APPENDIX A

Natural Heritage Report

PALMER ENVIRONMENTAL CONSULTING GROUP INC.
74 Berkeley Street, Toronto, ON M5A 2W7

Southdown District Stormwater Servicing and Environmental Management Plan

Natural Environmental Conditions Report

PECG Project #
131129

Prepared For
TMIG | The Municipal Infrastructure Group Ltd.

March 18, 2019

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

74 Berkeley Street, Toronto, ON M5A 2W7

March 18, 2019

Steve Hollingworth
Director of Stormwater Management
TMIG | The Municipal Infrastructure Group Ltd.
8800 Dufferin Street, Suite 200
Vaughan, ON
L4K 0C5

Dear Mr. Hollingworth:

Re: **Southdown District Stormwater Servicing and Environmental Management Plan – Natural Environmental Conditions Report**
Project #: **131129**

Palmer Environmental Consulting Group Inc. (PECG) is pleased to submit the attached draft Natural Environmental Conditions and Management Plan for the Southdown District Stormwater Serving and Environmental Management Plan Project in the City of Mississauga, Peel Region, Ontario.

The intent of this report is to consolidate the natural environmental existing conditions information collected through background review, available mapping and agency consultation, as well to present the status, significance and sensitivity of existing natural resources within the study area. This information will inform the determination of environmental constraints and opportunities and ultimately the identification of lands suitable for future development/re-development.

Thank you for the opportunity to work with your team on this project. Please let us know if you have questions or comments on this submission.

Yours truly,
Palmer Environmental Consulting Group Inc.

Jason Cole, M.Sc., P.Geo.
Principal, Senior Hydrogeologist

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1. Introduction

1.1 Overview

Palmer Environmental Consulting Group Inc. (PECG) was retained by The Municipal Infrastructure Group (TMIG) to complete a Natural Environmental Conditions Report in support of the Southdown District Stormwater Servicing and Environmental Management Plan Project. The objective of this project is to address flooding, erosion and water quality issues for the study area, while also enhancing natural heritage systems to support future development/ re-development. The project study area is bounded by Winston Churchill Blvd to the west, Southdown Road to the east and Royal Windsor Drive and Lake Ontario to the north and south respectively, in the City of Mississauga (**Figure 1**).

The study area occurs predominately with the Lake Ontario Shoreline West Subwatershed (Clearview Creek, Avonhead Creek, Lakeside Creek and Sheridan Creek), under the jurisdiction of Credit Valley Conservation (CVC). A small area within the southwest corner of the study area occurs within the Oakville East Urban Creeks Subwatershed (Joshua Creek) under the jurisdiction of Conservation Halton (CH). Natural Areas, as identified in the City of Mississauga Natural Areas Survey (2017) occur within the project study area. Clearview Creek, Lakeside Creek and Arrowhead Creek traverse the study area, with outlets to Lake Ontario.

The focus of this Natural Environmental Conditions Report is to identify the location, extent, current status, significance and sensitivity of existing natural resources within the study area. This report is based on the review and compilation of available background information and agency consultation. Field surveys to confirm this information and refine where necessary, will be incorporated in subsequent phases of this study, in areas for which access is permitted.

1.2 Scope of Work and Objectives

This Natural Environmental Conditions Report addresses environmental considerations based on natural heritage features, environmental designations, species of conservation concern, geological and hydrogeological conditions and guiding environmental policies and regulations at the federal, provincial, municipal and watershed levels. This includes the Provincial Policy Statement, City of Mississauga Official Plan, CVC and CH regulations, *Endangered Species Act* and the *Migratory Birds Convention Act*.

The objectives of this study are to consolidate the natural environmental existing conditions information collected through background review, available mapping and agency consultation, as well to present the status, significance and sensitivity of existing natural resources within the study area. This information will inform environmental constraints and opportunities and the identification of lands suitable for future development/ re-development, as well as provide the basis for appropriate management practices and buffer recommendations. A general characterization of existing geological and hydrogeological conditions is provided and used to identify constraint areas and opportunities for stormwater management measures, particularly the use of Low Impact Development (LID) measures. There areas include the location of low and high permeability soils, the potential location of high water tables and areas of groundwater recharge /discharge.

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Study Area

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

ADDITIONAL MAP NOTES:
Coordinate Reference System: NAD83 UTM 17
Imagery: study area - provided by client (2017); surrounds - Esri basemap service

CLIENT: TMIG

PROJECT: Southdown District

TITLE: Site Location

FIGURE NO.	REVISION:	PROJECT NO.
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2. Environmental Policy

2.1 Provincial Policy Statement 2014

Policy 2.1 of the Provincial Policy Statement (PPS) (2014) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The 2014 PPS defines eight natural heritage features and provides planning policies for each (MMAH, 2014):

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.*

2.1.5 Development and site alteration shall not be permitted in:

> *a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
> *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);*
> *d) significant wildlife habitat;*
> *e) significant areas of natural and scientific interest; and*
> *f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b),*
>
> *unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*

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

2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.

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.

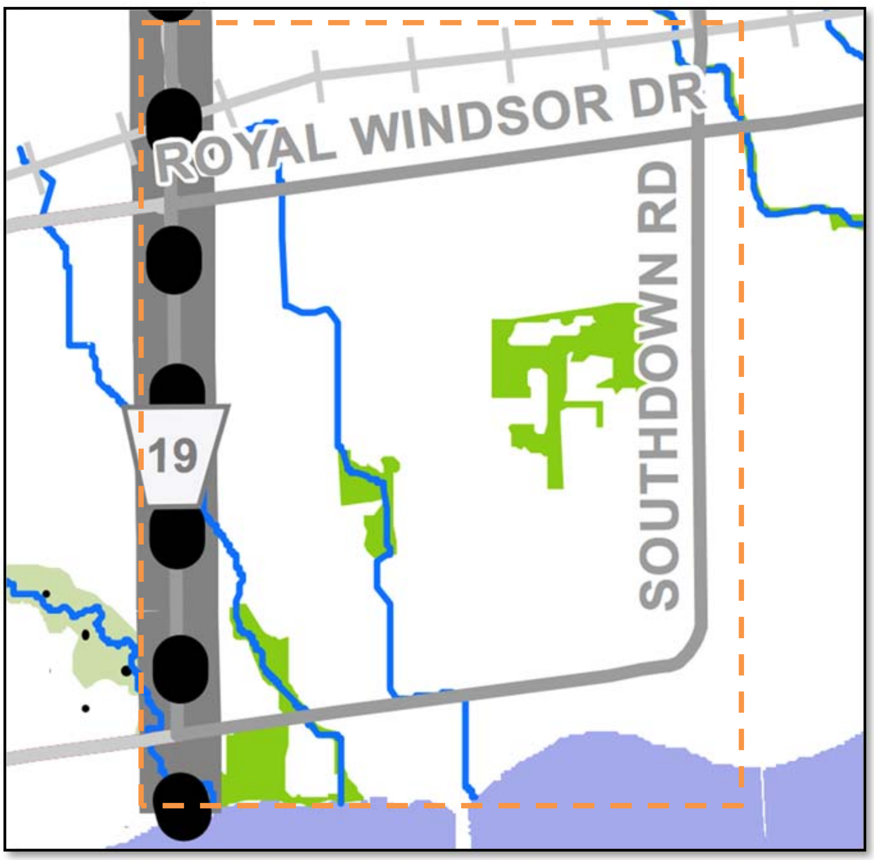
Section 4.11 of the PPS states that, in addition to land use approvals under the *Planning Act*, infrastructure may also require approval subject to other legislation and regulations.

