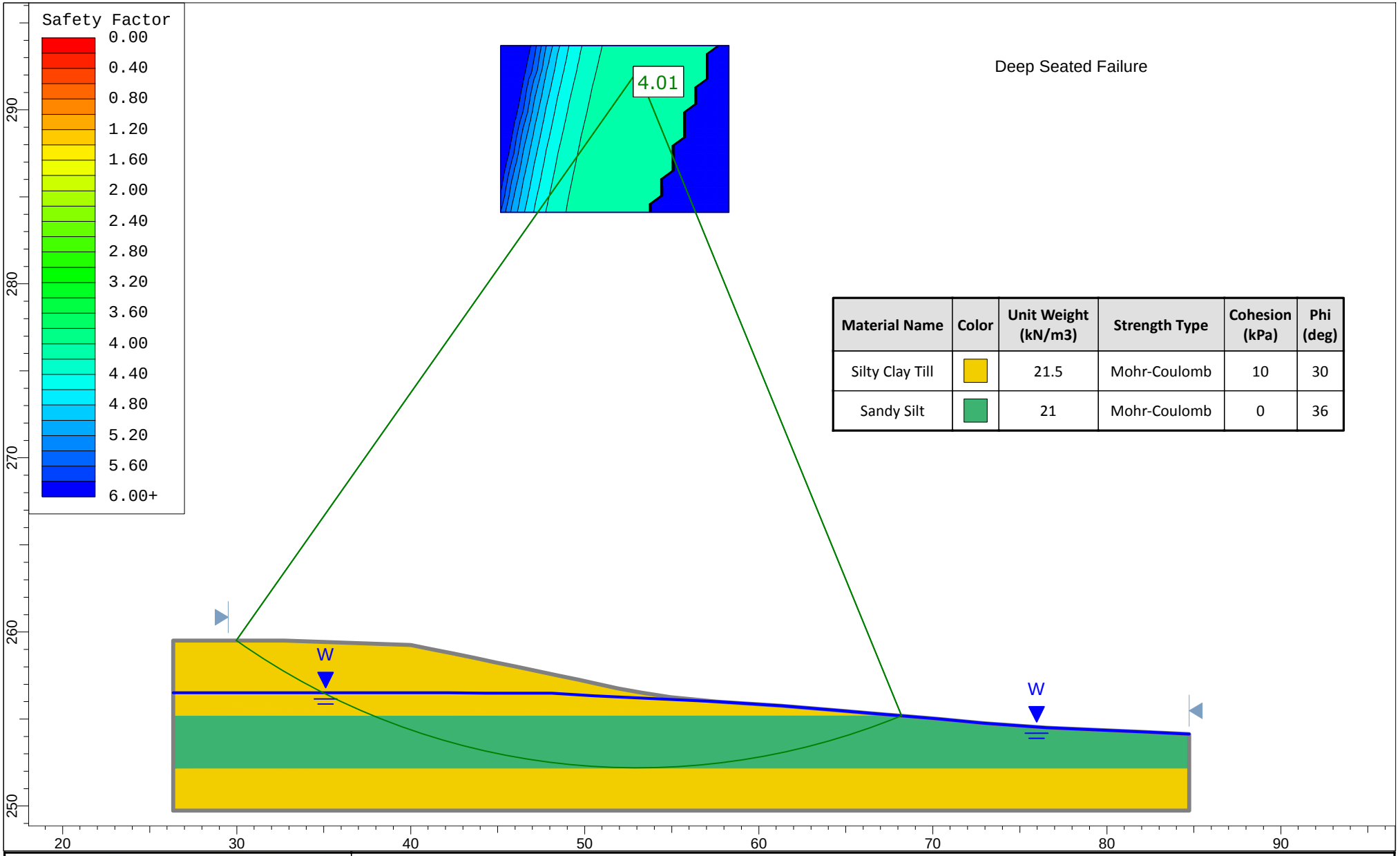
Toe Failure

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30
Sandy Silt		21	Mohr-Coulomb	0	36
Silt		20.5	Mohr-Coulomb	0	31



Project: Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON			
Analysis Description: Section P6C-P6C' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method			
Drawing No.: 2A	Scale: 1:150	Company: WSP Canada Inc.	
Date: June 7, 2017		Location Identification: Proposed Stormwater Management Pond 6	

SLIDEINTERPRET 7.024



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30
Sandy Silt		21	Mohr-Coulomb	0	36

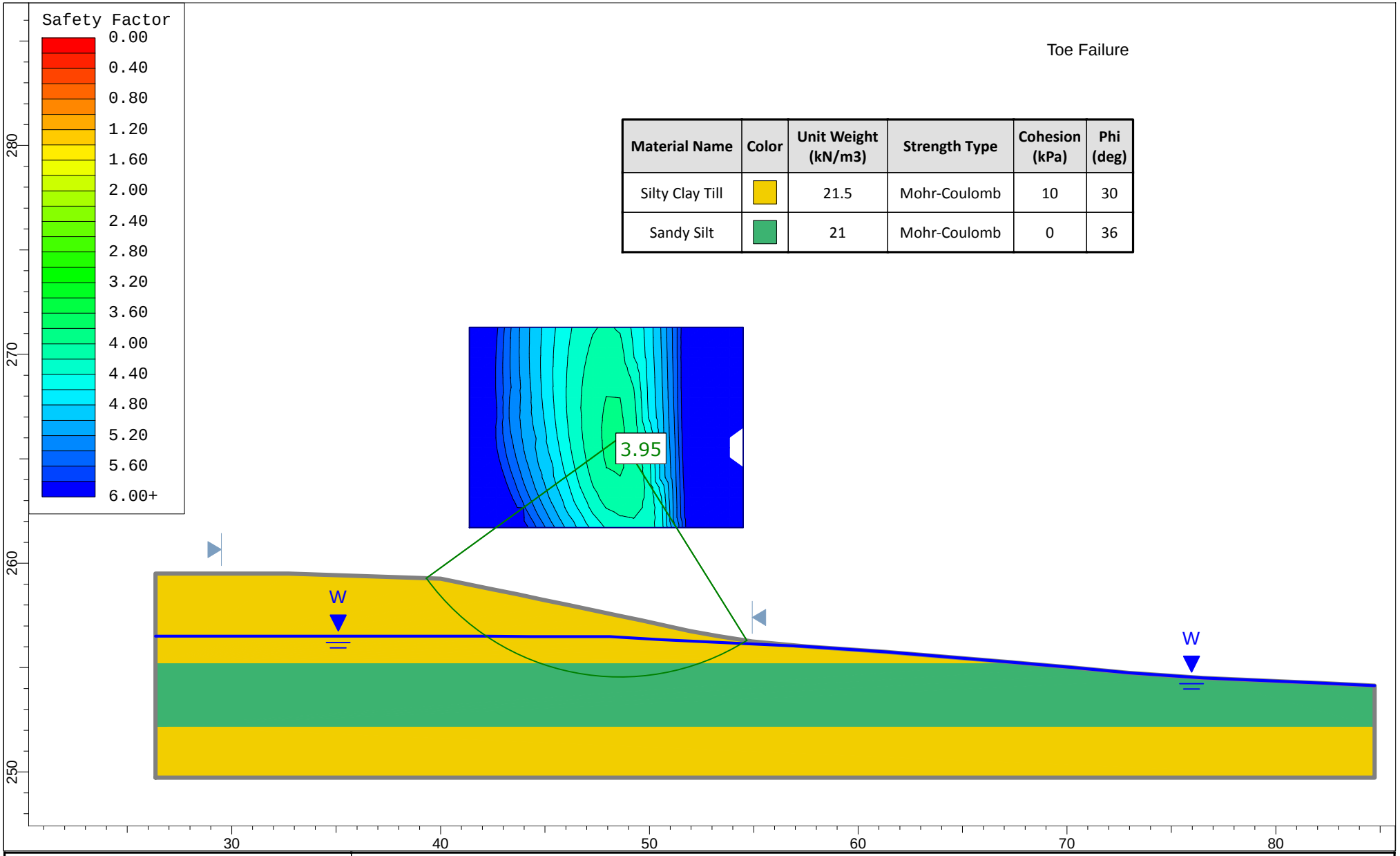
SLIDEINTERPRET 7.024

Project
Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON

Analysis Description
Section P7B-P7B' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method

Drawing No.	*Scale*	*Company*
3	1:300	WSP Canada Inc.

Date	*Location Identification*
June 7, 2017	Proposed Stormwater Management Pond 7

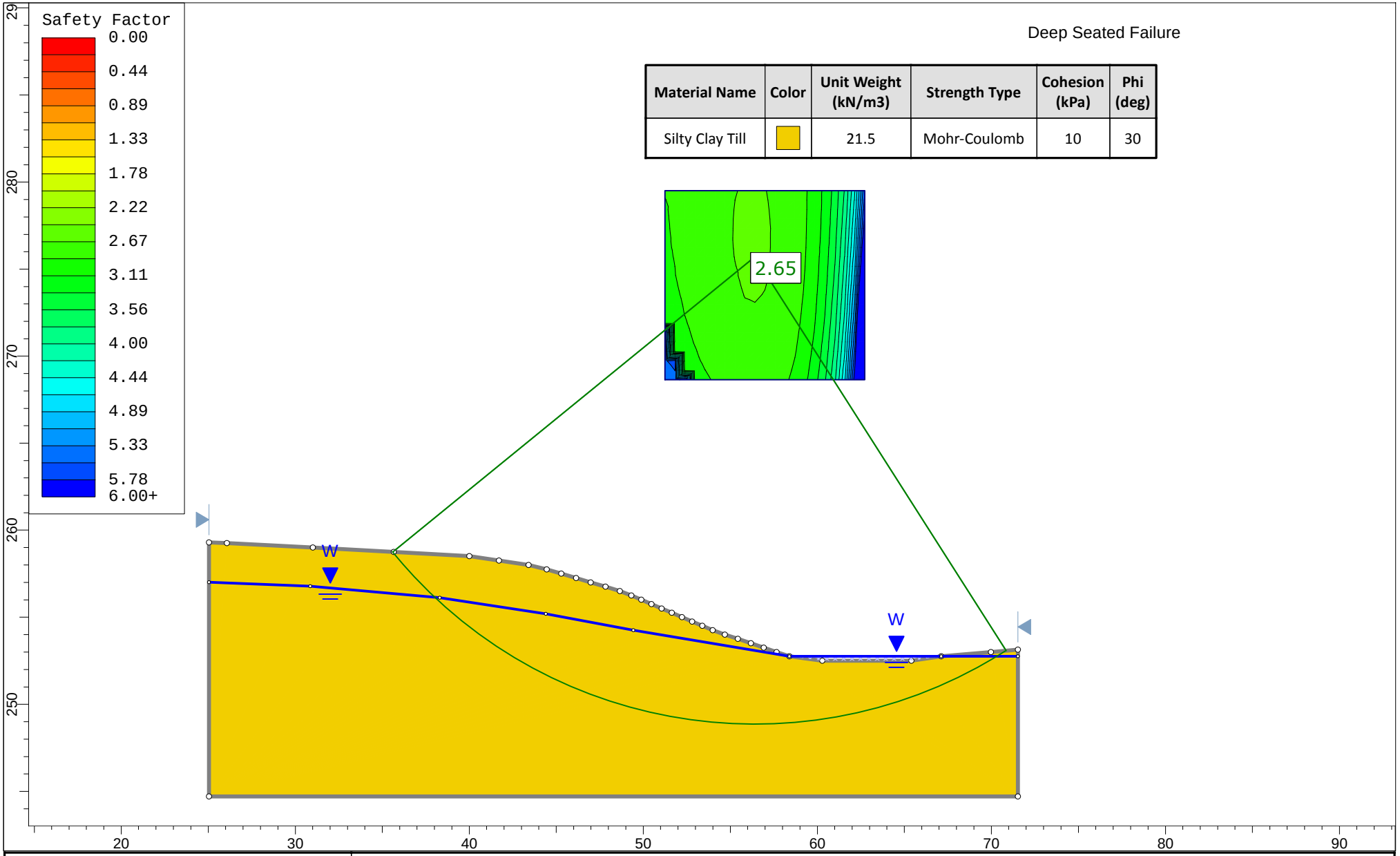


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30
Sandy Silt		21	Mohr-Coulomb	0	36

WSP

SLIDEINTERPRET 7.024

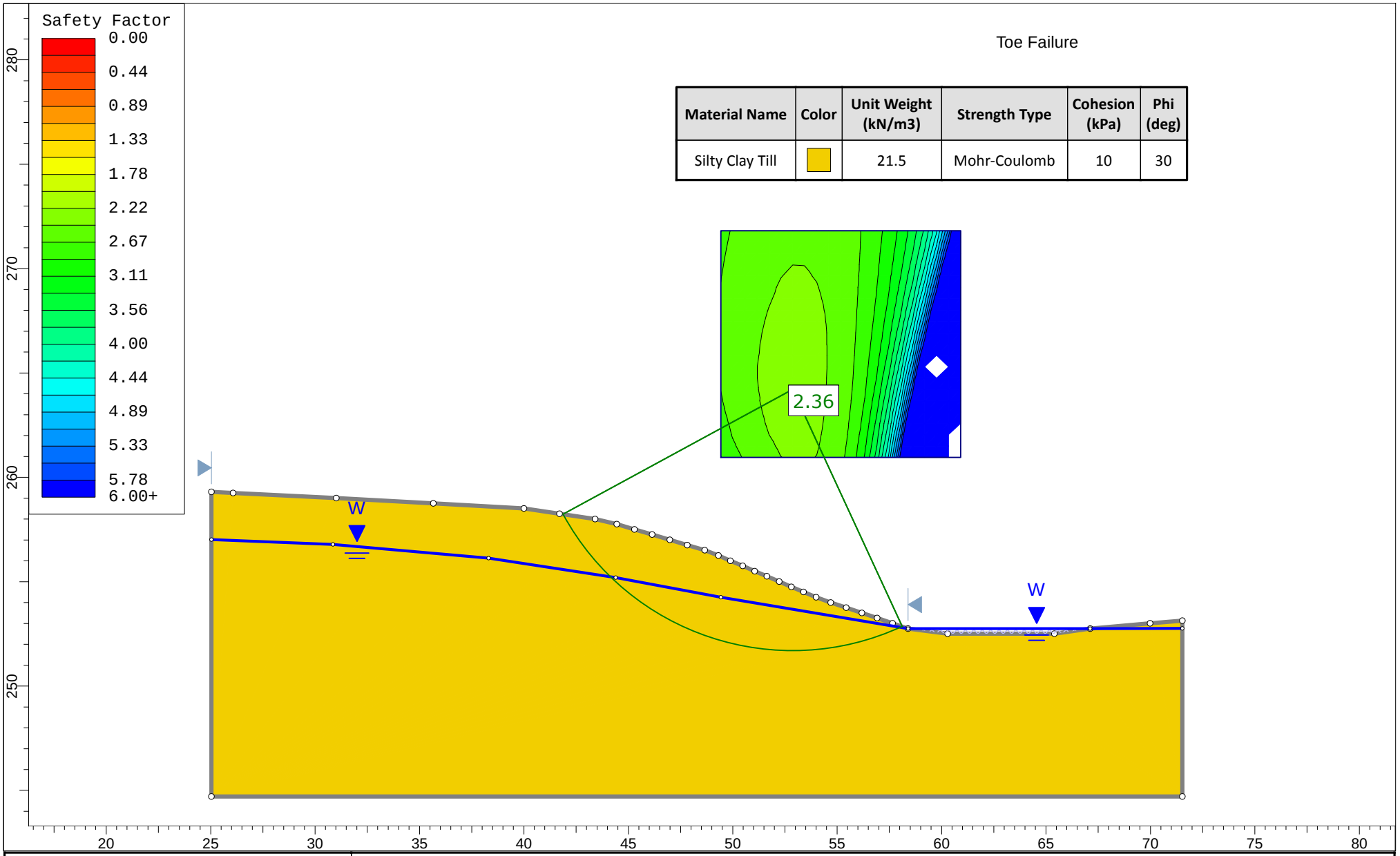
Project	Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON		
Analysis Description	Section P7B-P7B' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method		
Drawing No.	3A	*Scale* 1:250	*Company* WSP Canada Inc.
Date	June 7, 2017	*Location Identification*	Proposed Stormwater Management Pond 7



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Silty Clay Till		21.5	Mohr-Coulomb	10	30