2.2 Region of Peel Official Plan

Peel Region recently completed Official Plan Review to bring the OP policies into conformity with provincial requirements. The Office Consolidation was completed in October 2014.

The natural environment policies are provided in Chapter 2 of the OP with the stated goal to create and maintain a system of viable, well-functioning environmental features to ensure a healthy, resilient and self-sustaining natural environment within Peel Region.

The natural heritage features in Peel Region are protected by its Greenlands System, which consists of Core Areas, Natural Areas and Corridors, and Potential Natural Areas and Corridors. Core Areas of the Greenlands System are shown on OP Schedule A and are depicted for the project study area on **Map A** below.



Map A. Region of Peel Official Plan – Schedule A: Core Areas of the Greenlands System in Peel

2.3 City of Mississauga Official Plan

The office consolidation of the City of Mississauga Official Plan has been updated as of October 14, 2015, which includes Ontario Municipal Board decisions and City Council approved Official Plan Amendments. As there are still outstanding appeals, the 2003 Mississauga OP remains partially in effect.

Section 6, Value the Environment, of the OP provides the environmental policies for the City. Areas designated as part of the Urban System – Green System are depicted on OP Schedule 1a and are depicted for the project study area on **Map B**.

Map B. City of Mississauga Official Plan – Schedule 1A

As mapped on OP Schedule 3, designated Significant Natural Areas [shown in light green on **Map C** below] occur within the study area. Natural Hazards are shown on **Map C** below in dark green and are associated with shoreline areas, Arrowhead and Clearview Creeks. The City's OP states that Natural Hazard lands are generally unsafe and development and site alteration will generally not be permitted due to the naturally occurring processes of erosion and flooding associated with river and stream corridors and the Lake Ontario Shoreline. A designated Special Management Area is shown in purple on **Map C** below. Special

Management Areas are defined in the OP (Section 6.3.15) as lands adjacent to or near Significant Natural Area or Natural Green Space and will be managed or restored to enhance and support the Significant Natural Area or Natural Green Space.

Map C. City of Mississauga OP Schedule 3 – Natural System

Under OP Section 11.2.3, uses permitted within the Greenlands land use designation are as follows:

a) Conservation;
b) Electric power distribution and transmission facility;
c) Facilities that by their nature must locate near water or traverse watercourses (e.g. bridges; storm sewer outlets and stormwater management facilities;
d) Flood control and/or erosion management;
e) Passive recreational activity;
f) Parkland;
g) Piped services and related facilities for water, wastewater and stormwater; and
h) Accessory uses.

Section 6.3.27 of the OP states:

> *Development and site alteration as permitted in accordance with the Greenlands designation within or adjacent to a Significant Natural Area will not be permitted unless all reasonable alternatives have been considered and any negative impacts minimized. Any negative impact that cannot be avoided will be mitigated through restoration and enhancement to the greatest extent possible. This will be demonstrated through a study in accordance with the requirements of the Environmental Assessment Act. When not subject to the Environmental Assessment Act, an Environmental Impact Study will be required.*

The Official Plan, Section 6.3 (Green System) states that:

Buffers

6.3.8: Buffers will be determined on a site specific basis as part of an Environmental Impact Study or other similar study to the satisfaction of the City and appropriate conservation authority.

Significant Woodlands

6.3.12 f: significant woodlands are those that meet one or more of the following criteria:

- *woodlands, excluding cultural savannahs, greater than or equal to four hectares;*
- *woodlands, excluding cultural woodlands and cultural savannahs, greater than or equal to two hectares and less than four hectares;*
- *any woodland greater than 0.5 hectares that:*
    - *supports old growth trees (greater than or equal to 100 years old);*
    - *supports a significant linkage function as determine through an Environmental Impact Study approved by the City in consultation with the appropriate conservation authority;*
    - *is located within 100 meters of another Significant Natural Area supporting a significant ecological relationship between the two features;*
    - *is located within 30 meters of a watercourse or significant wetland; or*
    - *supports significant species or communities.*

Natural Hazard Lands *and buffers will be designated Greenlands and zoned to protect life and property. Uses will be limited to conservation, flood and /or erosion control, essential infrastructure and passive recreation.*

Stormwater and Drainage

Official Plan policies specific to Stormwater and Drainage (Official Plan Section 6.4.2) state:

> 6.4.2.3 *The location and design of surface drainage and stormwater management facilities will respect the Natural Heritage System and will include naturalization to the satisfaction of the City and the appropriate conservation authority.*

2.4 Conservation Authority Regulations and Policies

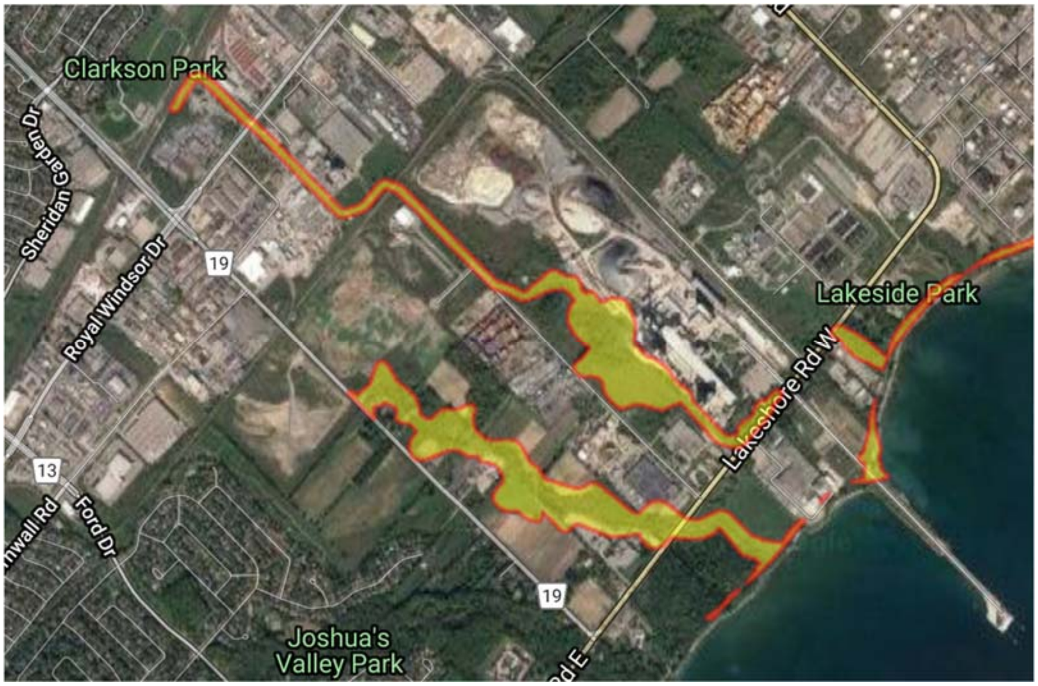
Relevant CVC and CH regulations and policies include the following:

- Ontario Regulation 160/06 (CVC) and 162/06 (CH) - *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Through these regulations, CVC and CH regulate activities in natural and hazardous areas (e.g., areas in and near rivers, streams, floodplains, wetlands, and slopes and shorelines).
- *Watershed Planning and Regulation Policies* (April 2010). This document presents CVC's planning and permit review practices and technical guidelines. Relevant policies will be discussed in applicable sections of this report.
- *Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning* (August 11, 2011). This document presents CH's planning and permit review practices and technical guidelines. Relevant policies will be discussed in applicable sections of this report.