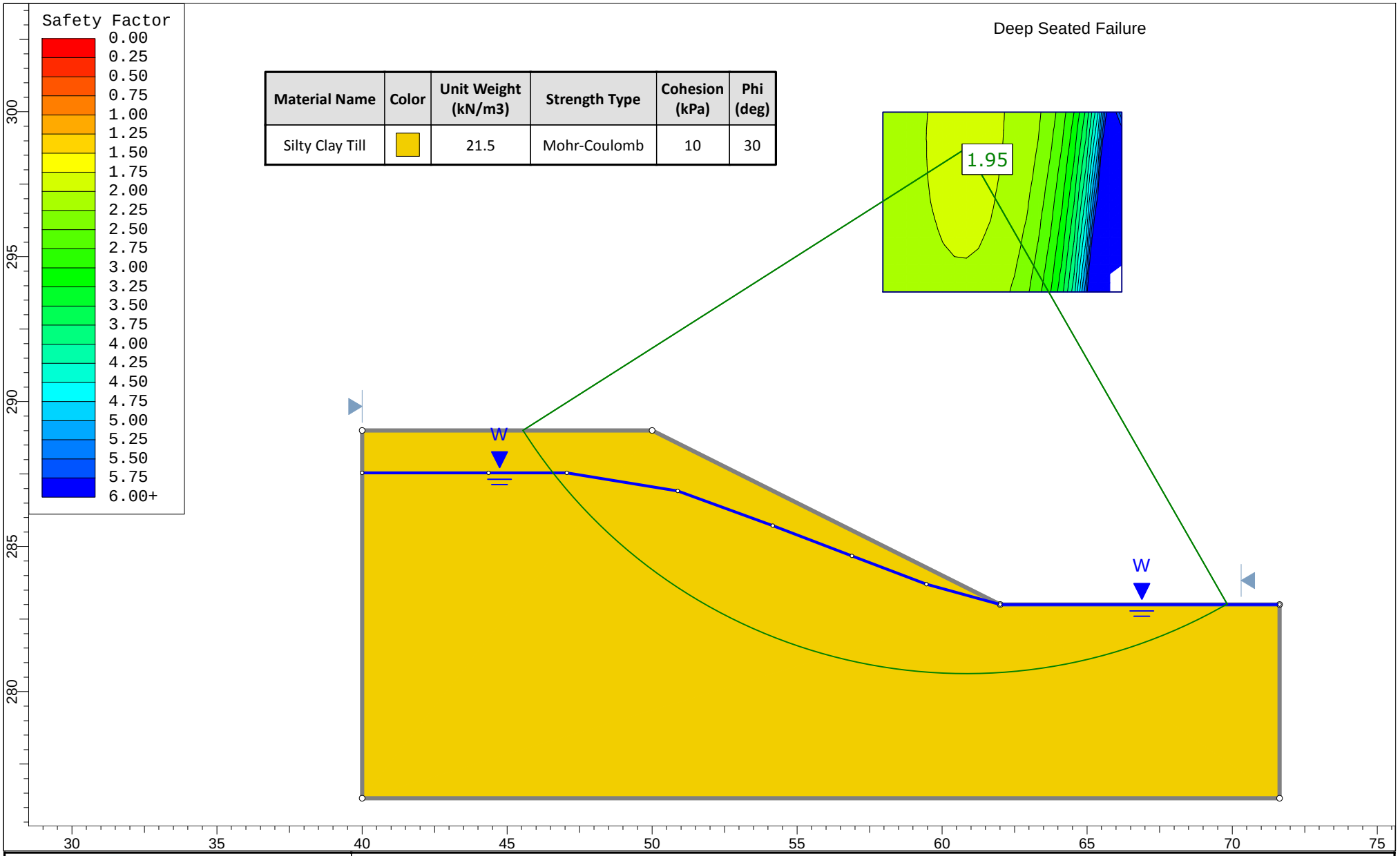
SLIDEINTERPRET 7.024

Project	Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON		
Analysis Description	Section P8F-P8F' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method		
Drawing No.	4	Scale 1:300	Company WSP Canada Inc.
Date	June 7, 2017		Location Identification Proposed Stormwater Management Pond 8



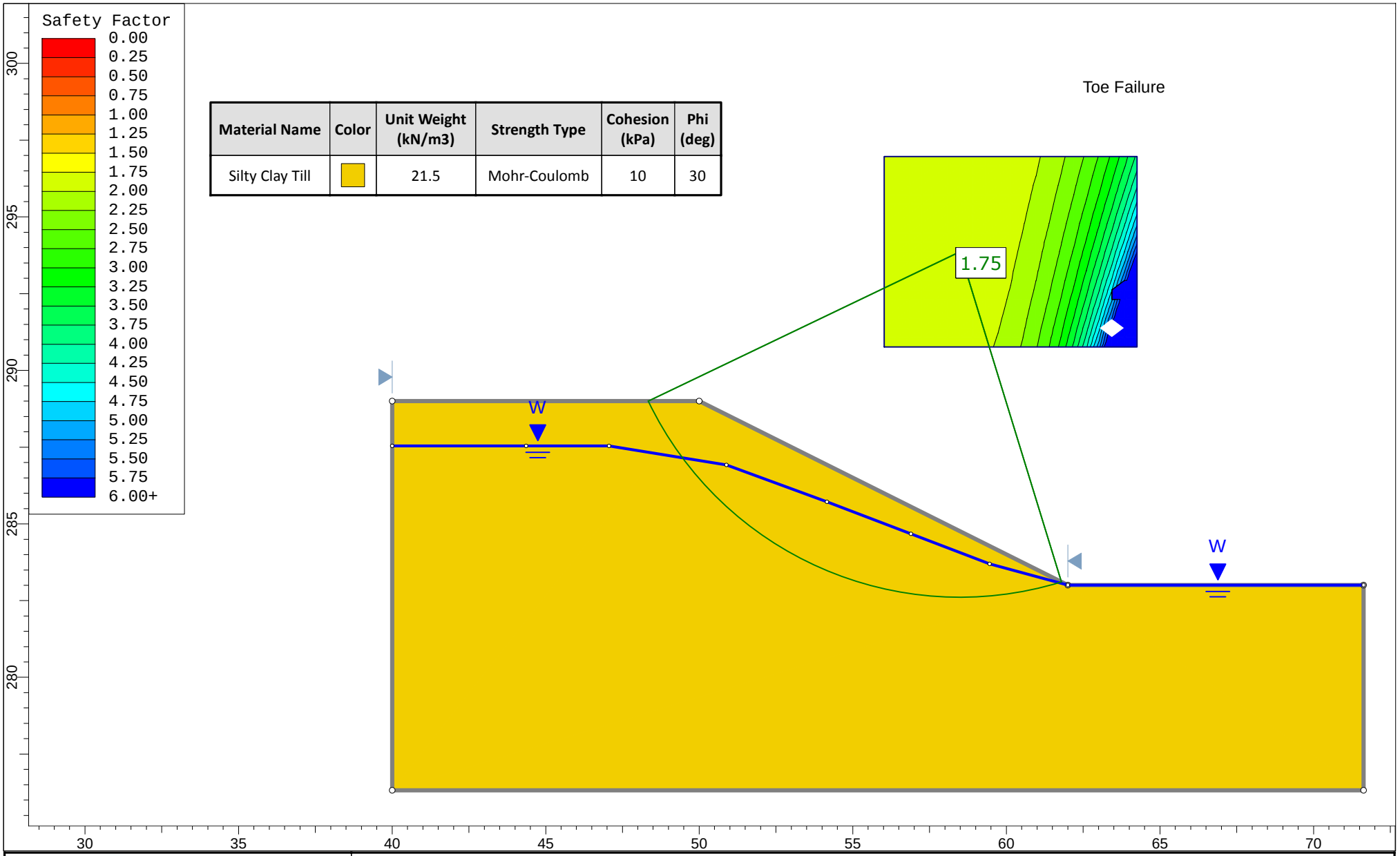
SLIDEINTERPRET 7.024

Project Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON			
Analysis Description Section P8F-P8F' (Existing): GLE\Morgenstern-Price Limit Equilibrium Method			
Drawing No. 4A	*Scale* 1:250	*Company* WSP Canada Inc.	
Date June 7, 2017		*Location Identification* Proposed Stormwater Management Pond 8	



SLIDEINTERPRET 7.024

Project Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON			
Analysis Description Hypothetical Section (Inclination of 2 Horizontal : 1 Vertical): GLE\Morgenstern-Price Limit Equilibrium Method			
Drawing No. 5	*Scale* 1:180	*Company* WSP Canada Inc.	
Date June 7, 2017		*Location Identification* Hypothetical Section	



WSP	Project: Slope Stability and Streambank Erosion Analysis, Five Locations Along Etobicoke Creek, Mayfield West Phase 2, Caledon, ON		
	Analysis Description: Hypothetical Section (Inclination of 2 Horizontal : 1 Vertical): GLE\Morgenstern-Price Limit Equilibrium Method		
	Drawing No.: 5A	Scale: 1:170	Company: WSP Canada Inc.
	Date: June 7, 2017		Location Identification: Hypothetical Section

SLIDEINTERPRET 7.024

APPENDIX

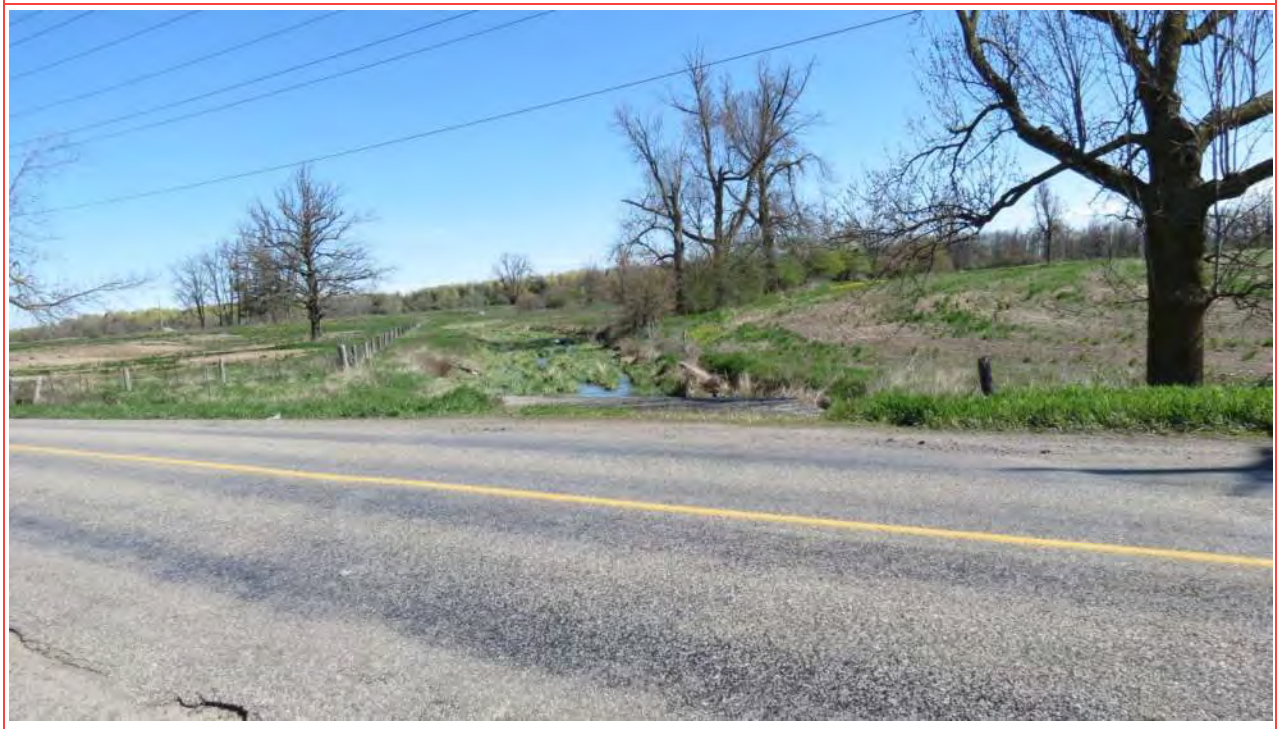
G

SITE VISIT PHOTOGRAPHS (TO BE READ IN CONJUCTION WITH DRAWINGS)

Site 1: This site is along both banks of the Etobicoke Creek, and is extended from Chinguacousy Road to about 150 m towards east



Photograph 1 (Aerial Photograph): The creek at this location is located within a relatively flat to gently rolling ground (unconfined system).



Photograph 2: Looking north along creek. The ground on north side of creek of relatively flat, and on the south side is gently rolling to flat.



Photograph 3: A close-up view of Photograph 2.



Photograph 4: Looking west along south bank of creek. Chinguacousy Road and culvert are visible in background.



Photograph 5: A view looking west.



Photograph 6: Another view looking north.



Photograph 7: Looking southeast along the ditch located between Chinguacousy Road and study area.



Photograph 8: Looking north at relatively flat ground on west side of creek.

Site 2: Stormwater Management Pond 5 location



Photograph 9 (Aerial Photograph): An overall aerial view of the slope.



Photograph 10: Looking at the location of southern portion of Stormwater Management Pond 5



Photograph 11: Looking at the location of northern portion of Stormwater Management Pond 5



Photograph 12: Slope surface is well vegetated with grass, weed, and young to mature trees



Photograph 13: Looking at the toe of the valley slope which is in contact with the Etobicoke Creek. Active toe erosion is visible.



Photograph 14: Another view, bank undercutting of slope toe within the study area is visible.



Photograph 15: A storm outlet pipe and a cut in slope is visible.

SITE 3: STORMWATER MANAGEMENT POND 6 LOCATION



Photograph 16 (Aerial Photograph):



Photograph 17: A view of the curvilinear valley slope. The slope at this location is separated from the creek by a flood plain more than 30 m wide.



Photograph 18: Looking south along the slope crest. A relatively flat table, currently used for agricultural purposes is visible.



Photograph 19: The flood plain is relatively flat and is overgrown with grass, weeds and a few trees.



Photograph 20: Another view of flood plain.

Site 4: Stormwater Management Pond 7 location



Photograph 21 (Aerial Photograph):



Photograph 22: Looking east along the grassy flood plain.



Photograph 23: Looking up along the gully.



Photograph 24: Looking southeast at the slope surface.



Photograph 25: Looking west at the tableland associated with the slope.



Photograph 26: A view of slope surface, looking east.



Photograph 27: Another view of slope surface, looking west.



Photograph 28: A view of flood plain, looking west.

SITE 5: STORMWATER MANAGEMENT POND 8 LOCATION



Photograph 29:



Photograph 30: Looking southeast at well vegetated slope associated with the siting of Stormwater Management Pond 8.



Photograph 31: Looking west along the slope crest. The associated tableland is currently used for agricultural purposes.



Photograph 32: Looking northeast at the slope surface.



Photograph 33: Looking at the toe of the valley slope which is in contact with the Etobicoke Creek. Active toe erosion is visible.

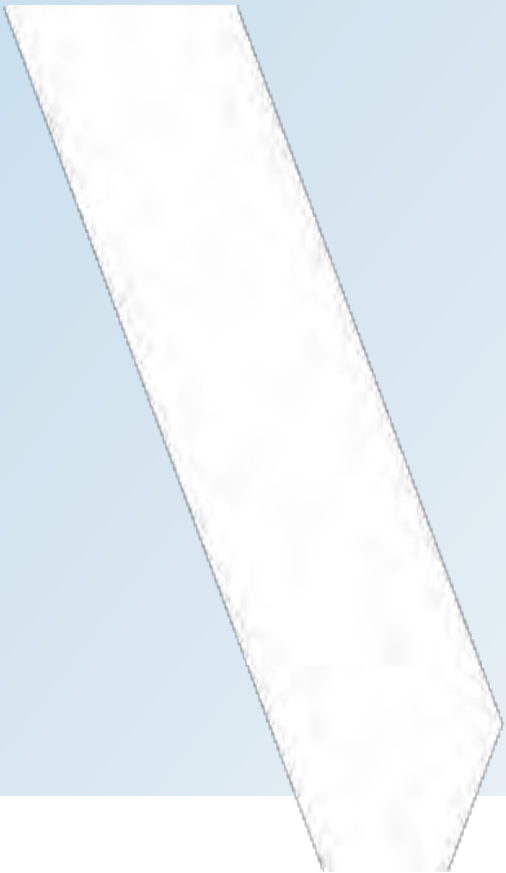


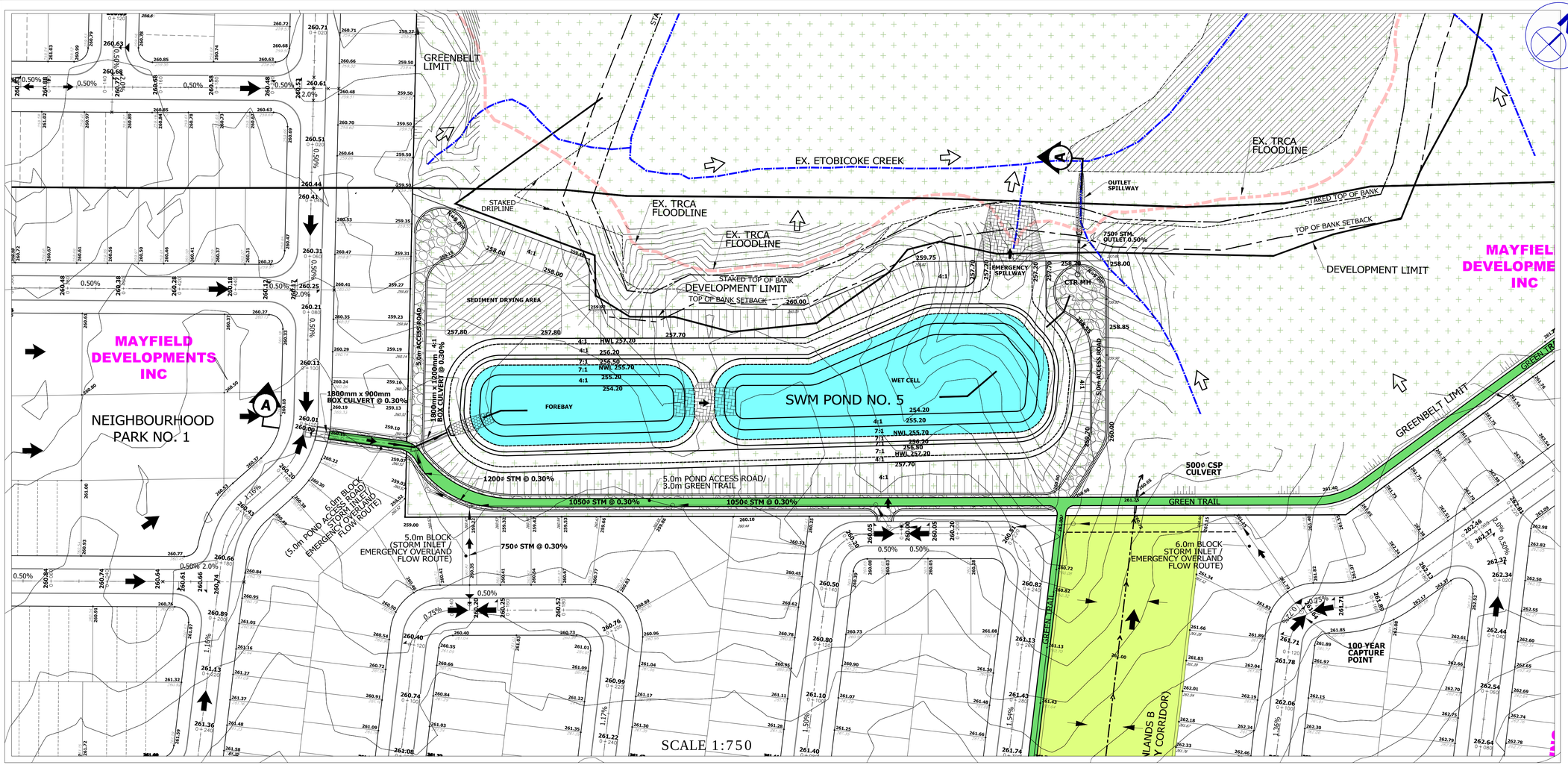
Photograph 34: Another view, looking along the creek.