The study area contains lands within the CH Regulated Area, associated with Joshua Creek and the Lake Ontario Shoreline, therefore there is a requirement for a permit under Ont. Regulation 162/06 for development within these areas. **Map D** below shows CH's Regulated Area with the Subject Area.

Map D. Conservation Halton – Regulated Area (shown in yellow)

Lands within the project study area that are within CVC Regulated Area are shown in **Map E** below. There is a requirement for a permit under Ont. Regulation 160/06 for development within these areas.



Map E. Credit Valley Conservation – Regulated Area (shown in yellow)

2.5 Endangered Species Act (2007)

Species designated as Threatened or Endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO), otherwise known as Species at Risk in Ontario (SARO), and their habitats (e.g. areas essential for breeding, rearing, feeding, hibernation and migration) are afforded legal protection under the *Endangered Species Act* (ESA) (Government of Ontario 2007).

The protection provisions for species and their habitat within the ESA apply only to those species listed as endangered or threated on the SARO list. Special Concern species may be afforded protection through policy instruments respecting significant wildlife habitat as defined by the Province or other relevant authority, or other protections contained in OP policies.

2.6 Migratory Birds Convention Act (1994)

The *Migratory Birds Convention Act* (MBCA) and Migratory Birds Regulations (MBR) (2014) protect most species of migratory birds and their nests and eggs anywhere they are found in Canada. General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposition of harmful substances in waters / areas frequented by them. The MBR includes an additional prohibition against incidental take, which is the inadvertent harming or destruction of birds, nests or eggs.

Compliance with the MBCA and MBR is best achieved through due diligence, which identifies potential risk based on a site-specific analysis in consideration of the Avoidance Guidelines and Best Management Practices information on the Environment Canada website.

3. Study Approach

3.1 Background Review

PECG has initiated agency consultation and reviewed relevant background material to provide a focus to field investigations and ensure compliance with regulations and policy. Background review included the following:

- Collection and review of relevant mapping and reports, including Official Plans (OP) and Natural Heritage Information Centre (NHIC) make-a-map application for species occurrences and designated area mapping;
- Natural Heritage information and mapping was provided by CVC, CH and the City of Mississauga;
- Field reconnaissance visit to the study area to confirm/verify background information (predominately conducted through roadside survey and in areas where access was permitted);
- The Ministry of Natural Resources and Forestry (MNRF) Aurora District office was contacted for natural heritage and SAR information in the study area; and
- Relevant Ontario Geological Survey (OGS) mapping available for the study area, including surficial geology, physiography, and bedrock mapping.

3.2 Ecological Surveys

A preliminary field reconnaissance visit was conducted by PECG ecologists on September 19, 2018, with a focus on field checking background information and available mapping, predominately from roadside areas. Field investigations will be undertaken in subsequent phases of this study in order to confirm and refine as necessary the characterization aquatic and terrestrial features, and to augment the assessment of the ecological features and functions within the study area.

3.2.1 Species at Risk

For the purposes of this report, Species at Risk (SAR) include species listed as Endangered, Threatened or Special Concern under Ontario's ESA. The protection provisions for species and their habitat within the ESA apply only to those species listed as Endangered or Threatened on the SARO list. Special Concern species may be afforded protection through policy instruments respecting significant wildlife habitat as defined by the Province or other relevant authority, or other protections contained in OP policies.

Existing SAR records were queried through the NHIC database, which identified no SAR records in the vicinity of the study area. MNRF was contacted for information on SAR occurrences or potential presence within the project study area. Habitat opportunities for SAR on the site were then assessed by comparing habitat preferences of species deemed to have potential to occur, against current site conditions. The SAR identified by MNRF as being recorded in the vicinity of the site, and others known through professional experience to have potential to occur in urban environments were considered in the assessment. A brief discussion of the status, habitat requirements, and assessment of likely presence on the subject property for each of these species is provided in Section 4.7.

3.3 Hydrogeology

This report provides a background hydrogeological assessment of the study area to identify areas of constraint and opportunities for stormwater management, applicable Low Impact Development (LID) measures, and to characterize the groundwater table elevation, groundwater flow direction and identify areas of potential groundwater recharge and discharge. As part of the hydrogeological assessment, a preliminary GIS-based pre-development water balance was completed to establish targets for groundwater recharge following development. Water balance calculations are based on a monthly soil-moisture balance approach (Thornthwaite and Mather, 1957) combined with established infiltration factors based on topography, soil type, and land cover (MOEE, 1995).

4. Existing Conditions

4.1 Site Description

The study area is an employment district which contains industrial and business employment areas. Existing development consists primarily of low-rise buildings, multi-unit developments, office and industrial uses. Some of the existing industrial operations are major facilities with extensive amounts of outdoor storage.

The study area contains a range of environmental features, including Avonhead Creek, Clearview Creek, Lakeview Creek and Sheridan Creek, forested natural areas and the Lake Ontario Shoreline. The Joshua Creek corridor is found in the very southwest corner of the study area. This corridor has been designated as a Key Feature of the Halton's Natural Heritage Strategy. Joshua Creek is characterized as relatively undisturbed and provides warmwater fish habitat (Mississauga Official Plan – Local Area Plan). Portions of Avonhead Creek and Clearview Creek have been channelized through the project study area. Clearview Creek supports warmwater habitat and serves as a wildlife corridor and linkage between the Lake Ontario shoreline and other habitat areas, within and beyond the Southdown area. The Lake Ontario shoreline though this area is characterized by a natural beach with shoreline erosion protection works and a prominent pier element extending out into the Lake.

4.2 Existing Geological and Hydrogeological Conditions

4.2.1 Physiography and Topography

The study area is located within the Iroquois Plain physiographic region (Chapman and Putnam, 1984). This region extends as a narrow band about five kilometers in width along the lowland bordering Lake Ontario. Although the dominant soil texture is comprised mainly of permeable silts, sands and gravels, which were deposited along the shores of glacial Lake Iroquois about 12,500 years ago, the underlying deposits of clayey silt till are commonly found at surface. The topography of the region is relatively flat, and is characterized by sand and shale plains.