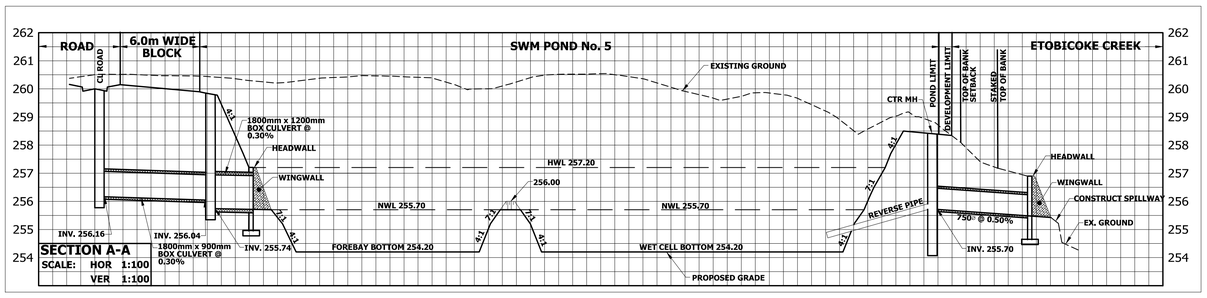
APPENDIX

H

PROPOSED STORMWATER MANAGEMENT PONG DRAWINGS FOR POND 5, POND 6, POND 7 AND POND 8







SWM POND 5				
CRITERIA	STAGE (m)	REQUIRED STORAGE (m3)	PROVIDED STORAGE (m3)	DISCHARGE (m3/s)
BOTTOM	254.20	-	-	-
PERMANENT POOL	255.70	3,264	6,940	0
EXTENDED DETENTION	256.50	3,945	5,672	0.006
25 yr	256.90	7,890	9,374	0.119
100 yr	257.20	8,497	12,150	0.697

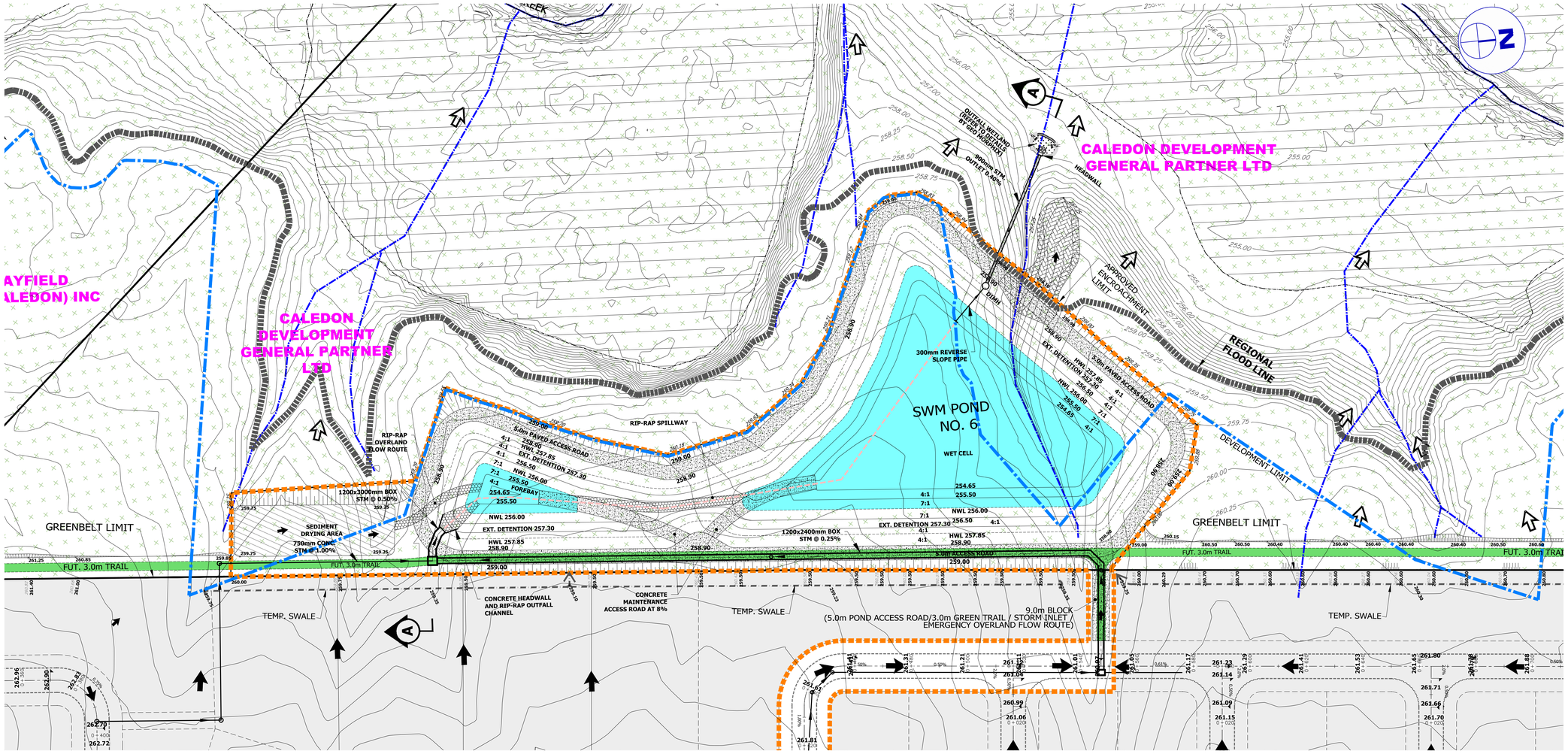
DRAINAGE AREA (ha) INCLUDING POND BLOCK		Imperviousness (%)	Pond Block Area (ha)
	19.9	61.0%	2.17

urbantech
Urbantech Consulting, A Division of Leighton-Zac Ltd.
25 Royal Crest Court, Suite 201, Markham, Ontario L3R 9X4
tel: 905.946.9461 fax: 905.946.9335
www.urbantech.com

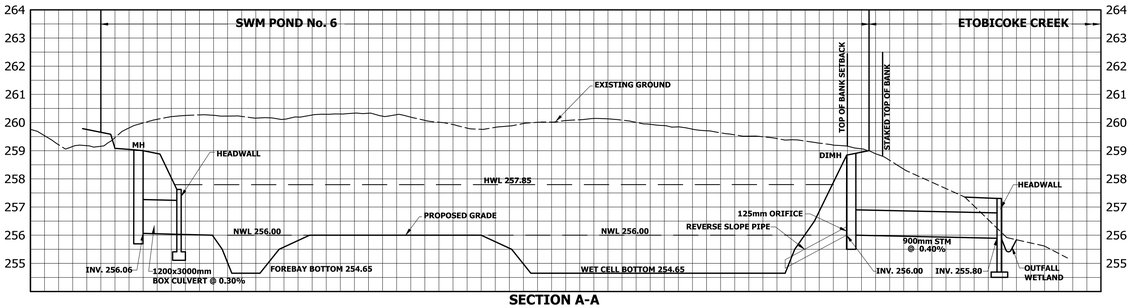
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2

SWM POND 5

SURVEYED BY:	R.P.E.	DATE:	2015	CONTRACT NO.	
DRAWN BY:	V.P.	CHECKED BY:	D.Z.	DRAWING NO.	SHEET NO.
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.	605	
SCALE:		DATE:	MAY, 2016		



PLAN VIEW
SCALE 1:750



SECTION A-A
SCALE: HOR 1:1000
VER 1:100

SWM POND 6-ULTIMATE CONDITION				
CRITERIA	STAGE (m)	REQUIRED STORAGE (m3)	PROVIDED STORAGE (m3)	DISCHARGE (m3/s)
BOTTOM	254.65	-	-	-
PERMANENT POOL	255.00	5,292	5,451	0
EXTENDED DETENTION	257.30	6,575	11,203	0.009
25 yr	257.70	13,191	15,643	0.169
100 yr	257.85	15,568	17,413	0.984

DRAINAGE AREA (ha) INCLUDING POND BLOCK	Imperviousness (%)	Pond Block Area (ha)
28.22	70.0%	2.23

NOTES:

*** REFER TO DRAWING 501A FOR INTERIM DRAINAGE AREA BREAKDOWN**
*** REFER TO DRAWING 502A FOR ULTIMATE DRAINAGE AREA BREAKDOWN**

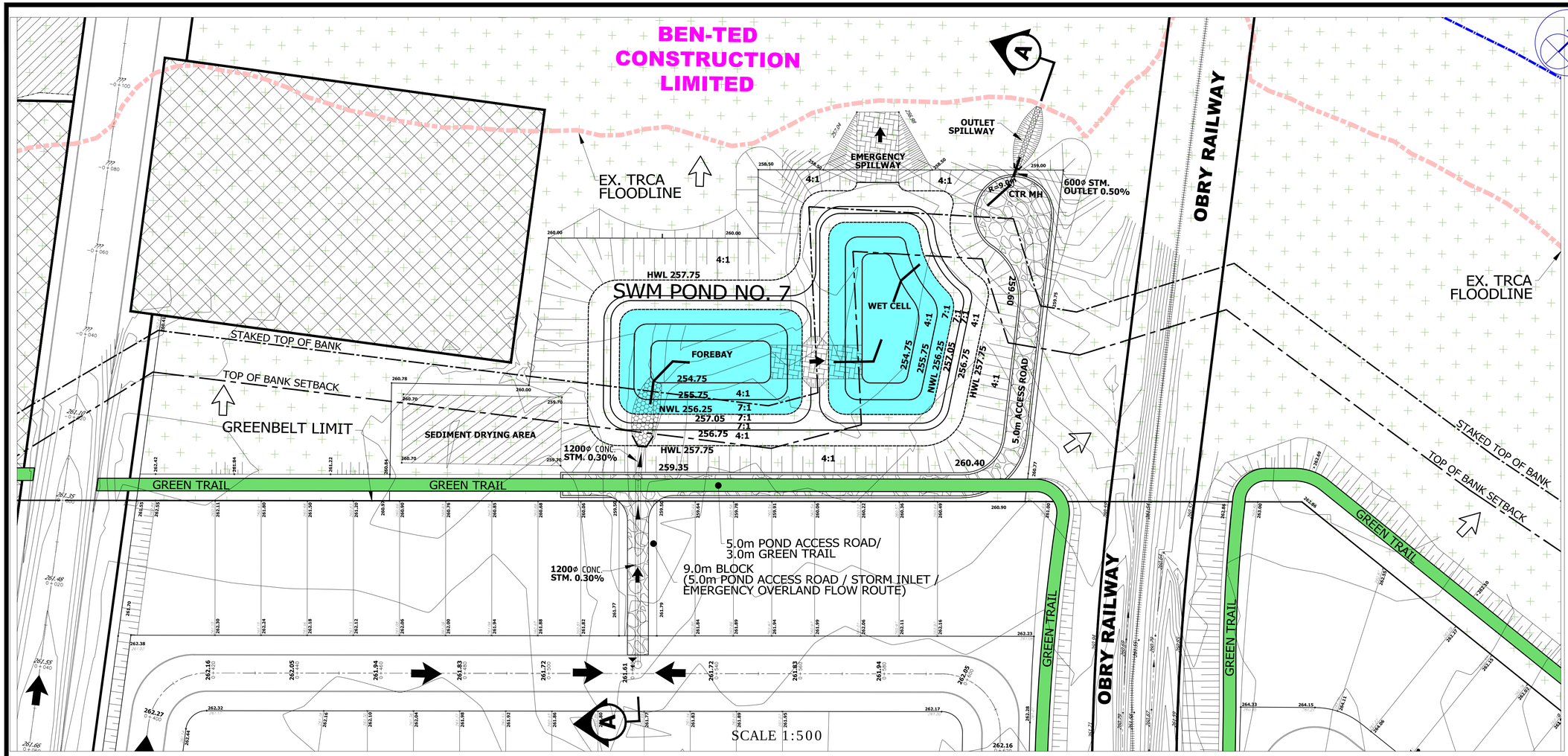
urbantech
Urbantech Consulting, A Division of Leighton-Zez Ltd.
3700 14th Avenue, Suite 201, Markham, Ontario L3R 3T7
tel: 905.946.9461 fax: 905.946.9595
www.urbantech.com

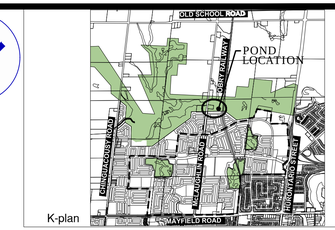
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2

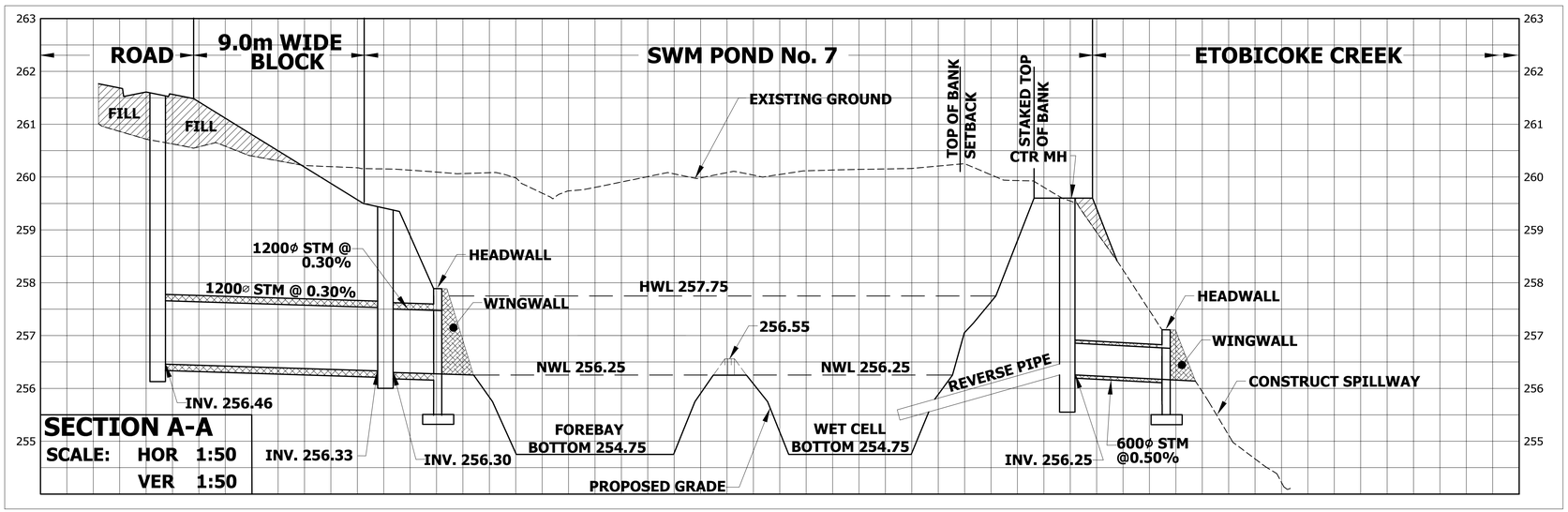
SWM POND 6

SURVEYED BY:	R.P.E.	DATE:	2015	JOB NO.	15-483
DRAWN BY:	V.P.	CHECKED BY:	D.Z.	DRAWING NO.	SHEET NO.
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.	606A	
SCALE:		DATE:	AUGUST 2018		

BEN-TED CONSTRUCTION LIMITED







SECTION A-A

SCALE: HOR 1:50
VER 1:50

SWM POND 7				
CRITERIA	STAGE (m)	REQUIRED STORAGE (m3)	PROVIDED STORAGE (m3)	DISCHARGE (m3/s)
BOTTOM	254.75	-	-	0
PERMANENT POOL	256.25	1,730	1,907	0
EXTENDED DETENTION	257.25	2,096	4,230	0.003
25 yr	257.50	4,191	5,650	0.062
100 yr	257.75	4,514	7,071	0.364