4.2.2 Geology and Hydrogeology

The native overburden soils at the site, as defined by OGS mapping, are primarily composed of coarse textured glaciolacustrine deposits of sand, gravel, minor silt and clay from Lake Iroquois, as well as the clay to silt textured till deposits of the Halton Till (**Figure 2**). Additionally, Paleozoic bedrock is exposed at surface along the northwestern and southeastern limits of the study boundary. These units are described in more detail below.

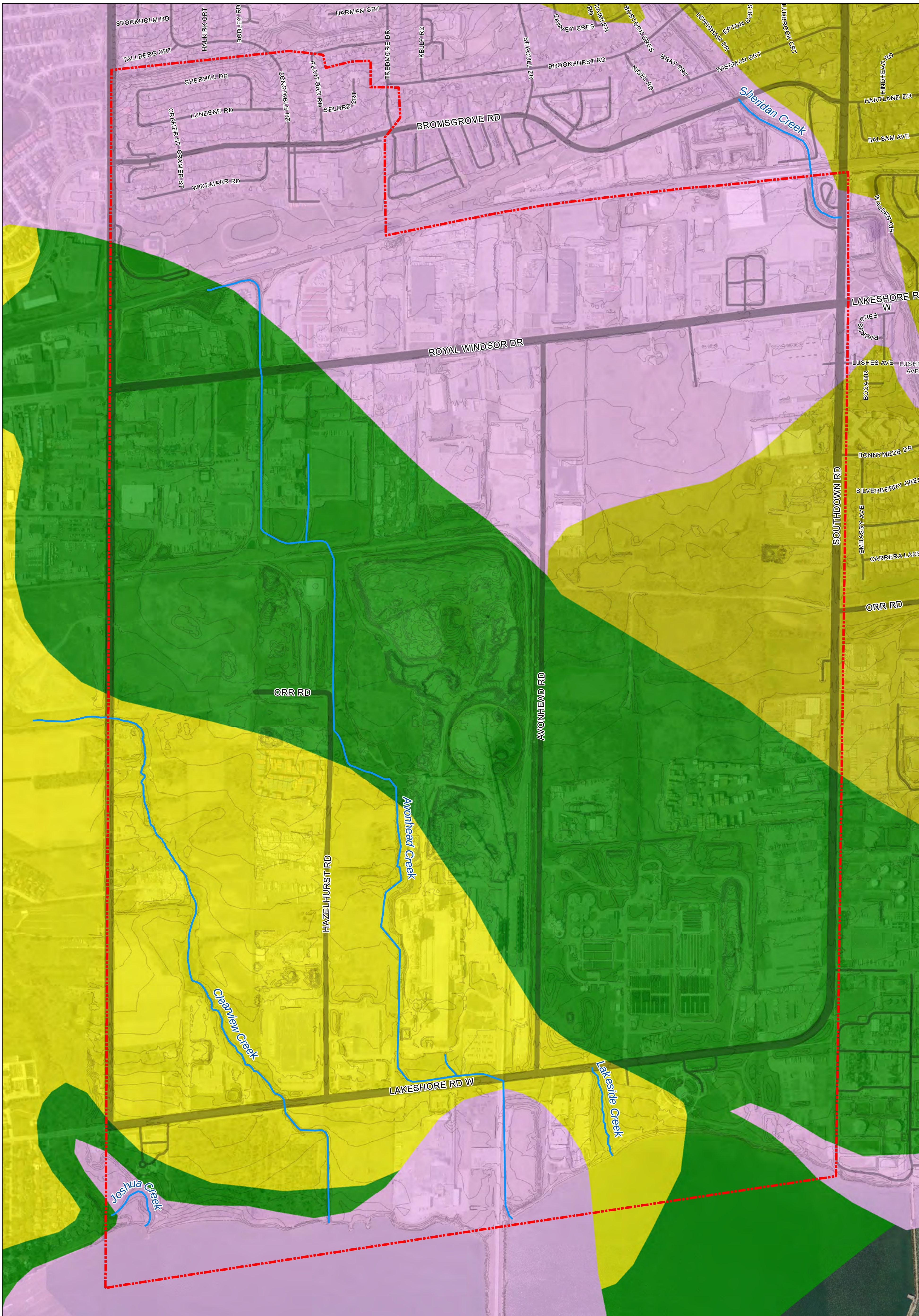
The *Lake Iroquois Glaciolacustrine Sand* deposits are widespread in this area and represent the uppermost geologic layer. These high permeability sand and gravel soils at surface form a discontinuous unconfined aquifer at the site, which promotes groundwater flow, recharge, and discharge. Water supply from this aquifer is generally limited due to the discontinuity of the soils.

The clay to silt textured *Halton Till* is found trending east-west through the site. The thickness of this unit is expected to be approximately 10 m near to the study area. Isolated lenses of lacustrine laminated sand, silt, and clay are commonly encountered within the till (Sharpe et al., 1999). Regionally, Halton Till soils are generally considered an aquitard with low permeability, and therefore limit infiltration to deeper aquifers. However, due to the heterogeneity within the till, on a local scale it may serve as a source of limited water supply for some private wells.

The bedrock in the area is characterized as the Georgian Bay Formation, and is described as shale with interbedded dolomitic siltstone and minor limestone. This formation is approximately 250 m thick, and dips to the southeast at about 5 m/km.

4.2.3 Water Well Records

Based on a search of the MECP Water Well Records there are a total of 106 water wells within a 500 m radius of the study area. Of this number, 23 are used for domestic water supply, 16 are used for commercial or industrial water supply, and 3 are used for irrigation or livestock water supply. The remaining wells include 41 listed as observation wells or test holes, and 23 abandoned wells. It is not expected that any of these wells are actively used for water supply as this area is serviced by the South Peel Municipal Water Supply System.



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PREPARED BY:
PALMER ENVIRONMENTAL CONSULTING GROUP INC.

LEGEND:

Study Area

Watercourse

Contour (1 m interval)

ADDITIONAL MAP NOTES:
Coordinate Reference System: NAD83 UTM 17
Imagery: study area - provided by client (2017); surrounds - Esri basemap service

Surficial Geology[1]

Paleozoic bedrock: shale or dolomite

Halton Till: glaciolacustrine derived silty to clayey till

Deltaic and lacustrine deposits: glaciolacustrine derived gravelly sand and silty sand

Foreshore-basinal deposits: glaciolacustrine derived sand

1 - Ontario Geological Survey 2010 (Mapped at 1:50,000). Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release — Data 128 – Revised.

CLIENT:
TMIG
The Municipal Infrastructure Group Ltd.

PROJECT: Southdown District

TITLE: Surficial Geology

FIGURE NO.	REVISION:	PROJECT NO.
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4.2.4 Source Water Protection

The majority of the study area falls within the limits of the Credit Valley Source Protection Area (CVSPA) (CTCSWP, 2015), however a small region is within the Halton Region Source Protection Area (HRSPA) (HHSPC, 2015) (**Appendix A**). Based on the respective source water protection plans, no well head protection areas (WHPA) are present within the site. However, regions associated with Highly Vulnerable Aquifers (HVA), Intake Protection Zone 2 (IPZ-2), and Event Based Areas (EBA) are present.