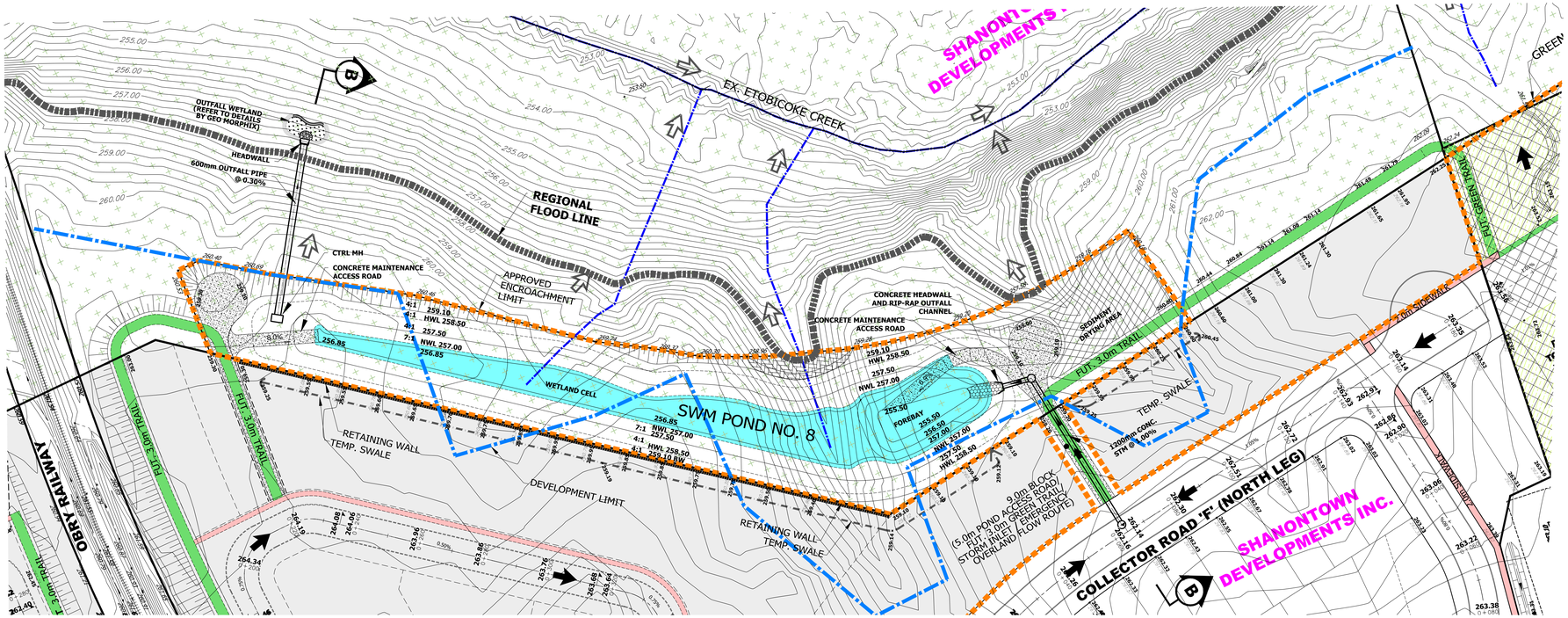
DRAINAGE AREA (ha) INCLUDING POND BLOCK		Imperviousness (%)	Pond Block Area (ha)
	10.4	62.0%	0.99

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25 Royal Crest Court, Suite 201, Markham, Ontario L3R 9X4
tel: 905.946.9461 fax: 905.946.0335
www.urbantech.com

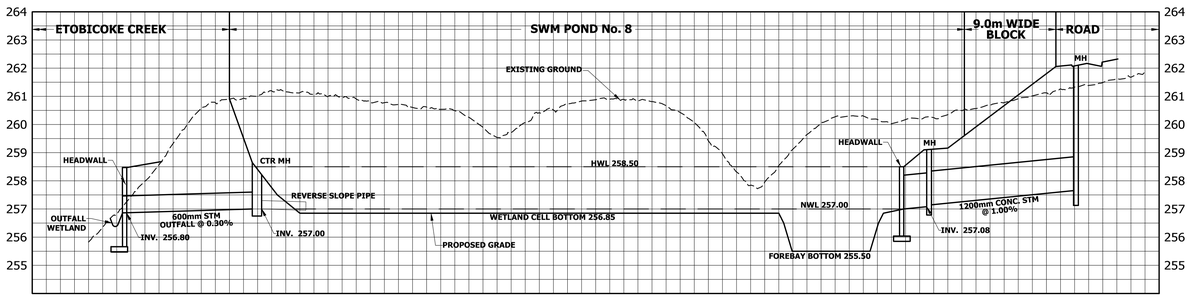
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2

SWM POND 7

SURVEYED BY:	R.P.E.	DATE:	2015	CONTRACT NO.	
DRAWN BY:	V.P.	CHECKED BY:	D.Z.	DRAWING NO.	SHEET NO.
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.	607	
SCALE:		DATE:	MAY, 2016		



PLAN VIEW
SCALE 1:750



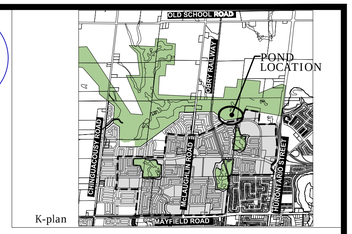
SECTION B-B
SCALE: HOR 1:1000
VER 1:100

SWM POND 8				
CRITERIA	STAGE (m)	REQUIRED STORAGE (m3)	PROVIDED STORAGE (m3)	DISCHARGE (m3/s)
BOTTOM	255.50	-	-	-
PERMANENT POOL	257.00	900	1,115	0
EXTENDED DETENTION	257.80	2,554	2,764	0.002
25 yr	258.15	4,426	4,645	0.166
100 yr	258.30	5,400	5,459	0.219

DRAINAGE AREA (ha) INCLUDING POND BLOCK	Imperviousness (%)	Pond Block Area (ha)
12.12	69.0%	1.06

NOTES:

*** REFER TO DRAWING 501A FOR INTERIM DRAINAGE AREA BREAKDOWN**
*** REFER TO DRAWING 502A FOR ULTIMATE DRAINAGE AREA BREAKDOWN**



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TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MW2 STAGE 1 ADDENDUM

SWM POND 8

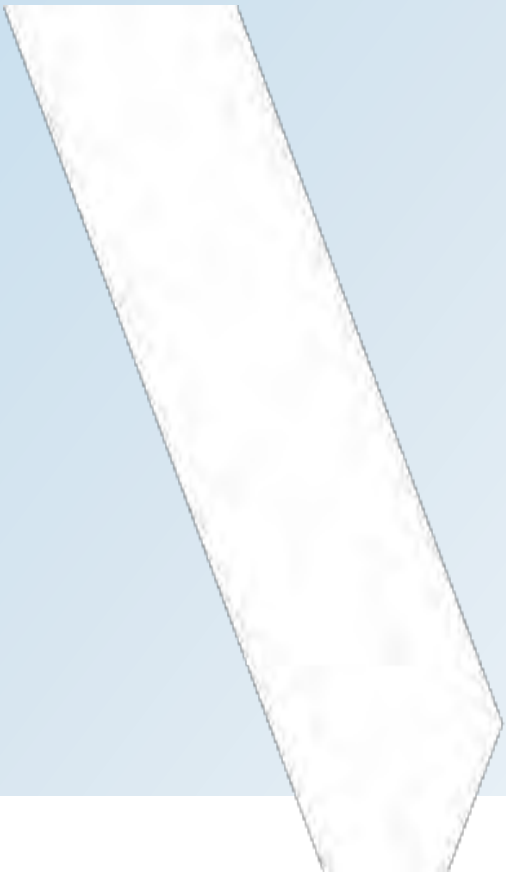
SURVEYED BY:	R.P.E.	DATE:	2015	JOB NO.	15-483
DRAWN BY:	V.P.	CHECKED BY:	D.Z.	DRAWING NO.	SHEET NO.
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.	608A	
SCALE:	AS SHOWN	DATE:	AUGUST 2018		

File: P:\Projects\15-483\STAGE 1 MW2 - FSR ADDENDUM\06 - STORMWATER MANAGEMENT PONDS - STAGE 1 ADDENDUM\608(a)-SWM POND B.dwg - Revised by <DZEC> : Thu, Aug 09 2018 - 7:00pm

APPENDIX

I

LIMITATIONS OF REPORT



LIMITATIONS OF REPORT AND GENERAL COMMENTS

WSP Canada Inc. should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, WSP Canada Inc. will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole and test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Inc. at the time of preparation. Unless otherwise agreed in writing by WSP, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

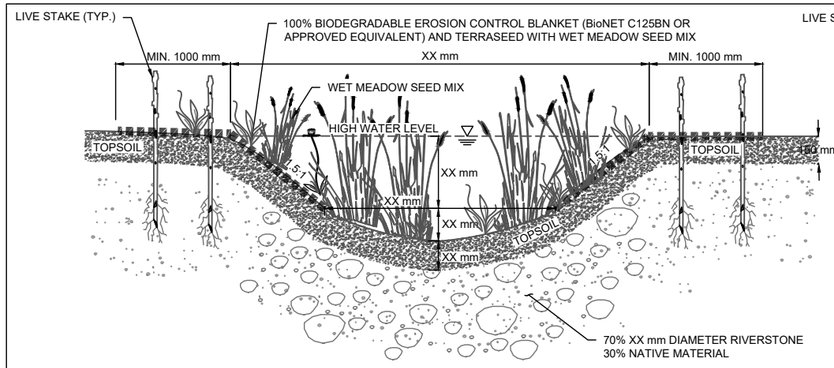
We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

APPENDIX D

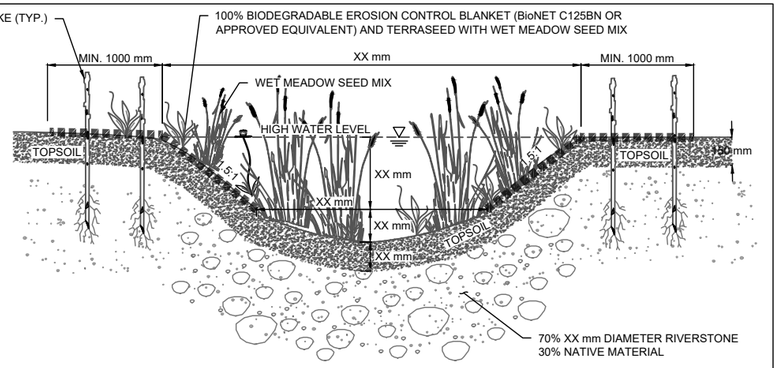
Drawings TYP-1 & TYP-2, Channel Restoration Typicals,

GEOMorphix

DRAFT FOR DISCUSSION

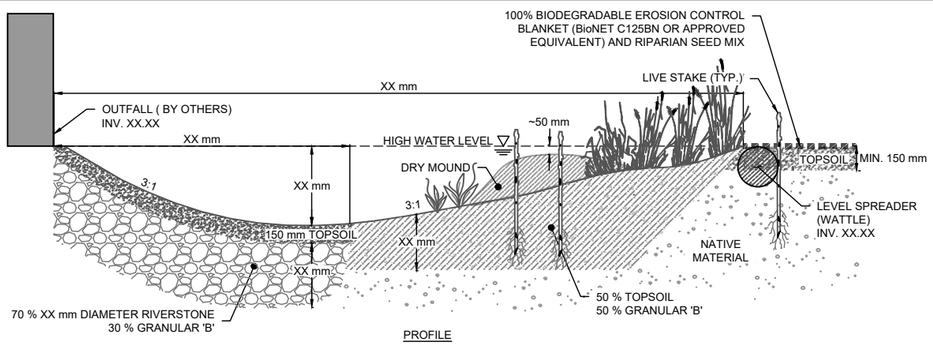


TYPICAL SHALLOW UNDULATION
N.T.S.

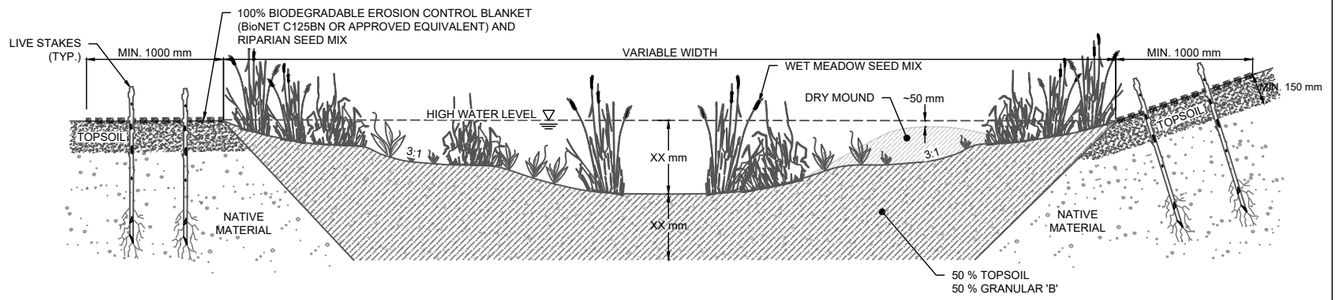


TYPICAL DEEP UNDULATION
N.T.S.

BIOSWALE CROSS SECTIONS
N.T.S

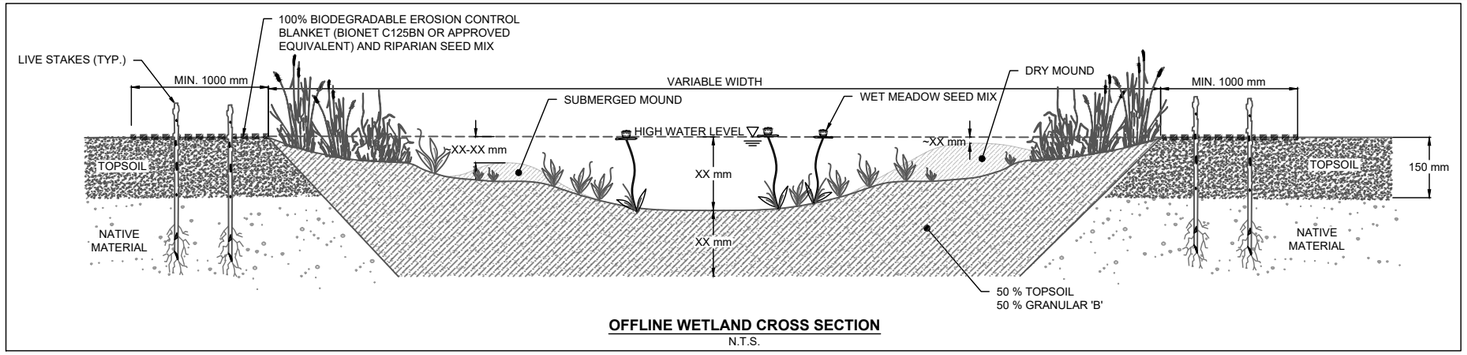


PROFILE

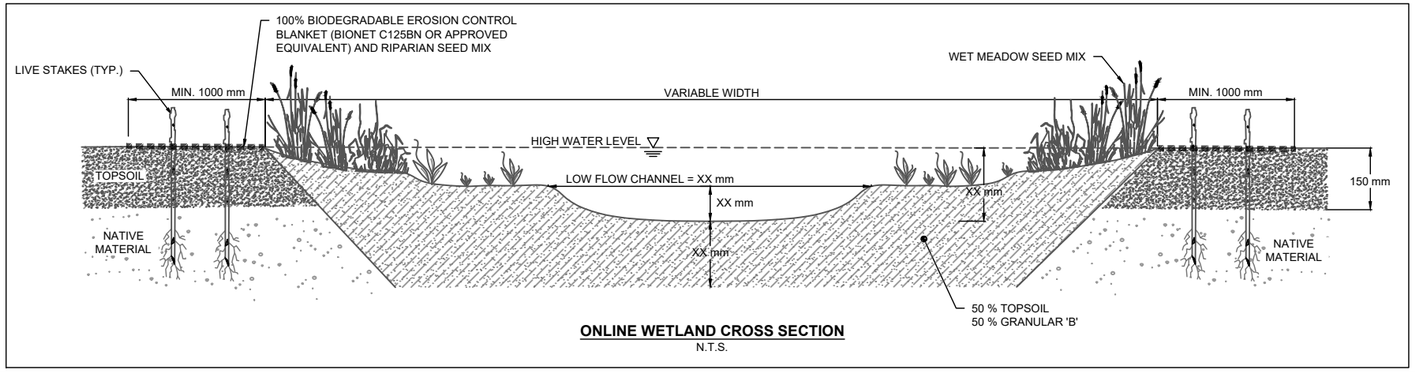


CROSS SECTION

STONE CORE WETLAND
N.T.S



OFFLINE WETLAND CROSS SECTION
N.T.S.



ONLINE WETLAND CROSS SECTION
N.T.S.

DESIGNED BY: P.V.	CHECKED BY: P.V.
DRAWN BY: B.W.M.	DATE: FEBRUARY 2020

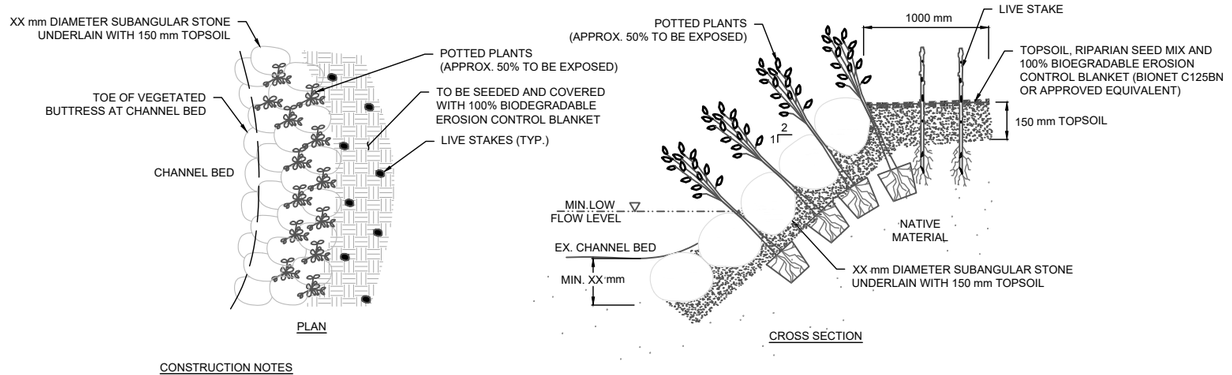
GEO MORPHIX
Geomorphology Earth Science Observations
36 Main Street North, PO Box 205
Campbellville, Ontario L0P 1B0
T: 416.920.0926
www.geomorphix.com

MAYFIELD WEST PHASE 2
STAGE 2

RESTORATION TYPICALS

PROJECT No.: 19130	DRAWING No.: TYP-1
SCALE: AS NOTED	SHEET 1 OF 2

DRAFT FOR DISCUSSION



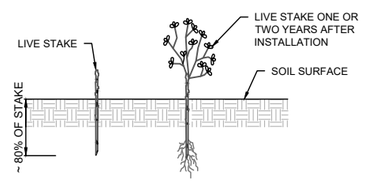
CONSTRUCTION NOTES

1. VEGETATED ROCK BUTTRESS TO BE INSTALLED IN LIFTS.
2. TOE STONES TO BE EMBEDDED INTO CHANNEL BED.
3. INSTALL PLANTS 1 m O/C IN EACH LAYER.
4. LATERALLY STAGGER EACH SUCCESSIVE LAYER OF PLANTS TO AVOID VERTICAL STACKING.
5. PLANTING SPECIES PLACEMENT SHOULD BE RANDOM.

POTTED PLANTINGS SPECIES AND QUANTITIES

COMMON NAME	SPECIES	QUANTITY	CONDITION
RED OSIER DOGWOOD	*Salix discolor*	XX	1 m ht. POTTED
SANDBAR WILLOW	*Salix exigua*	XX	1 m ht. POTTED
SHINING WILLOW	*Salix lucida*	XX	1 m ht. POTTED

VEGETATED ROCK BUTTRESS
N.T.S



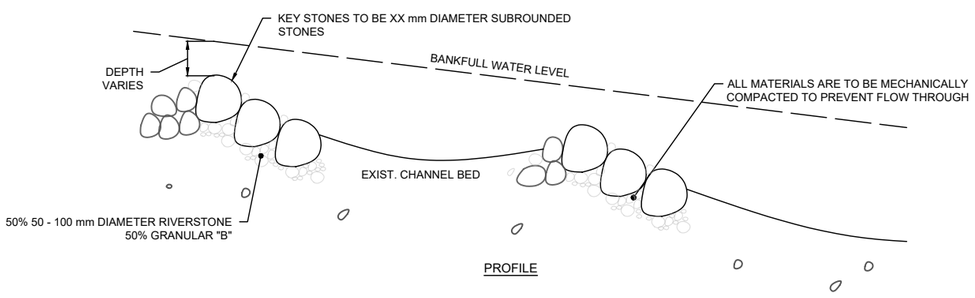
SPECIES AND QUANTITIES

COMMON NAME	SCIENTIFIC NAME	QTY	CONDITION
RED OSIER DOGWOOD	*Cornus stolonifera*	XX	1 m, BARE ROOT
PUSSY WILLOW	*Salix discolor*	XX	1 m, BARE ROOT
SANDBAR WILLOW	*Salix exigua*	XX	1 m, BARE ROOT

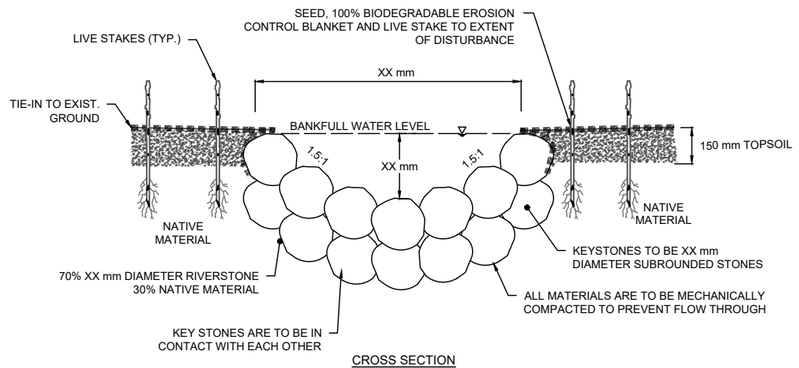
NOTES

1. QUANTITY TO BE DETERMINED BASED ON AREA OF DISTURBANCE TO BE RESTORED
2. LIVE STAKES SHOULD BE FROM AT MINIMUM 2-YEAR OLD STOCK.
3. LIVE STAKES ARE TO BE INSTALLED AT A DENSITY OF 3 STAKES PER SQUARE METRE.
4. LIVE STAKES SHOULD BE PRE-SOAKED (SUBMERGED IN WATER) FOR AT LEAST 24 HOURS AFTER HARVESTING AND IMMEDIATELY BEFORE INSTALLATION.
5. LIVE STAKES SHOULD NOT BE STORED FOR A PERIOD LONGER THAN 2 DAYS, UNLESS THEY ARE BEING SOAKED.
6. THE CONTRACTOR SHALL PROTECT PLANT MATERIALS FROM DRYING FROM THE TIME OF HARVEST UNTIL INSTALLED.
7. LIVE STAKES ARE TO BE A MINIMUM OF 25 mm IN DIAMETER AND CUT TO A LENGTH OF 1000 mm.
8. CUT ANGLE AT THE BOTTOM OF THE STAKE AND FLAT ON THE TOP.
9. TRIM ALL SIDE BRANCHES WHILE TAKING CARE NOT TO DAMAGE THE BARK.
10. INSTALL STAKES WITH BUDS POINTING UPWARDS AND THICKER STEM IN THE BED.
11. LIVE STAKES SHOULD BE INSTALLED USING A LARGE RUBBER MALLET.
12. 80% OF THE STAKE IS TO BE BELOW SURFACE.
13. TAMP THE LIVE STAKE INTO THE GROUND AT RIGHT ANGLE TO THE SURFACE.
14. IN COMPACT SOIL A PILOT HOLE SHOULD BE USED TO LIMIT DAMAGE TO THE STAKES.
15. IF USING A PILOT HOLE REPACK SOIL AROUND THE LIVE STAKE.
16. LIVE STAKES SHOULD STAND FIRM FROM THE SOIL FOLLOWING INSTALLATION.
17. ALL STAKES NOT PLANTED TO THE SPECIFICATIONS ABOVE WILL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

LIVE STAKE
N.T.S.

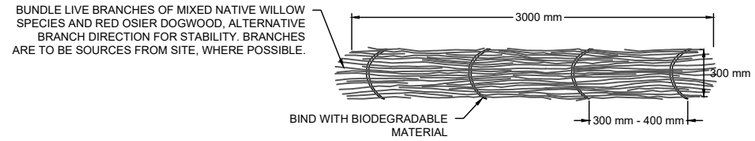


PROFILE



CROSS SECTION

TYPICAL CASCADE
N.T.S.



NOTES

1. WATTLES TO BE INSTALLED IN A 400 mm WIDE TRENCH AND STAKED EVERY METER.
2. WATTLE AND GRADING INSTALLATION TO RESULT IN A LEVEL BERM WITHOUT BREAKS.
3. MATCH GRADES AS SHOWN IN PLAN.

WATTLE/ FASCINE DETAIL
N.T.S.

DESIGNED BY: P.V.	CHECKED BY: P.V.
DRAWN BY: B.W.M.	DATE: FEBRUARY 2020

GEO MORPHIX
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MAYFIELD WEST PHASE 2
STAGE 2

RESTORATION TYPICALS

PROJECT No.:19130	DRAWING No.: TYP-2
SCALE: AS NOTED	SHEET 2 OF 2

FIGURES & DRAWINGS

Figure 1: Study Area

Figure 2: Mayfield West Endorsed Framework Plan

Figure 3: Mayfield West Preferred Framework Plan

Figure 4: Surficial Geology

Figure 5: Piezometric Surface and Groundwater Flow

Figure 6: Drawing 507 – Mayfield West Phase 2 LID Map

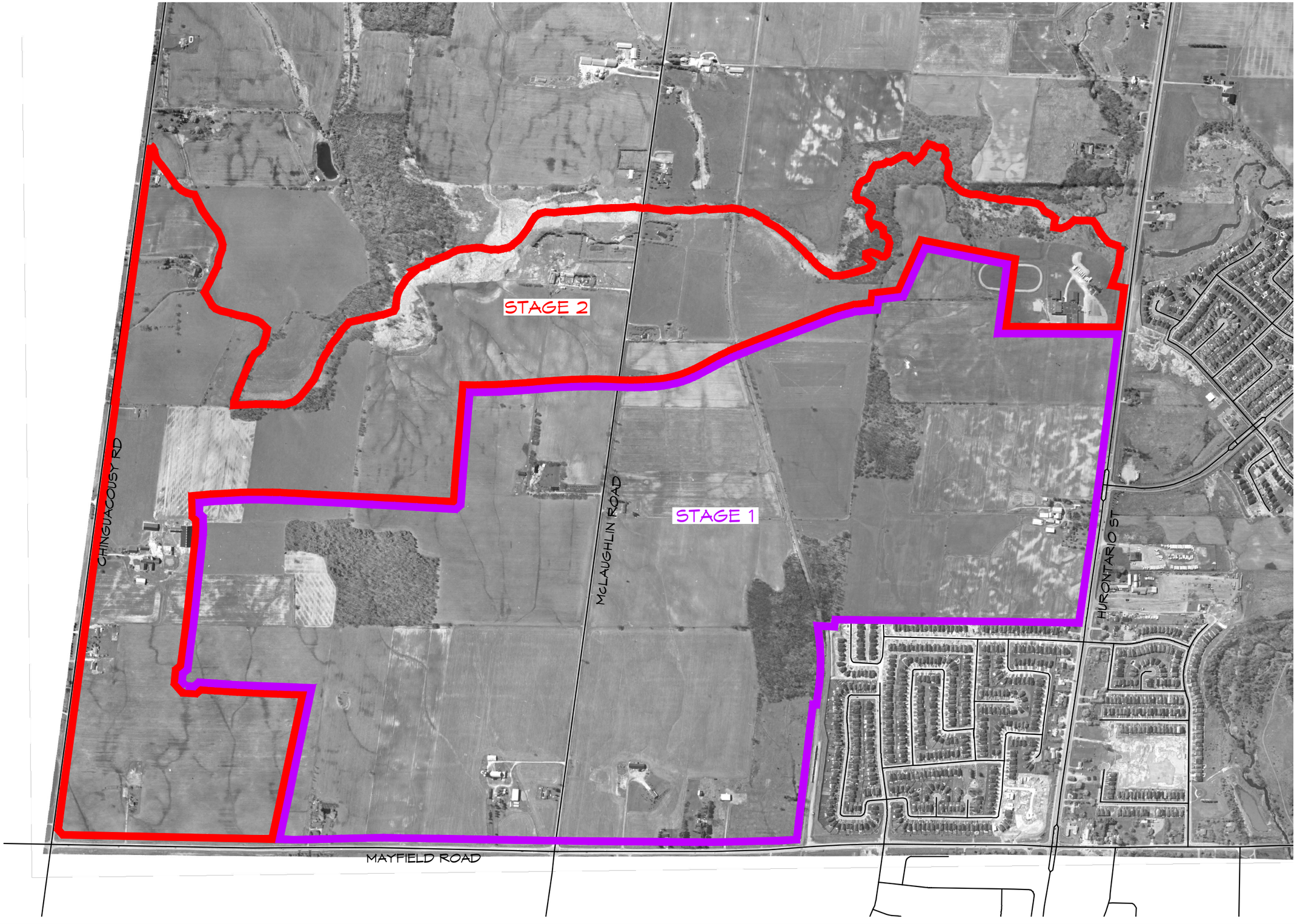
Figure 7: MOECC Water Wells

Figure 8: Source Water Protection

Figure 9: Drawing C-1, Constraints to Development

Figure 10: Drawing 101B, Constraints to Development Characterization of Proposed Conditions

Figure11: Mayfield West Phase 2 Reach Reference Plan and Net Watercourses Constraint Ranking



Key Plan *(n.t.s.)*

Legend

- PHASE 2 / STAGE 1 BOUNDARY
- PHASE 2 / STAGE 2 BOUNDARY
- EXISTING ROADS

N

0 50 100 200 300 400 m

1 : 10,000

No.	Revision	Date	Init

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE CONSULTANT BEFORE COMMENCING OR PROCEEDING WITH ANY WORK.

DO NOT SCALE THIS DRAWING.

Hensel Design Group
Advancing Sustainable Development Solutions
372 Peel St, Collingwood, Ontario, L9Y 3W4
Phone: 705-443-8394 Fax: 705-443-8494

PROJECT

MAYFIELD WEST
PHASE 2 / STAGE 2
Caledon, Ontario

TITLE

STUDY
AREA

SEAL

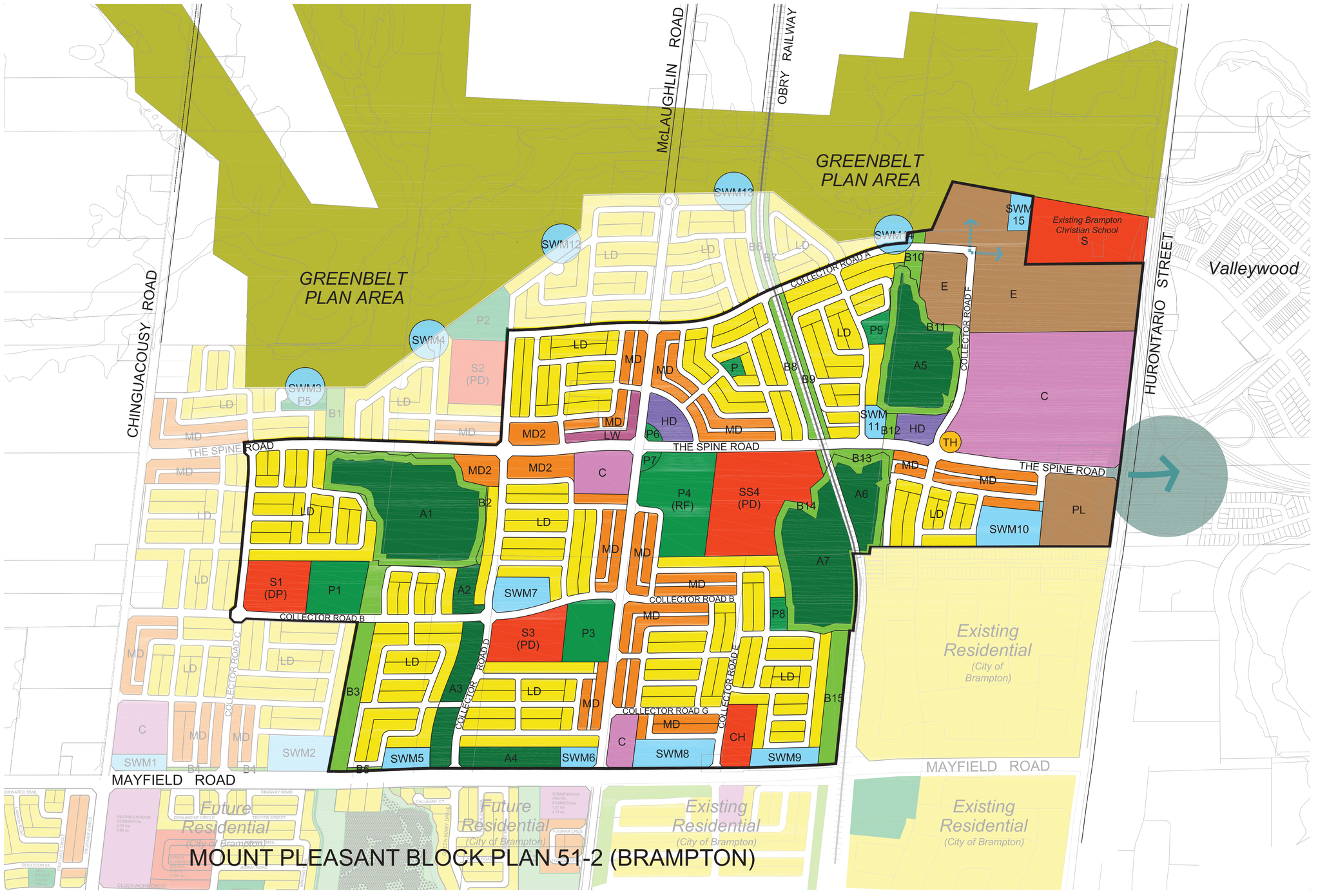
SEAL — ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS — MICHAEL J. HENSEL — OALA — MEMBER

Scale:	1:10,000
Date:	January 2018
CAD File:	HDG-SA
Drawn by:	C.M.
Checked by:	M.H.
Job No.:	-

Drawing No.

Figure 1

Date Plotted: January 4, 2018 File Location: Q:\Projects\HDG\Mayfield\ACAD\DWG\HDG\Jan 2018\HDG-SA.dwg



LEGEND

- C — COMMERCIAL
- E — EMPLOYMENT
- LD — LOW DENSITY (SINGLE / SEMI-DETACHED)
- MD — MEDIUM DENSITY (TOWNHOUSE)
- MD2 — MEDIUM DENSITY 2 (STACKED TOWNHOUSE)
- HD — HIGH DENSITY (CONDOS / APARTMENT)
- LW — LIVE-WORK UNITS
- PL — PEEL REGION POLICE FACILITY
- S — ELEMENTARY SCHOOL (PD - Peel District) (DP - Dufferin-Peel)
- SS — SECONDARY SCHOOL (PD - Peel District)
- P — PARK
- P(RF) — RECREATION FACILITY
- SWM — STORMWATER POND FACILITY
- SWM — CONCEPTUAL STORMWATER POND FACILITY (TRCA JURISDICTION)
- TH — TRANSIT HUB
- CH — EXISTING CHURCH
- A — GREENLANDS A
- B — GREENLANDS B
- GREENBELT PLAN AREA
- PROPOSED FUTURE MODIFIED INTERCHANGE

NOTE:

- PLAN IS PRELIMINARY AND IS NOT TO BE USED TO DEFINE THE ULTIMATE LOCATION, EXTENT AND SIZING OF TRANSPORTATION AND SERVICING INFRASTRUCTURE, LAND USES, LIMITS TO THE NATURAL HERITAGE SYSTEM, STORMWATER MANAGEMENT FACILITIES AND POTENTIAL NATURAL LINKAGES. THESE COMPONENTS ARE TO BE DEFINED THROUGH APPROPRIATE DETAILED TECHNICAL STUDIES.
- FOR THE PURPOSE OF CALCULATING THE LAND BUDGET NECESSARY TO ACHIEVE THE GREENFIELD DENSITY TARGETS PROPOSED FOR THE SECONDARY PLAN, THE FOLLOWING DIMENSIONS HAVE BEEN USED TO PREPARE THE DRAFT CONCEPTUAL BLOCK PLAN:
  1. GREENLANDS A:
     EXISTING WOODLOTS - MEASURED FROM STAKED DRIPLINE CONDUCTED IN SUMMER 2011.
     PROTECTED HEADWATER FEATURE CHANNEL WIDTH - 60 METRES.
  2. GREENLANDS B:
     INTRODUCED GREEN LINKAGE WIDTH - 50 METRES
     BUFFER AREA WIDTH - 20 METRES
     OBRY RAIL BUFFER WIDTH - 15 METRES
     MAYFIELD ROAD BUFFER WIDTH - 10 METRES

  THE ULTIMATE RECOMMENDED BOUNDARIES, LOCATION, WIDTH AND ROLES OF THE GREENLANDS A AND GREENLANDS B WILL BE DETERMINED THROUGH THE TOWN'S ONGOING COMPREHENSIVE ENVIRONMENTAL IMPACT STUDY & MANAGEMENT PLAN.