Within the CVSPA, a large portion of the site is associated with a HVA with a vulnerability score of 6. A HVA is defined as an area where the aquifer is susceptible to contamination by the release of pollutants on ground surface. This can result from conditions such as a shallow groundwater table, a thin (or absent) and permeable overburden, or the presence of fractured bedrock. Policies are associated with land use and actions within a HVA, such as the application and/or handling and storage of road salt.

An IPZ-2 with a score of 4.5 has been delineated within the northern corner of the site within the CVSPA, and an IPZ-2 with a score of 4.8 has been delineated within the southern corner within the HHSPA. An IPZ-2 is defined as is the area around a surface water intake where water can reach the intake within 2 hours. In addition, two EBA’s have been delineated within the study area; an EBA associated with the Clarkson Wastewater Treatment Plant and Sanitary Sewer has been identified within the CVSPA, and an EBA associated with pipeline fuel and/or an oil spill has been identified surrounding Joshua’s Creek within the HHSPA. An EBA is an area delineated if modelling indicates that a spill from a specific activity may be transported to an intake and poses a significant threat to drinking water.

4.3 Pre-Development Water Budget

A Geographic Information Systems (GIS)-based water budget was completed for the overall site area under pre-development conditions. Water balance calculations used a monthly soil-moisture balance approach (Thornthwaite and Mather, 1957). The water balance calculations estimate average annual evapotranspiration (evaporation and plant transpiration) using factors such as monthly precipitation, temperature and latitude. Long-term climate data were obtained from the nearest meteorological station to the site, the Toronto Pearson International Airport (43°40’N, -79°38’W), over the 30-year duration from 1981 to 2010 (**Table 1**). Subtracting the average annual evapotranspiration from the average annual precipitation gives the average annual water surplus, which is available for infiltration and runoff.

The average annual water surplus was then partitioned using infiltration factors (MOEE, 1995). This approach takes into consideration three factors: topography/slope, soil type, and land cover. Water will infiltrate more easily through sands compared to clays, on flat slopes compared to steep slopes, and through naturally vegetated soils compared to agricultural crops or urban areas. The method developed by Bernard (1932) and described by the MOEE (1995) was used to determine the infiltration factors across the property, based on the topography, vegetation, and surficial geology.

The databases utilized to determine the infiltration factors at the study area originated from a variety of sources. The topography factor was estimated based on 5 m contour mapping made available under the Open Government License - Ontario, soil type was determined from quaternary geology mapping published by the Ontario Geological Survey (**Figure 2**), and land cover classifications were determined using ELC Community data provided by CVC and the City of Mississauga (**Figure 5**). A summary of the infiltration factors used for the pre-development water budget calculations is provided in **Table 2**.

Table 1. Climate Normals (1981 - 2010) from Toronto Pearson International Airport

Month	Average Temperature (ºC)	Total Precipitation (mm)
January	-5.5	51.8
February	-4.5	47.7
March	0.1	49.8
April	7.1	68.5
May	13.1	74.3
June	18.6	71.5
July	21.5	75.7
August	20.6	78.1
September	16.2	74.5
October	9.5	61.1
November	3.7	75.1
December	-2.2	57.9
Year	**8.2**	**785.9**

Table 2. Pre-Development Water Budget Infiltration Factors

Description of Area	Infiltration Factor Value
SOIL TYPE	
• Silty Clay Till	0.1
• Coarse Textured Glaciolacustrine Sand	0.4
TOPOGRAPHY/SLOPE	
• 10% slope	0.05
• 5% slope	0.1
• 1% slope	0.1
• 0.5% slope	0.2
• 0.1% slope	0.25
LAND COVER	
• Agricultural	0.1
• Beach	0.1
• Treed Beach	0.2
• Cultural Meadow	0.1
• Cultural Plantation	0.2
• Cultural Thicket	0.15
• Cultural Woodland	0.2
• Commercial Industrial	0.05
• Forest	0.15
• Marsh	0.2
• Open Anthropogenic or Residential	0.1
• Paved Road	0
• Railroad	0.2
• Swamp	0.25

4.3.1 Pre-Development Water Budget Results

Based on the water holding capacity (WHC) of the soils at the site (assumed 250 mm for silty clay soils and 150 mm for the glaciolacustrine sandy soils), the calculated actual ET (or AET) based on the Thornthwaite and Mather monthly water balance model is between approximately 493 mm/year and 499 mm/year (**Table 3**). Based on the site location and conditions, this result for ET is consistent with the average ET calculated over the entire Credit Valley Watershed, determined to be approximately 540 mm/yr (CTC Source Protection Committee, 2009). Actual evapotranspiration is calculated based on a potential ET (or 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. There is a total soil moisture deficit of between about 128 – 134 mm/year, equivalent to 16% - 17% of the total precipitation in the study area.

The estimated water surplus for the total site area is between approximately 287 - 293 mm/year (36% - 37% of the total precipitation) (**Table 3**), which is consistent with the average surplus calculated over the Credit Valley Watershed, reported as 310 mm/year (CTC Source Protection Committee, 2009).

The water surplus has two components: a runoff component which is the overland flow when the soil moisture capacity is exceeded, and an infiltration component. Using the method in the MOE SWM manual and MOEE (1995) for guidance, it is estimated that approximately 56% (163 mm/year) of the surplus runs off, and the remaining 44% (129 mm/year) infiltrates. Results are summarized in **Table 4**, and on **Figures 3 and 4**. This translates to approximately 775,949 m^3/year of infiltration and approximately 979,830 m^3/year of runoff across the site. The infiltration values calculated are expected to have an error of approximately 10%, and therefore consideration should be given to maintain at least 90% of the pre-development infiltration volumes following site development.

Based on the results of the water balance most of the infiltration is expected in the areas associated with coarse grained glaciolacustrine deposits. It is recommended that Low Impact Development (LID) strategies should be implemented in these regions of the site where infiltration is expected to be high, and which are also outside of the HVA region indicated in **Appendix A**. Consideration should be given to maintaining the pre-to-post water balance of the natural areas present within the site boundary (**Figure 5**). Potentially effective LID measures include infiltration trenches, redirection of roof runoff, and/or permeable pavement. Other factors, such as the depth to the water table, should also be considered when selecting appropriate LID mitigation measures for the site.