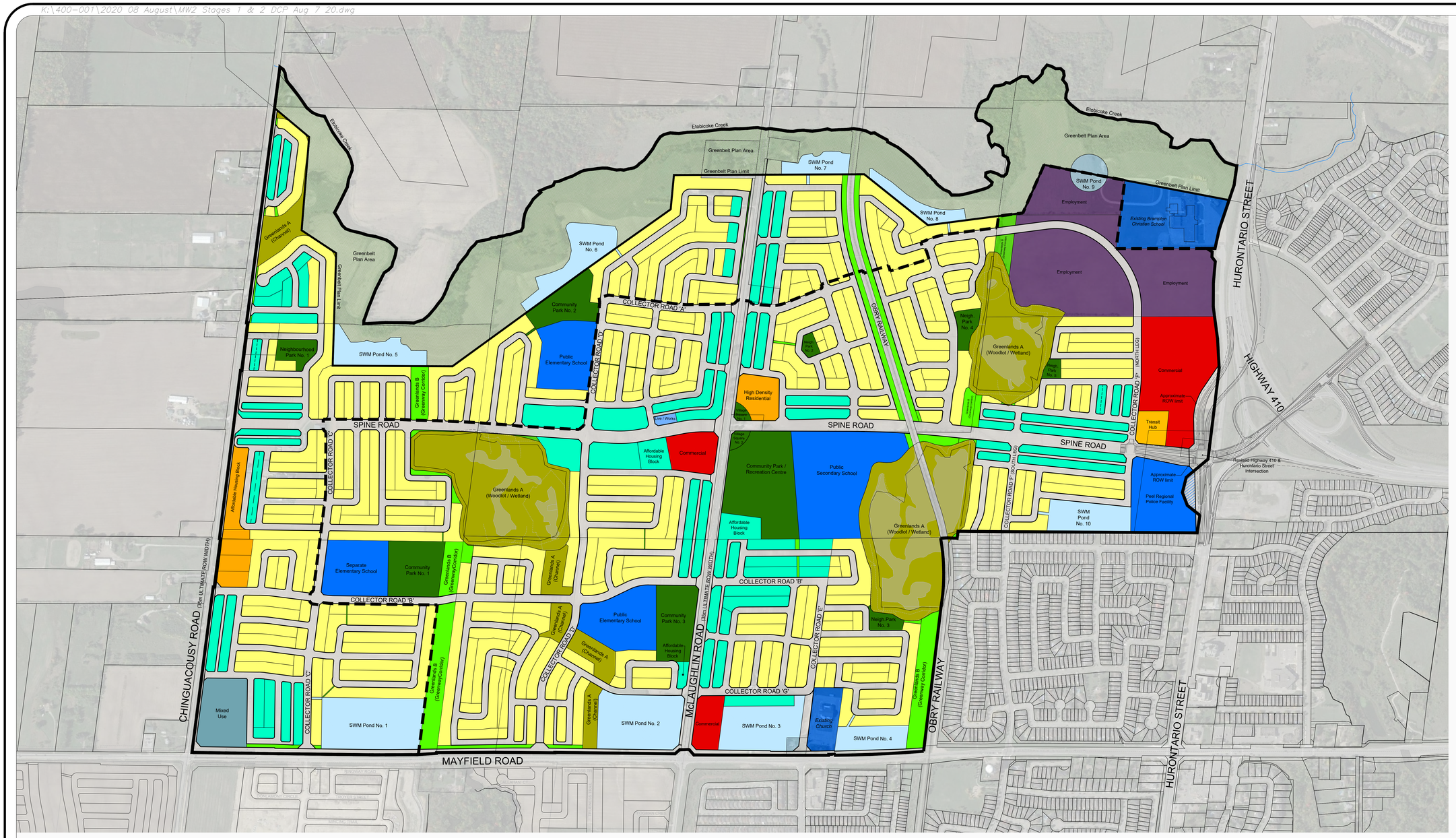
0 100 250 500

ENDORSED FRAMEWORK PLAN

Figure 100

Figure 2

K:\400-001\2020 08 August\MW2 Stages 1 & 2 DCP Aug 7 20.dwg



LEGEND

- Low-Density Residential
- Medium-Density Residential
- High-Density Residential
- Prestige Industrial
- General Commercial
- Mixed Use
- Live-Work
- Institutional
- Open Space Policy Area
- Environmental Policy Area
- Stormwater Pond Facility
- Greenway Corridor
- Transit Hub
- Greenbelt Plan Area
- Stage 1 / 2 Boundary
- MW2 Boundary (Stage 1 & Stage 2)

POPULATION CALCULATION - STAGE 1

LAND USE	AREA (ha)	PROPOSED DENSITY (UPH)[1]	TOTAL NUMBER OF UNITS	PERSONS PER UNIT[2]	POPULATION
LOW-DENSITY *(ALLOWS FOR: DETACHED, SEMI-DETACHED & TOWNHOUSES)*	64.34	32.36	2,082	3.21	**6,633**
MEDIUM-DENSITY *(ALLOWS FOR: TOWNHOUSES)*	20.01	56.27	1,126	2.97	**3,344**
HIGH-DENSITY *(ALLOWS FOR: TOWNHOUSES & APARTMENTS)*	1.34	128.36	172	2.16	**372**
LIVE-WORK	0.16	50.00	8	2.97	**24**
TOTALS	**85.85**	39.46	**3,388**		**10,373**

JOBS CALCULATION - STAGE 1

LAND USE	NUMBER OF JOBS
LIVE-WORK, COMMERCIAL & TRANSIT HUB	1,380
REGION OF PEEL POLICE BLOCK	600
ELEMENTARY, SECONDARY SCHOOLS & RECREATION CENTRE	210
PRESTIGE INDUSTRIAL	1,164
WORK-AT-HOME / NO FIXED PLACE OF WORK	445
TOTALS	**3,799**

TOTAL POPULATION & JOBS	TOTAL DESIGNATED GREENFIELD AREA[3]	TOTAL DENSITY
14,172	**207.5ha**	**68.3 PEOPLE & JOBS PER HECTARE**

POPULATION CALCULATION - STAGE 2

LAND USE	AREA (ha)	PROPOSED DENSITY (UPH)[4]	TOTAL NUMBER OF UNITS	PERSONS PER UNIT[5]	POPULATION
LOW DENSITY *(ALLOWS FOR: DETACHED, SEMI-DETACHED & TOWNHOUSES)*	44.36	32	1,420	3.51	**4,983**
MEDIUM DENSITY *(ALLOWS FOR: TOWNHOUSES)*	11.08	56	620	2.97	**1,841**
HIGH-DENSITY *(ALLOWS FOR: TOWNHOUSES & APARTMENTS)*	2.40	150	360	2.16	**778**
TOTALS	**55.44**		**2,400**		**7,602**

JOBS CALCULATION - STAGE 2

LAND USE	NUMBER OF JOBS
MIXED USE	148
BRAMPTON CHRISTIAN SCHOOL	60
PROPOSED ELEMENTARY SCHOOL	55
WORK-AT-HOME / NO FIXED PLACE OF WORK	286
TOTALS	**549**

TOTAL POPULATION & JOBS	TOTAL DESIGNATED GREENFIELD AREA[3]	TOTAL DENSITY
8,151	**105.5ha**	**77.3 PEOPLE & JOBS PER HECTARE**

POPULATION CALCULATION - STAGES 1 & 2

LAND USE	POPULATION
LOW-DENSITY *(ALLOWS FOR: DETACHED, SEMI-DETACHED & TOWNHOUSES)*	**11,616**
MEDIUM-DENSITY *(ALLOWS FOR: TOWNHOUSES)*	**5,185**
HIGH-DENSITY *(ALLOWS FOR: TOWNHOUSES & APARTMENTS)*	**1,150**
LIVE-WORK	**24**
TOTALS	**17,975**

JOBS CALCULATION - STAGES 1 & 2

LAND USE	NUMBER OF JOBS
LIVE-WORK, COMMERCIAL, MIXED USE & TRANSIT HUB	1,528
REGION OF PEEL POLICE BLOCK	600
ELEMENTARY, SECONDARY SCHOOLS & RECREATION CENTRE	325
PRESTIGE INDUSTRIAL	1,164
WORK-AT-HOME / NO FIXED PLACE OF WORK	731
TOTALS	**4,348**

TOTAL POPULATION & JOBS	TOTAL DESIGNATED GREENFIELD AREA[3]	TOTAL DENSITY
22,323	**313.0ha**	**71.3 PEOPLE & JOBS PER HECTARE**

MAYFIELD WEST PHASE 2: PROPOSED STAGES 1 & 2 DEVELOPMENT CONCEPT PLAN

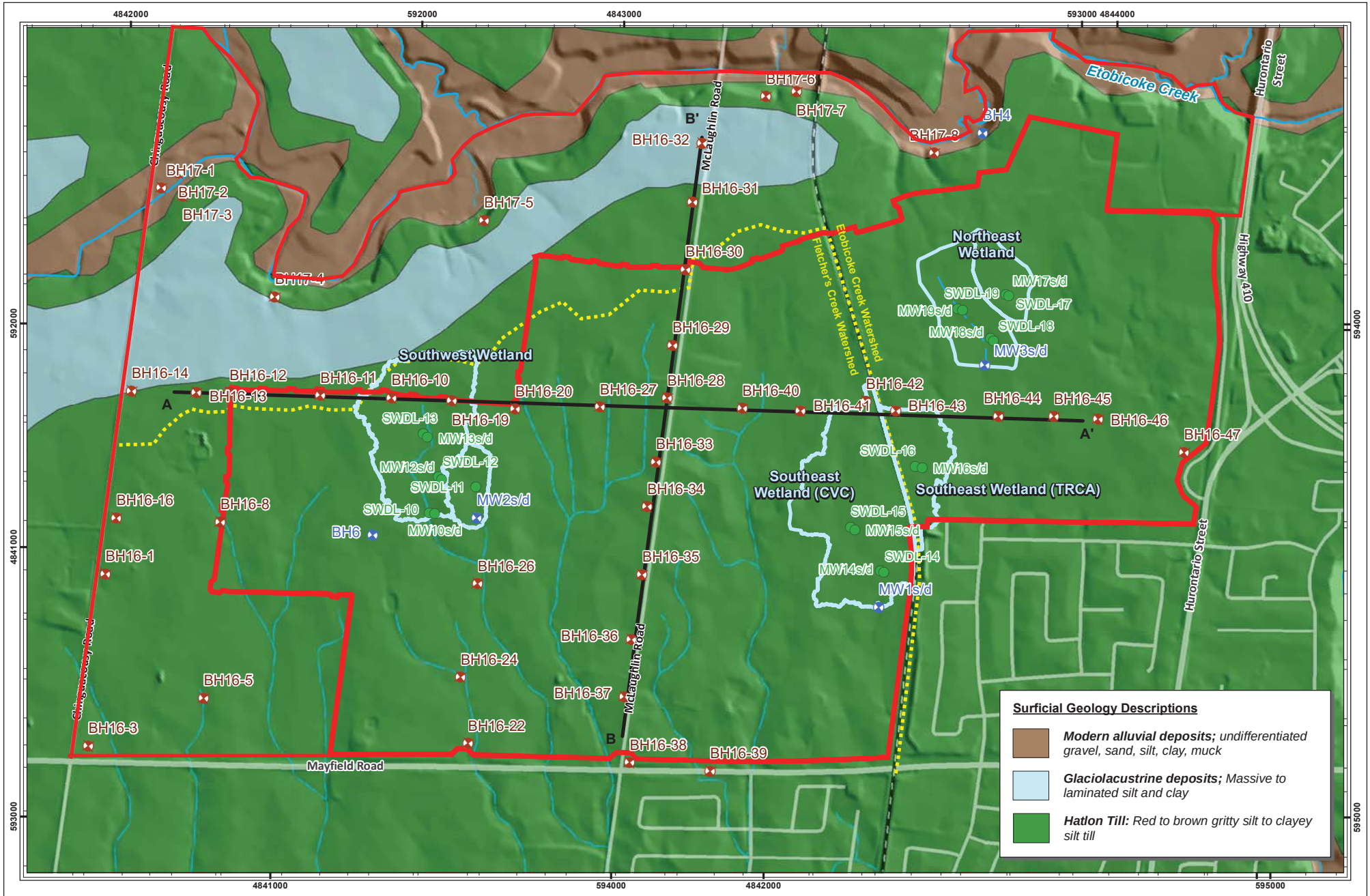
PART OF LOTS 18 - 20, CONCESSIONS 1 & 2, W.H.S.
TOWN OF CALEDON, REGIONAL MUNICIPALITY OF PEEL

Figure 3

NOTES:
1 BASED ON ACTUAL DENSITY ACHIEVED IN MAYFIELD WEST PHASE 2, STAGE 1.
2 PERSONS PER UNIT RATE PROVIDED BY THE TOWN OF CALEDON.
3 AREA CALCULATED AS PER GROWTH PLAN POLICY 2.2.7.3
4 BASED ON AVERAGE DENSITY ACHIEVED IN MAYFIELD WEST PHASE 2, STAGE 1.
5 PERSONS PER UNIT RATE PROVIDED BY REGION OF PEEL.

SCALE 1:4000
(36 x 48)
AUGUST 7, 2020

GSAI



Project: Mayfield West FBWB

Client: GSAI

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN:B. Elder
CHECKEDJ. Cole
PROJECT: 160581
DATE: Apr 24, 2018

LEGEND

- Mayfield West Stage 2 Boundary
- Watershed/Conservation Authority Boundary
- Monitoring Well
- Borehole
- Wetland Hydroperiod Monitor
- Wetland Catchment
- Road
- Railway
- Watercourse
- Watercourse (Intermittent)

DATA SOURCES: Surficial geology from Ontario Geological Survey 2010, Surficial Geology of Southern Ontario. Property boundaries, contours provided by Urbantech Consulting. Watercourses (Ontario Hydrographic Network) and Roads (National Road Network) provided under the Open Government Licence – Ontario. Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions, Landsat / Copernicus).

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

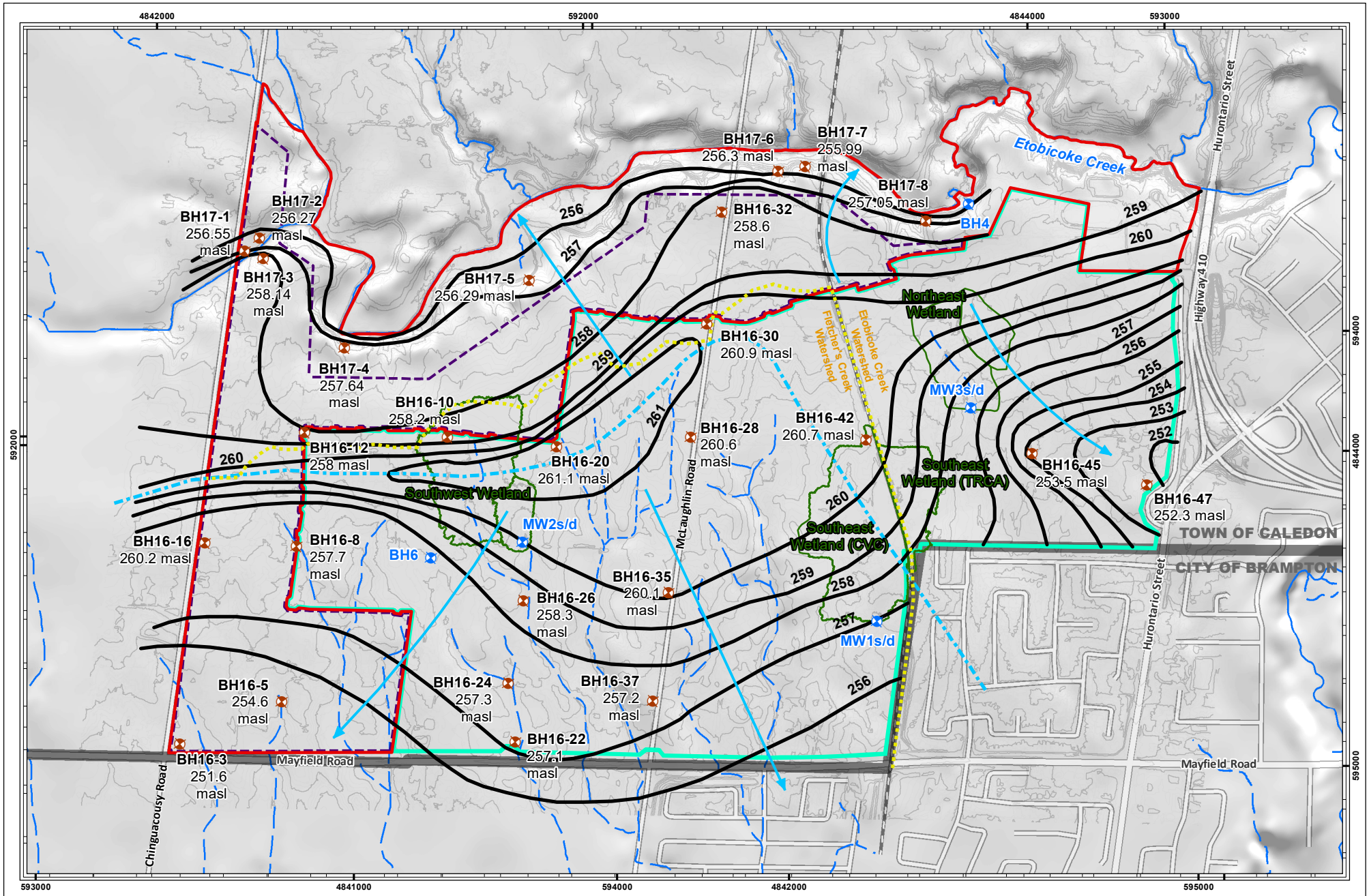
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METRES

Surficial Geology

FIGURE 4

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Project: Mayfield West FBWB

Client: GSAI

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: J. Cole
PROJECT: 160581
DATE: Jun 29, 2018

LEGEND

- Monitoring Well
- Borehole
- Watershed/Conservation Authority Boundary
- Wetland Catchment
- Potentiometric Surface (masl)
- 256 Groundwater Elevation (masl)
- Groundwater Flow Direction
- Groundwater Divide
- Watercourse
- Watercourse (Intermittent)
- Existing Stage 1 Boundary
- Proposed Stage 2 Future Expansion Area (ROPA)
- Future Development Boundary
- Contour (1 m)
- Road
- Railway

DATA SOURCES: Property boundaries, contours provided by Urbantech Consulting. Watercourses (Ontario Hydrographic Network) and Roads (National Road Network) provided under the Open Government Licence – Ontario.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

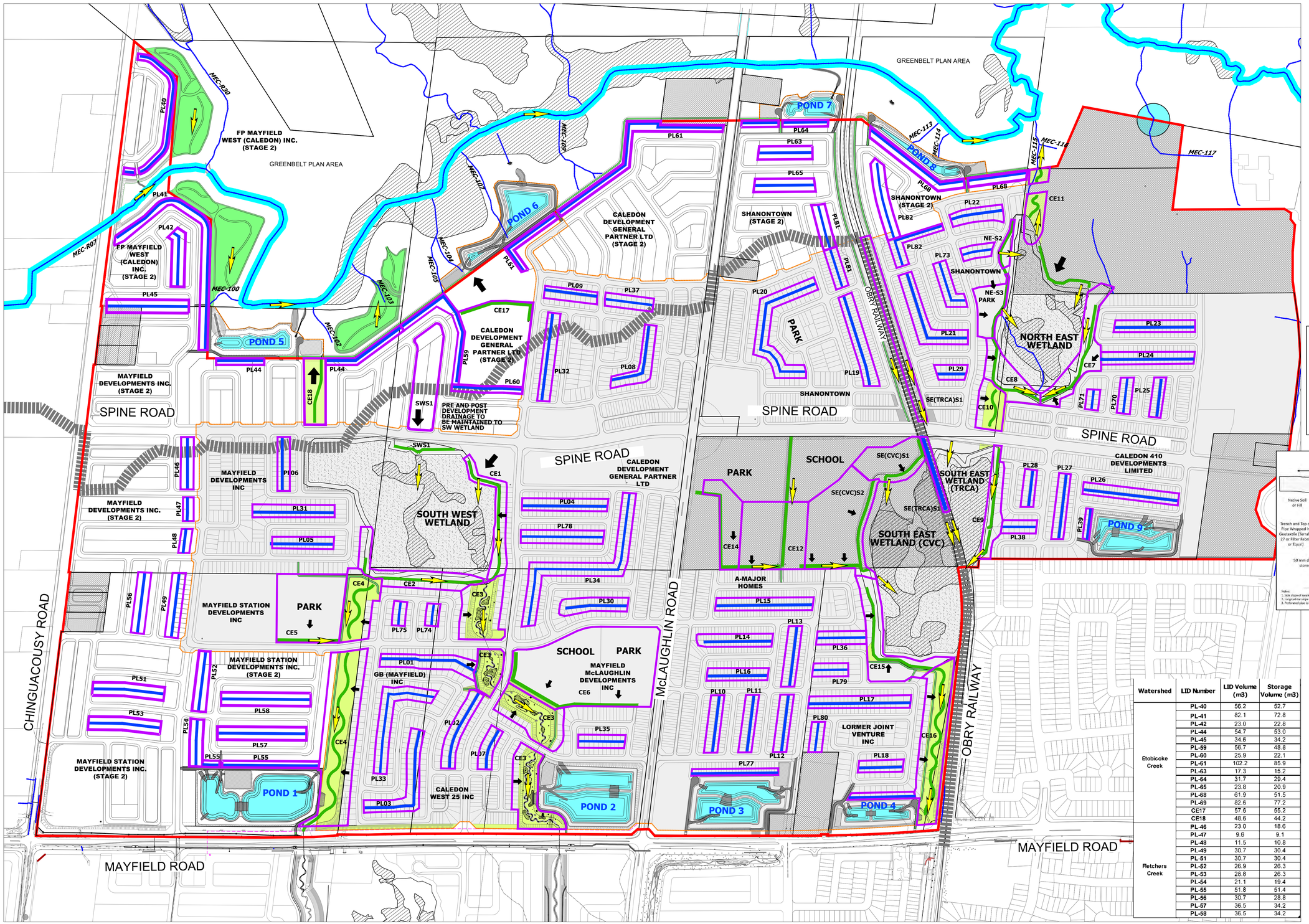
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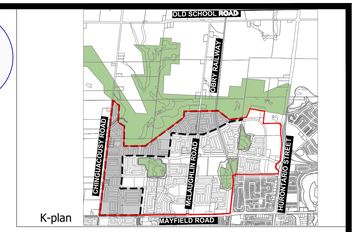
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METRES

Piezometric Surface and Groundwater Flow

FIGURE 5

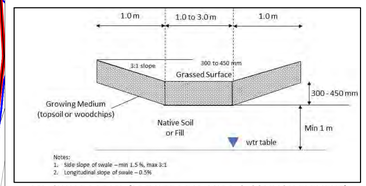
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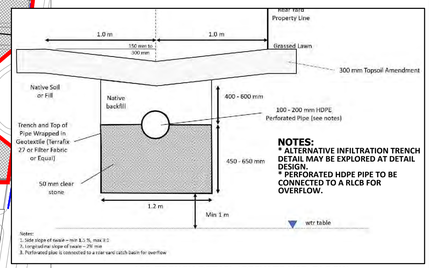


LEGEND:

- MAYFIELD WEST 2 FRAMEWORK PLAN LIMIT
- EXISTING ETOBICOKE CREEK
- EXISTING FLETCHERS/ETOBICOKE CREEK WATERSHED BOUNDARY
- PROPOSED GREEN CORRIDOR WITHIN MW2 LIMIT
- PROPOSED GREENBELT CORRIDOR GRADING AND RESTORATION AREA
- STAGE 1 LANDS
- PROPOSED DRAINAGE BOUNDARY TO LID FEATURE
- DIRECTION OF SURFACE FLOW CONTRIBUTING TO LID FEATURE
- PRIVATE LID FEATURE
- PUBLIC LID FEATURE
- DIRECTION OF SURFACE FLOW ENTERING AND WITHIN OPEN SPACE BLOCKS



LID SWALE DETAIL (PRIVATE REAR-YARD & COMMON ELEMENT)



NOTES:
* ALTERNATIVE INFILTRATION TRENCH DETAIL MAY BE EXPLORED AT DETAIL DESIGN.
* PERFORATED HDPE PIPE TO BE CONNECTED TO A RLCB FOR OVERFLOW.

LID TRENCH DETAIL (PRIVATE MID-BLOCK)

Watershed	LID Number	LID Volume (m3)	Storage Volume (m3)
Etobicoke Creek	PL-40	56.2	52.7
	PL-41	82.1	72.8
	PL-42	23.0	22.8
	PL-44	54.7	53.0
	PL-45	34.8	34.2
	PL-59	56.7	48.8
	PL-60	25.9	22.1
	PL-61	102.2	85.9
	PL-63	17.3	15.2
	PL-64	31.7	29.4
	PL-65	23.8	20.9
	PL-68	61.9	51.5
	PL-69	82.6	77.2
	CE17	57.6	55.2
	CE18	48.6	44.2
Fletchers Creek	PL-46	23.0	18.6
	PL-47	9.6	9.1
	PL-48	11.5	10.8
	PL-49	30.7	30.4
	PL-51	30.7	30.4
	PL-52	26.9	26.3
	PL-53	28.8	26.3
	PL-54	21.1	19.4
	PL-55	51.8	51.4
	PL-56	30.7	28.8
	PL-57	36.5	34.2
	PL-58	36.5	34.2

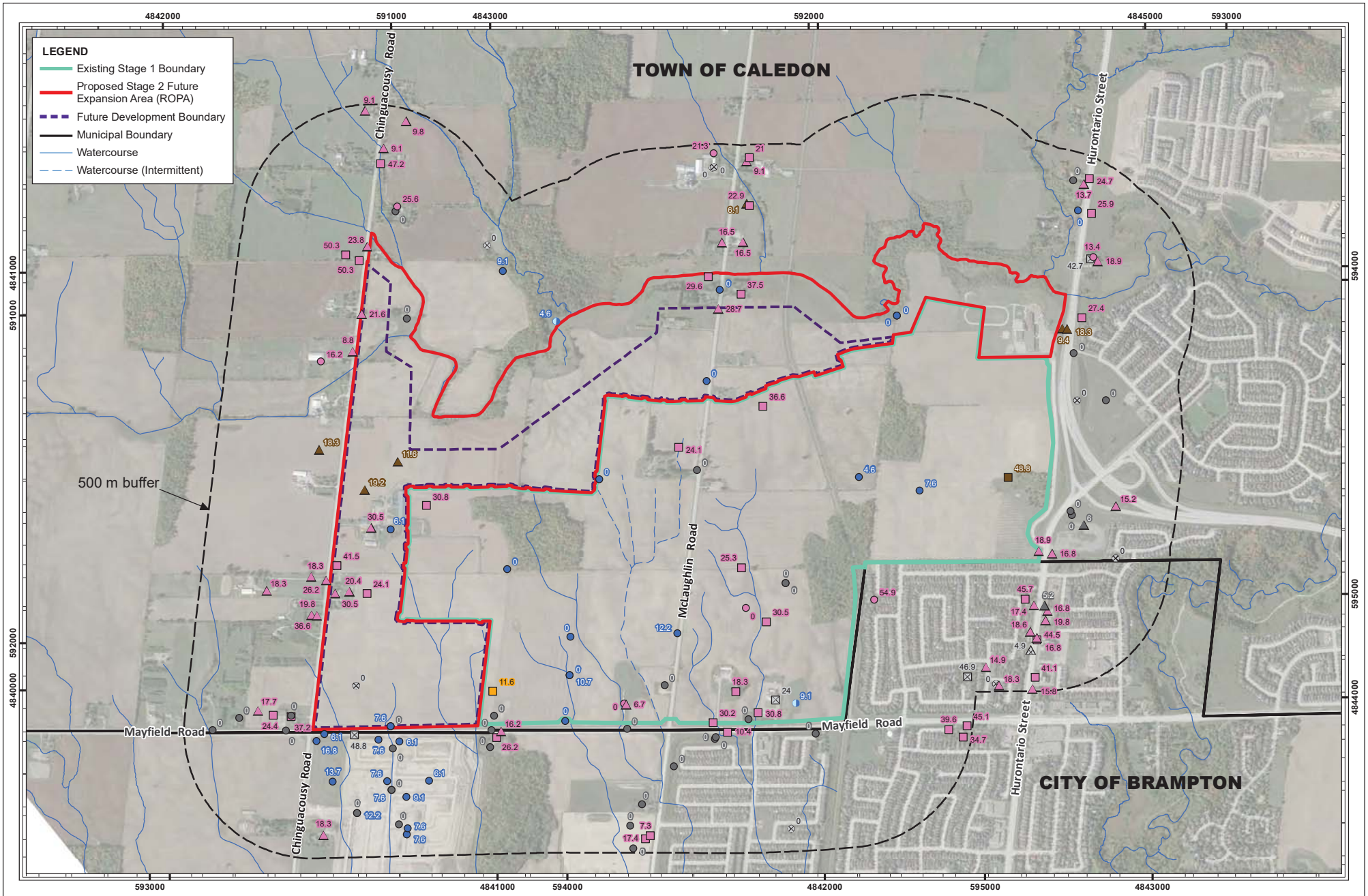
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Urbantech Consulting, A Division of Lighthorn Zen Ltd.
3761 nashua drive, mississauga, ontario, L4V 1R7
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TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2

MW2 LID MAP

SURVEYED BY:	R.P.E.	DATE:	2015	JOB NO.	15-483
DRAWN BY:	D.L.	CHECKED BY:	D.Z.	DRAWING NO.	SHEET NO.
DESIGNED BY:	D.Z.	CHECKED BY:	D.Z.	507	
SCALE:	1:4000	DATE:	JANUARY 2020		

File: P:\Projects\LS-483\STAGE 2 MW2 FSR\05 - STORM SERVICING - STAGE 2\507_LID Map.dwg - Revised by <DZEC> - Sat, Jan 04 2020 - 10:22am



Project: Mayfield West CEISMP Part B

Client: GSAI

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: J. Cole
PROJECT: 160581
DATE: Jan 04, 2018

MOECC Water Wells - Land Use

- Monitoring and Test Hole, unknown
- Monitoring, unknown
- Domestic, unknown; Domestic/Livestock, unknown
- Domestic, bedrock
- Domestic, overburden
- Livestock, overburden; Livestock/Domestic, overburden
- Livestock/Domestic, bedrock
- Irrigation/Domestic, bedrock
- Not Used, unknown
- Not Used, overburden
- Not Used, bedrock
- unknown
- unknown use, overburden

Note: Well depths in metres.

DATA SOURCES: Ministry of the Environment and Climate Change (Well Record Information System). Ontario Ministry of Natural Resources and Forestry (Ontario Hydrographic Network). Ontario Municipal Affaris (Municipal boundaries). Imagery ©2017 Google.

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

SCALE: 1:20,000

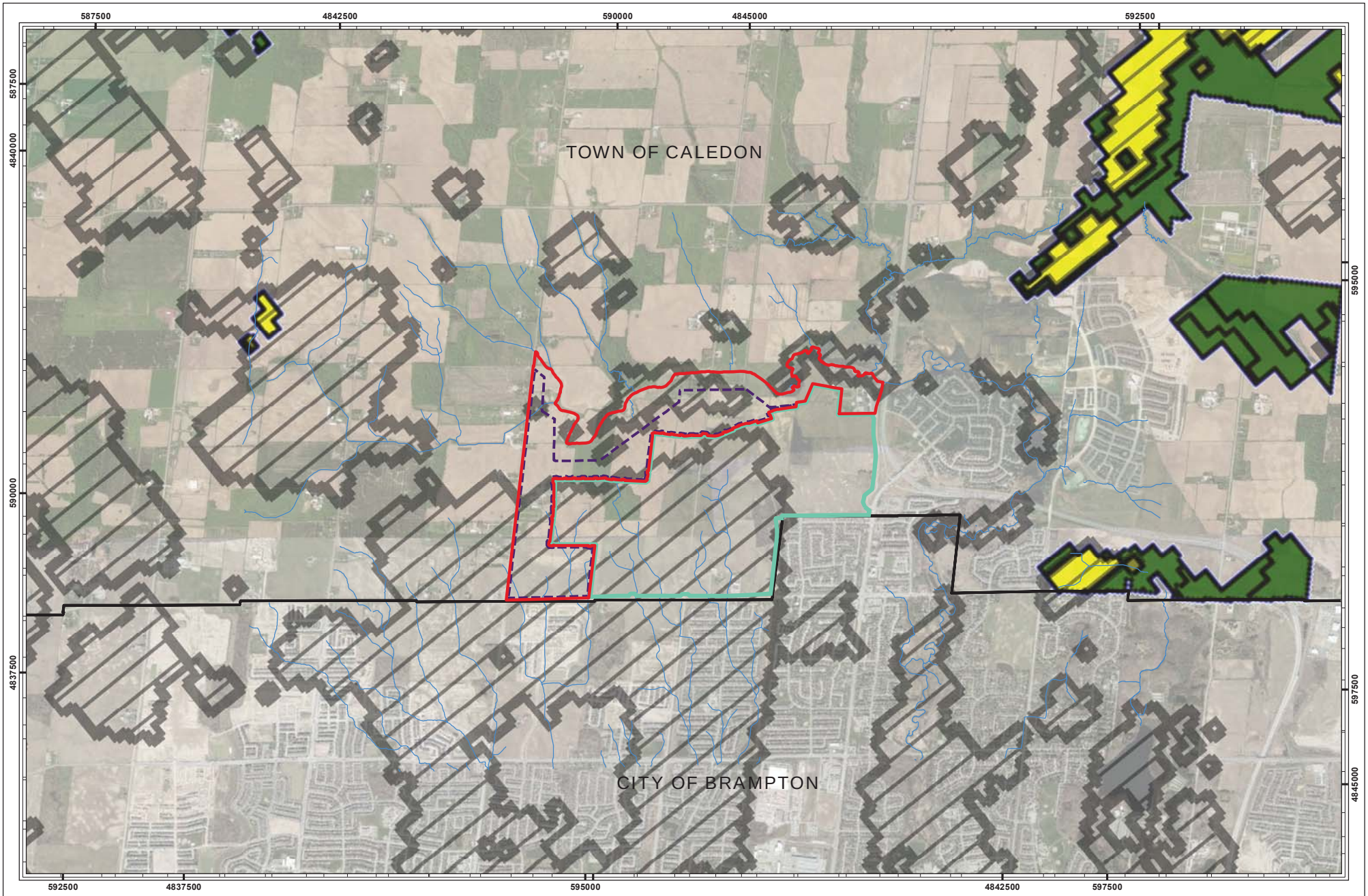
0 0.25 0.5
KILOMETRES

MOECC Water Wells

FIGURE 7

Document Path: C:\Egnyte\Shared\Projects\Active\16058 - GSAI\160581 - Mayfield West EIR Phase 2\Mapping\mxd\160581_Figure3_MOECC.mxd

Service Layer Credits:



Project: Mayfield West EIR Stage 2

Client: GSAI

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: J. Cole
PROJECT: 160581
DATE: Jun 29, 2018

LEGEND

- Existing Stage 1 Boundary
- Proposed Stage 2 Future Expansion Area (ROPA)
- Future Development Boundary
- Municipal Boundary
- Watercourse

Significant Groundwater Recharge Areas

2 | 4 | 6

Well Head Protection Areas

A | B | C(C1) | D | F

Highly Vulnerable Aquifer

DATA SOURCES: Ministry of the Environment and Climate Change (Source Water Protection Information Atlas - © Queen's Printer for Ontario, 2017). Ontario Ministry of Natural Resources and Forestry (Ontario Hydrographic Network). Ontario Municipal Affairs (Municipal boundaries).