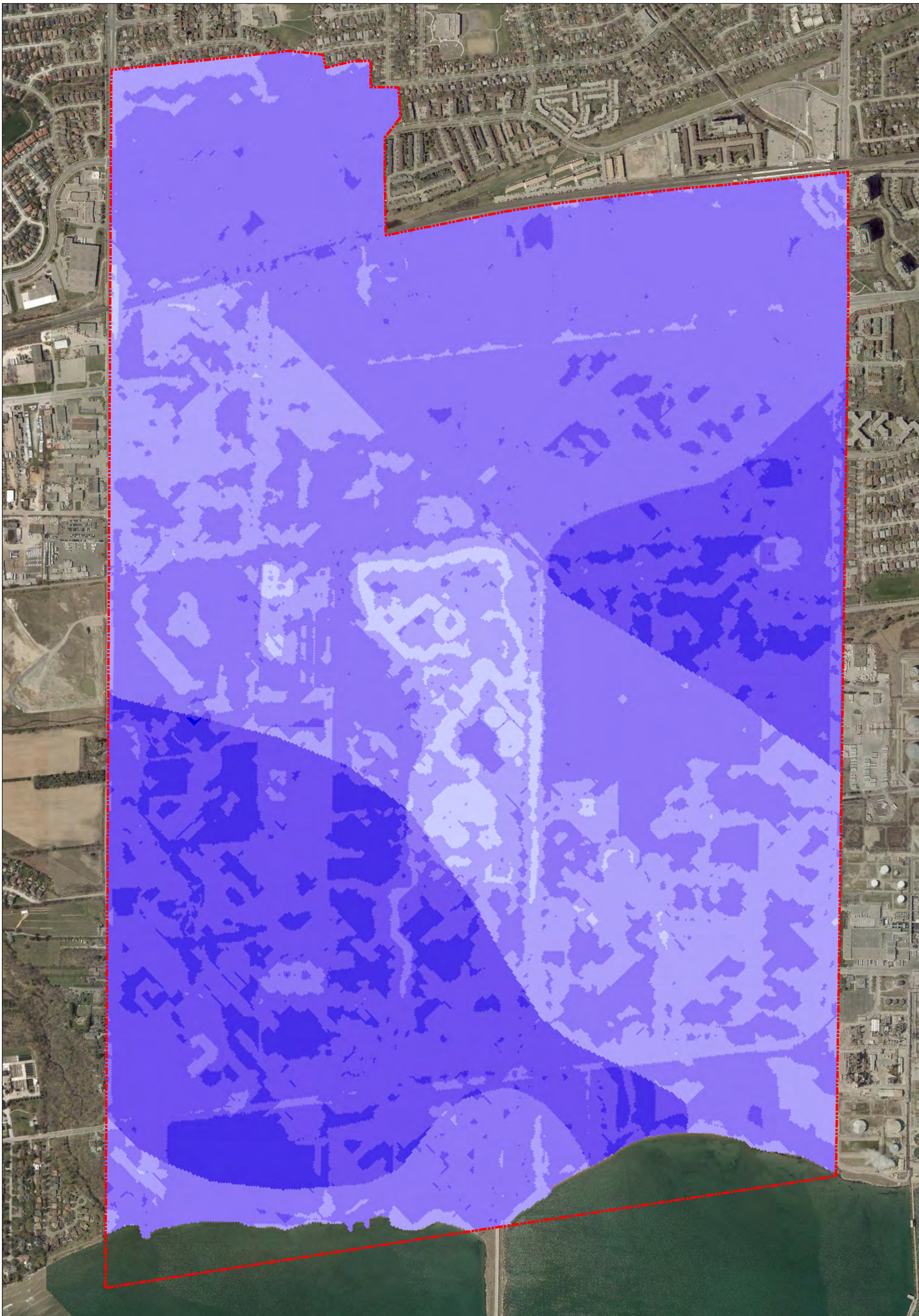
Table 3. Summary of Annual Water Surplus (mm)

Water Holding Capacity: 150 mm (Glaciolacustrine Sandy Soils)													
Water Balance (mm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation	51.8	47.7	49.8	68.5	74.3	71.5	75.7	78.1	74.5	61.1	75.1	57.9	786
Temperature (ºC)	-5.5	-4.5	0.1	7.1	13.1	18.6	21.5	20.6	16.2	9.5	3.7	-2.2	8
Potential Evapotranspiration (PET)	0	0	0	35	78	117	140	123	82	41	12	0	628
P - PET	52	48	50	34	-4	-46	-64	-45	-7	21	63	58	158
Change in Soil Moisture Storage	0	0	0	-33	-35	-26	-14	10	27	33	26	0	-12
Soil Moisture Storage	150	150	150	118	88	68	58	65	86	113	138	150	-
Actual Evapotranspiration (AET)	0	0	0	35	104	92	86	71	54	41	12	0	493
Soil Moisture Deficit	0	0	0	0	-26	26	54	52	28	0	0	0	134
Surplus (P - AET)	**52**	**48**	**50**	**34**	**-30**	**-20**	**-10**	**7**	**21**	**21**	**63**	**58**	**292.6**

Water Holding Capacity: 250 mm (Silty Clay Soils)													
Water Balance (mm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Precipitation	51.8	47.7	49.8	68.5	74.3	71.5	75.7	78.1	74.5	61.1	75.1	57.9	786
Temperature (ºC)	-5.5	-4.5	0.1	7.1	13.1	18.6	21.5	20.6	16.2	9.5	3.7	-2.2	8
Potential Evapotranspiration (PET)	0	0	0	35	78	117	140	123	82	41	12	0	628
P - PET	52	48	50	34	-4	-46	-64	-45	-7	21	63	58	158
Change in Soil Moisture Storage	0	0	0	-33	-35	-26	-14	10	27	33	26	0	-12
Soil Moisture Storage	250	250	250	217	182	156	142	152	179	212	238	250	-
Actual Evapotranspiration (AET)	0	0	0	35	109	98	90	68	48	41	12	0	499
Soil Moisture Deficit	0	0	0	0	-31	20	50	55	34	0	0	0	128
Surplus (P - AET)	**52**	**48**	**50**	**34**	**-35**	**-26**	**-14**	**10**	**27**	**21**	**63**	**58**	**286.6**

Table 4. Pre-Development Water Balance Analysis Summary

Pre-Development Conditions		**mm/year**	**m^3/year**	**Percent (%)**
Total Site (603.9 ha)	Potential Infiltration	128.7	775,949	44%
	Potential Runoff	162.5	979,830	56%



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PRINT SCALE: 1:10000

PRINT SIZE: 11 x 17 "

DATE: Mar 14, 2019

DRAWN: BE

CHECKED: CH

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

LEGEND:

Study Area

Potential Infiltration (mm/yr)

0 50 100 150 200 250 300

ADDITIONAL MAP NOTES:

Coordinate Reference System: NAD83 UTM 17

Imagery: study area - provided by client (2017); surrounds - Esri basemap service

CLIENT: TMIG The Municipal Infrastructure Group Ltd.

PROJECT: Southdown District

TITLE: Potential Infiltration

FIGURE NO.	REVISION:	PROJECT NO.
3	2	1301129

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METRE SCALE:

0 50 100 200 300

NORTH:

LEGEND:

Study Area

Potential Runoff (mm/yr)

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PRINT SCALE: 1:10000

PRINT SIZE: 11 x 17 "

DATE: Mar 14, 2019

DRAWN: BE

CHECKED: CH

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

ADDITIONAL MAP NOTES:

Coordinate Reference System: NAD83 UTM 17

Imagery: study area - provided by client (2017); surrounds - Esri basemap service

CLIENT:

TMIG

The Municipal Infrastructure Group Ltd.