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

SCALE: 1:40,000

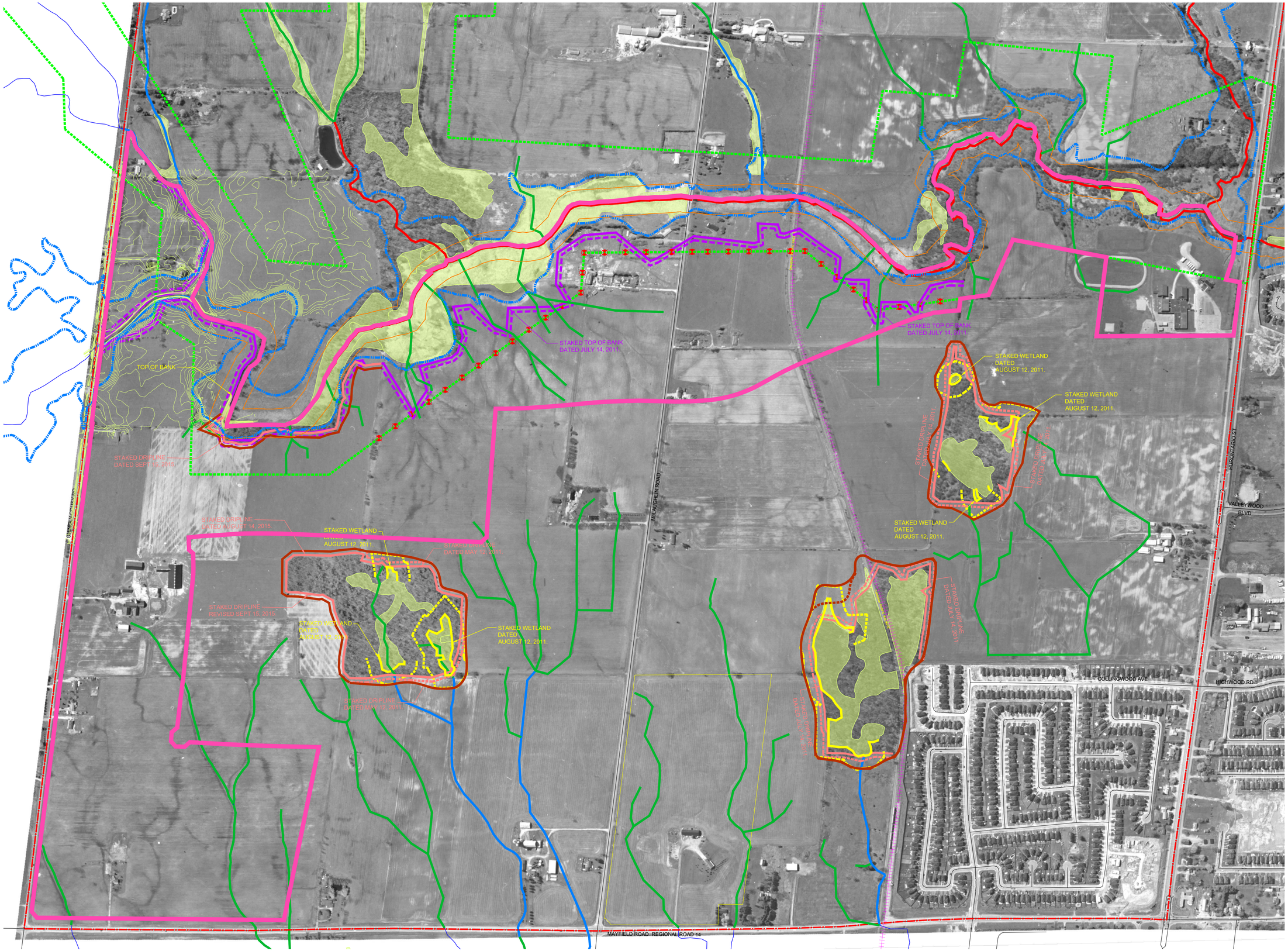
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KILOMETRES

Source Water Protection

FIGURE 8

Document Path: C:\Egnyte\Shared\Projects\Active\16058 - GSAI\160581 - Mayfield West EIR Phase 2\Mapping\mxd\160581_Figure1_WPzones.mxd

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- APPROXIMATE PROPERTY BOUNDARY
- STAGE 2 BOUNDARY
- GREENBELT LIMIT
- ENGINEERED FLOODLINE (TRCA)
- GREENBELT STAKES
- MNRF PROVINCIALLY SIGNIFICANT WETLAND (OCTOBER 29, 2015)
- MEANDER BELT
- WOODLAND DRIPLINE
- WOODLAND SETBACK (10 METRES)
- TOP OF BANK (A GEOTECHNICAL ANALYSIS WILL BE UNDERTAKEN TO DETERMINE THE LONG TERM STABLE TOP OF SLOPE AND 10 METRE BUFFER TO INFORM THE LIMITS OF DEVELOPMENT FOR DRAFT PLANS OF SUBDIVISION)
- INTERIM TRCA TOP OF BANK SETBACK (10 METRES)
- TOP OF BANK
- STAKED & SURVEYED MINISTRY OF NATURAL RESOURCES (MNRF WETLAND BOUNDARY
- 30m WETLAND SETBACK (MAY BE NEGOTIABLE)
- ROADS
- RAILWAY
- WATERWAY (MNR)

WATERWAY CONSTRAINTS (Based on AMEC, Part B Report.)

- HIGH CONSTRAINT
- MEDIUM CONSTRAINT (CAN BE RELOCATED)
- LOW CONSTRAINT

WOODLAND AND WETLAND CONSTRAINTS

(Based on joint fieldwork completed by the MDS Consultants, TRCA, CVC and MNRF.)

- COMBINED WOODLAND CONSTRAINT PLUS 10m AND WETLAND CONSTRAINTS PLUS 30m

N

0 20 40 80 120 160 m

1 : 4000

No.	Revision	Date	Init
5	REVISED AS PER AGENCY COMMENTS	SEPT 27/17	MH
4	ADDED MEANDER BELT	SEPT 17-17	MH
3	REVISED TO ADD ENGINEERED FLOODPLAIN	MAR 21-17	MH
2	REVISED TO ADD ADDITIONAL CONSTRAINT INFO	NOV 03-15	MH
1	REVISED AS PER TRCA COMMENTS	SEPT 25-14	MH

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE CONSULTANT BEFORE COMMENCING OR PROCEEDING WITH ANY WORK.

DO NOT SCALE THIS DRAWING.

Hensel Design Group
Advancing Sustainable Development Solutions
372 Peel St, Collingwood, Ontario, L9Y 3W4
Phone: 705-443-2324 Fax.: 705-443-2494

PROJECT

MAYFIELD WEST
Phase II
Town of Caledon, Ontario

TITLE

CONSTRAINTS TO DEVELOPMENT

SEAL

SEAL

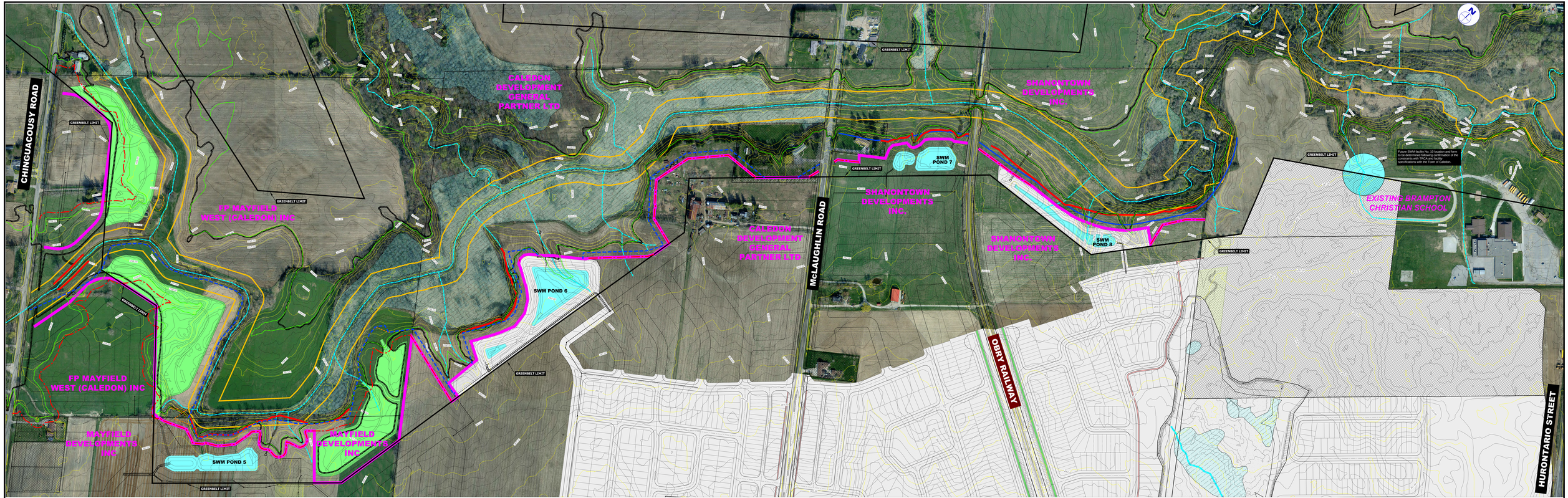
ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS — MICHAEL J. HENSEL — OALA MEMBER

Scale:	1:4000
Date:	MAY 2014
CAD File:	HDG_MYF_C-1
Drawn by:	CM
Checked by:	MH
Job No.:	-

DRAWING No.

C-1

Date Plotted: March 8, 2019 File Location: C:\Users\Admin\Desktop\HDG_MYF_C-1 - Standard\HDG_MYF_C-1.dwg



LEGEND:

- EX CONTOUR @ 25cm INTERVAL (BASED ON AVAILABLE LIDAR AND GROUND SURVEY INFORMATION)
- EX REACH/WATERCOURSE
- STAKED DRIPLINE (SEE NOTE 1.)
- STAKED TOP OF BANK (SEE NOTE 2.)
- MNRF PROVINCIALLY SIGNIFICANT WETLAND (SEE NOTE 3.)
- EXISTING REGIONAL FLOOD LINE (PREPARED BY URBANTECH BASED ON THE 2013 ETOBICOKE CREEK HYDROLOGY UPDATE STUDY)
- EXISTING CONSTRAINT LIMIT BASED ON TRCA LCP POLICY REQUIREMENTS (2011 TOP OF BANK STAKING WITH TRCA AND SETBACK, REFER TO DRAWING 101A)
- COMPOSITE MEANDER BELT WIDTH (SEE NOTE 4.)
- LONG TERM STABLE TOP OF SLOPE (SEE NOTE 5.)
- TRCA ACCEPTED TOP OF BANK IN PLACE OF THE 2011 STAKED TOP OF BANK TO DEFINE THE LEVEL OF FEATURE ENCROACHMENT FOR PONDS 7 AND POND 8 (SEE NOTE 6.)
- PROPOSED REGIONAL FLOOD LINE (PREPARED BY URBANTECH BASED ON THE 2013 ETOBICOKE CREEK HYDROLOGY UPDATE STUDY)
- PROPOSED GREENBELT CORRIDOR GRADING AND RESTORATION AREA
- LIMIT OF MW2 STAGE 1 WORK
- PROPOSED MASTER DEVELOPMENT LIMIT DETERMINED BY:

  1) GREATER OF:
  * 10m SETBACK FROM PROPOSED REGIONAL FLOOD LINE, OR
  * 10m SETBACK FROM TOP OF BANK, OR
  * 30m SETBACK FROM PSW

  OR 2) PREVIOUSLY AGREED UPON LIMITS OF POND ALTERATION

NOTES:

1. * DRIPLINE (FP MAYFIELD WEST) STAKED BY TRCA ON OCTOBER 6, 2017.
   * DRIPLINE (MAYFIELD DEVELOPMENTS INC.) STAKED BY TRCA ON SEPTEMBER 15, 2015.
2. * TOP OF BANK (FP MAYFIELD WEST) STAKED BY TRCA ON OCTOBER 6, 2017.
   * TOP OF BANK (CALEDON DEVELOPMENT) STAKED BY TRCA ON JULY 14, 2011.
   * TOP OF BANK (SHANONTOWN DEVELOPMENTS) STAKED BY TRCA ON JULY 14, 2011.
3. * PROVINCIALLY SIGNIFICANT WETLAND LIMIT WITHIN GREENBELT (CONFIRMED BY MNRF ON OCTOBER 28, 2015).
4. * MEANDER BELT WIDTH (GEOMORPHIX, 2017)
5. * LONG TERM STABLE TOP OF SLOPE (AS PER THE LTSTOS REPORT BY WSP, DATED NOVEMBER 23, 2018)
6. * REFINED TOP OF BANK - REFER TO A LETTER PREPARED BY DSEL ON BEHALF OF SHANONTOWN SUBDIVISION, AND SUBMITTED FOR TRCA RECORDS ON NOV. 20, 2017.

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CONSULTANTS

TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL
MAYFIELD WEST PHASE 2
STAGE 2

CONSTRAINTS TO DEVELOPMENT
CHARACTERIZATION OF
PROPOSED CONDITIONS

SURVEYED BY:	K.P.S.	DATE:	2019	JOB NO:	17-483
DRAWN BY:	K.P.	CHECKED BY:	N.T.	DRAWING NO:	
DESIGNED BY:	K.S.	CHECKED BY:	N.T.		101B
PLOTTED:	17th	APR.	2019	SCALE:	AS SHOWN

File: P:\Projects\17-483\Reports\2019MP\Part B\DRAWINGS\101B - MW2 Constraint Mapping (Proposed Conditions).dwg - Revised by: rlobb - Wed, Jun 26 2019 - 1:49pm

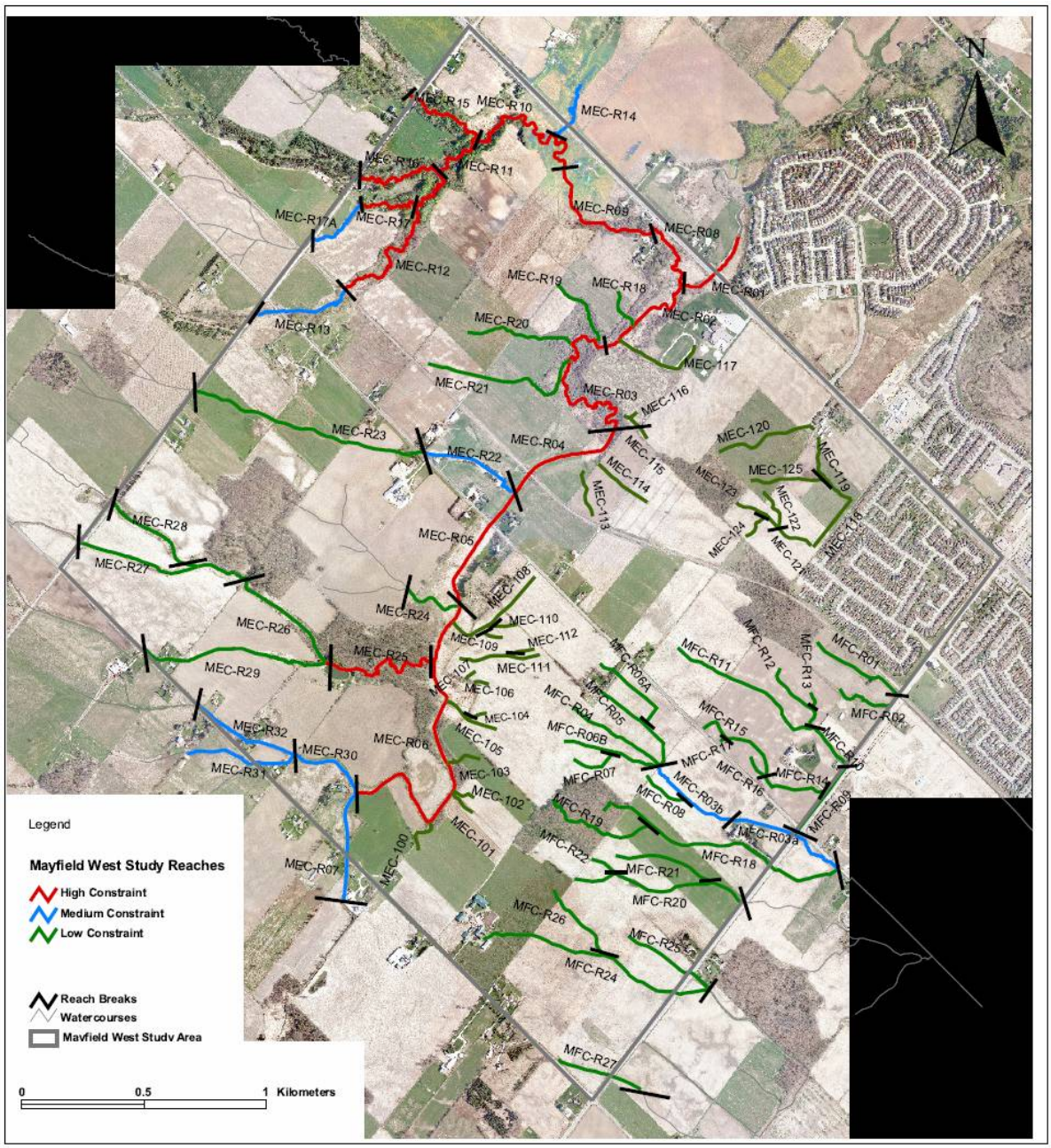


Figure 11 Mayfield West Phase 2 Reach Reference Plan and Net Watercourses Constraint Ranking