PROJECT: Southdown District

TITLE: **Potential Runoff**

FIGURE NO.	REVISION:	PROJECT NO.
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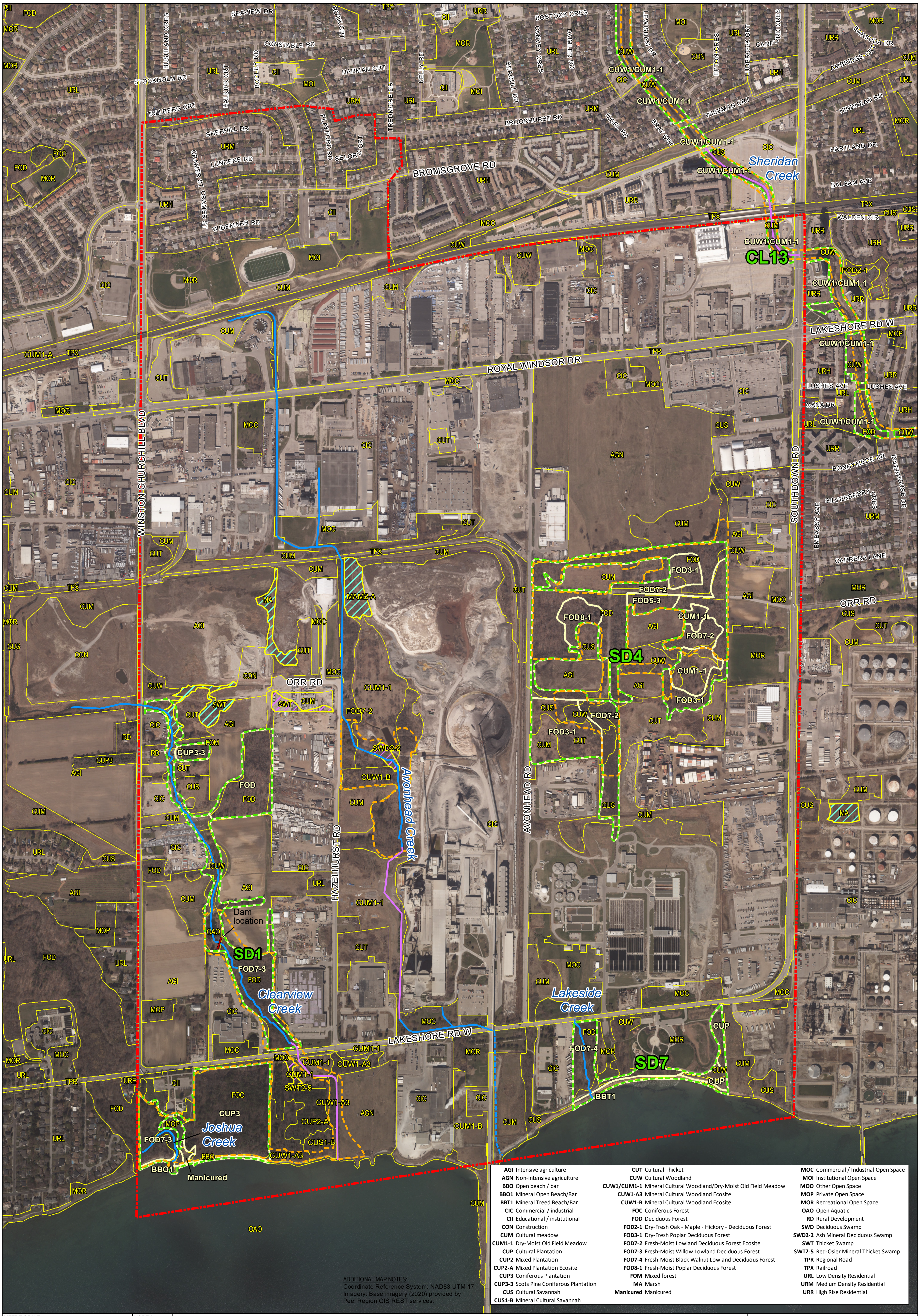
4.4 Environmental Designations

No Provincially Significant Wetlands (PSWs) or Areas of Natural and Scientific Interest (ANSIs) occur within or adjacent to the subject property. Three designated Natural Areas occur within the study area, as identified by the Mississauga Natural Areas Survey (2014). These areas are mapped on **Figure 5** and described in **Table 5** below.

Table 5. Natural Areas

Natural Area	Natural Area Classification	Area (ha)	Natural Area Description
SD01	Significant Natural Area	20.03	This 20 ha site contains a portion of Clearview Creek and the mouth of Joshua Creek. Lake Ontario forms the southern boundary of this site. The site is currently in fair condition. Disturbances include garbage, dumping, windthrow and erosion. Non-native (introduced) plant species represent 43% of the total number of species present. This natural area mainly supports bird species of late successional and forest edge habitat. The high diversity of faunal species documented highlights the importance of natural areas along the lakeshore. One provincially significant flora species and one provincially significant fauna species has been documented within this site. Clearview Creek is classified as a type 2 (Important) fishery within the site (Natural Areas Survey 2014).
SD4	Significant Natural Area	24.38	This site is located in the Lakeside Creek sub-watershed. This natural area supports species of mid-to late successional habitat and forest edge. Disturbances present at this site are relatively limited due to the controlled access. Some litter is associated with the roads that fragment the site, however there are no trails. Non-native (introduced) plant species represent 22% of the total number of species present. Surrounding land use is industrial (Natural Areas Survey 2014).
SD7	Significant Natural Area Special Management Area	3.93	This site contains a portion of Lakeside Creek. The southern border is Lake Ontario. The natural area mainly supports species of mid- to late successional and forest edge habitat. The high diversity of species notes in this area illustrates the importance of natural areas along the lakeshore to migrating fauna. This site is currently in poor condition. Non-native (introduced) plant species represent 51% of the total number of species present. Surrounding land use is industrial. One provincially significant flora species has been documented (Natural Areas Survey 2014). A Special Management Area has been identified through this area that consists predominately of manicured parkland.
CL13	Significant Natural Area	10.12	This site contains a portion of Sheridan Creek. This natural area supports a complex of mineral cultural woodland and dry – moist old field meadow (CUW1/CUM1-1). The site is currently in poor condition. Disturbances present at this site include garbage and dumping, vandalism, encroachment, disease/insects and excessive road noise. Non-native

Natural Area	Natural Area Classification	Area (ha)	Natural Area Description
			(introduced) plant species represent 56% of the total number of species present. This natural area mainly supports bird species of small forests and successional habitat. Surrounding land use is a mixture of industrial, residential and commercial. One provincially significant fauna species has been documented. Sheridan Creek is classified as a type 2 (Important) fishery within the site (Natural Areas Survey 2014).



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NORTH:

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PRINT SIZE: 11 x 17 "

DATE: Apr 01, 2022

DRAWN: BE/SM

CHECKED: AA

PREPARED BY: Palmer™

LEGEND:

- Study Area
- ELC Community[1]
- ELC Community[2]
- Significant Natural Area[2]
- Watercourse
- Piped Channel
- Hardened Channel

Significant Natural Areas

- CVC Regulated Wetland (<0.5 ha)
- CVC Regulated Wetland/Mississauga NHS (≥0.5 ha)
- Core Areas of the Greenlands[3]

1 - Data provided by Credit Valley Conservation
2 - Data provided by City of Mississauga
3 - Peel region GIS REST services.

CLIENT: TMIG

PROJECT: Southdown District

TITLE: Existing Terrestrial Conditions

FIGURE NO.: 5

REVISION: 1

PROJECT NO.: 1301129

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4.5 Vegetation Communities

ELC mapping provided by CVC, CH and the City of Mississauga has been compiled and mapped for the project study area (**Figure 5**). Vegetation communities for City of Mississauga Natural Areas are described in **Table 6** below, based on the 2017 Natural Areas Update.

Table 6. Vegetation Communities – Mississauga Natural Areas

Location with Study Area	Vegetation Community	Vegetation Community Description
Natural Area – SD7	Fresh – Moist Willow Lowland Deciduous Forest (FOD7-4)	This lowland forest community is composed of a mixture of naturally occurring vegetation and planted species. The canopy is composed of Black Walnut (*Juglans nigra*), non-native species White Willow (*Salix alba*), Black Locust (*Robinia pseudoacacia*) and Norway Maple (*Acer platanoides*) for an open canopy above the creek.
	Cultural Plantation (CUP)	This community was cultural meadow that underwent naturalization efforts; plantings and no mow areas. The canopy is now Black Locust and Oak species (*Quercus* sp.) and is 10-25 m in height, covering greater than 60%.
	Dry – Moist Old Field Meadow (CUM1-1)	Planted trees and shrubs are scattered throughout this community. The community is dominated by goldenrod (*Solidago* sp.) and aster species (*Aster* sp).
	Mineral Treed Beach/Bar (BBT1)	This community consists of a stone beach fairly bare of vegetation. The canopy of the beach bar is comprised of equal parts White Willow and Sandbar Willow (*Salix exigua*) and is 10 – 25 m in height, covering less than 25% area.
Natural Area – SD1	Fresh – Moist Willow Lowland Deciduous Forest (FOD7-3)	This lowland forest is present along the Clearview Creek and the mouth of Joshua Creek. The open canopy is comprised of scattered mature Willow (*Salix* sp.), Green Ash (*Fraxinus pennsylvanica*) and Silver Maple (*Acer saccharinum*). Canopy trees are greater than 25 m in height and cover greater than 60% of the community.
	Coniferous Plantation (CUP3)	Located along the Lake Ontario Shoreline, this coniferous plantation is dominated by mature Red Pine (*Pinus resinosa*), White Pine (*Pinus strobus*) and Scot's Pine (*Pinus sylvestris*).
	Scot's Pine Coniferous Plantation (CUP3-3)	This is a densely planted and immature plantation of Scot's Pine, located along Clearview Creek. Red Pine and White Pine scattered throughout.
	Mineral Open Beach/Bar	This community consists of a stone beach along the Lake Ontario shoreline. The trees located along the edge of this community consist of Black Walnut, Manitoba Maple (*Acer negundo*), Crack Willow (*Salix fragilis*) and Freeman's Maple (*Acer freemanii*), Red Oak (*Quercus rubra*) and White Pine.

Location with Study Area	Vegetation Community	Vegetation Community Description
Natural Area – SD4	Dry – Fresh Poplar Deciduous Forest (FOD3-1)	The open canopy of this community is dominated by Trembling Aspen (*Populus tremuloides*) with other Poplar species (*Populus* sp.), 10 – 25 m in height and providing cover of 25 – 60%.
	Fresh – Moist Poplar Deciduous Forest (FOD8-1)	The canopy and subcanopy of this community are dominated by a mixture of Balsam Poplar (*Populus balsamifera*), Large – tooth Aspen (*Populus grandidentata*) and White Birch (*Betula papyrifera*). Canopy trees are 10 – 25 m in height, providing greater than 60% cover.
	Dry – Fresh Sugar Maple – Red Oak Deciduous Forest (FOD5-3)	This community forms a narrow fringe along the south edge of the road through this site. Mature, open grown Red Oak and Sugar Maple (*Acer saccharum*) form a closed canopy, with some Red Maple (*Acer rubrum*).
	Fresh – Moist Ash Lowland Deciduous Forest (FOD7-2)	This community is found in two locations within this Natural Area site. It is dominated by an open canopy and sub canopy of Green Ash with Balsam Poplar and Black Walnut as associates. Depressions that are likely water filled in the spring support sensitive fern and lady fern.
	Dry – Moist Old Field Meadow (CUM1-1)	This meadow is found in associated with the early successional forest on the eastern portion of the site and is dominated by Tall Goldenrod (*Solidago altissima*), Canada Goldenrod (*Solidago canadensis*), Flat-top Goldenrod (*Euthamia graminifolia*), Western Poison-ivy (*Toxicodendron radicans*), Kentucky Blue-grass (*Poa pratensis*) and Wild Carrot (*Daucus carota*).
CL13	Mineral Cultural Woodland (CUW1)/ Dry – Moist Old Field Meadow (CUM1-1)	This canopy of this community is dominated by Manitoba Maple, Norway Maple, and Silver Maple, 10 - 25 m in height and providing cover of 25 - 60%. There are open meadow patches within this community and mainly consist of Canada Goldenrod, Smooth Brome (*Bromus inermis*), Reed Canary Grass (*Phalaris arundinacea*) and Orchard Grass (*Dactylis glomerata*).

4.5.1 Vegetation Communities outside of Mississauga Natural Areas

Lake Ontario Shoreline (south of Lakeshore Road West)

Vegetation communities outside of Natural Areas SD1 and SD7 in this area consist of areas of cultural meadow (CUM), with some cultural savannah (CUS) (**Figure 5**). Connected pockets of cultural woodland (CUW) and cultural plantation (CUP) occur just east of Natural Area SD1. One wetland community has been identified in this area, Red-osier Mineral Thicket Swamp (SWT2-5), along the south side of Lakeshore Blvd West and just east of Natural Area SD1.

Eastern Portion of the Study Area (Avonhead Road to Southdown Road)

Vegetation communities outside of Natural Area SD4 in this area are limited to a small pocket of cultural woodland (CUW) and cultural savannah (CUS) and larger areas of cultural thicket (CUT) and cultural meadow (CUM), particularly in areas immediately surrounding Natural Area SD4 (**Figure 5**).

Western Portion of the Study Area (Winston Churchill Blvd to Avonhead Road)

Natural vegetation communities through the northern portion of this area, in the area south of Royal Windsor Drive is limited to small pockets of cultural thicket (CUT), with a long linear cultural meadow (CUM) community that occurs along the rail line.

Vegetation communities outside of Natural Area SD1 in this area consist of area of cultural thicket (CUT), cultural meadow (CUM) and cultural woodland (CUW). A deciduous forest community (FOD) has been identified on the east side of Winston Churchill Blvd. Larger forested communities are associated with the Avonhead Creek corridor, including Fresh – Moist Ash Deciduous Forest (FOD7-2) and cultural woodland with connection to large areas of cultural meadow. The CUW community along Avonhead Creek generally co-insides with the Region of Peels identified Core Areas of the Greenlands System in this portion of the study area. Based on the ELC mapping three wetland communities occur in this area, including two small pockets of thicket swamp (SWT, SWT2-5) and an area of mineral meadow marsh (MAM2).

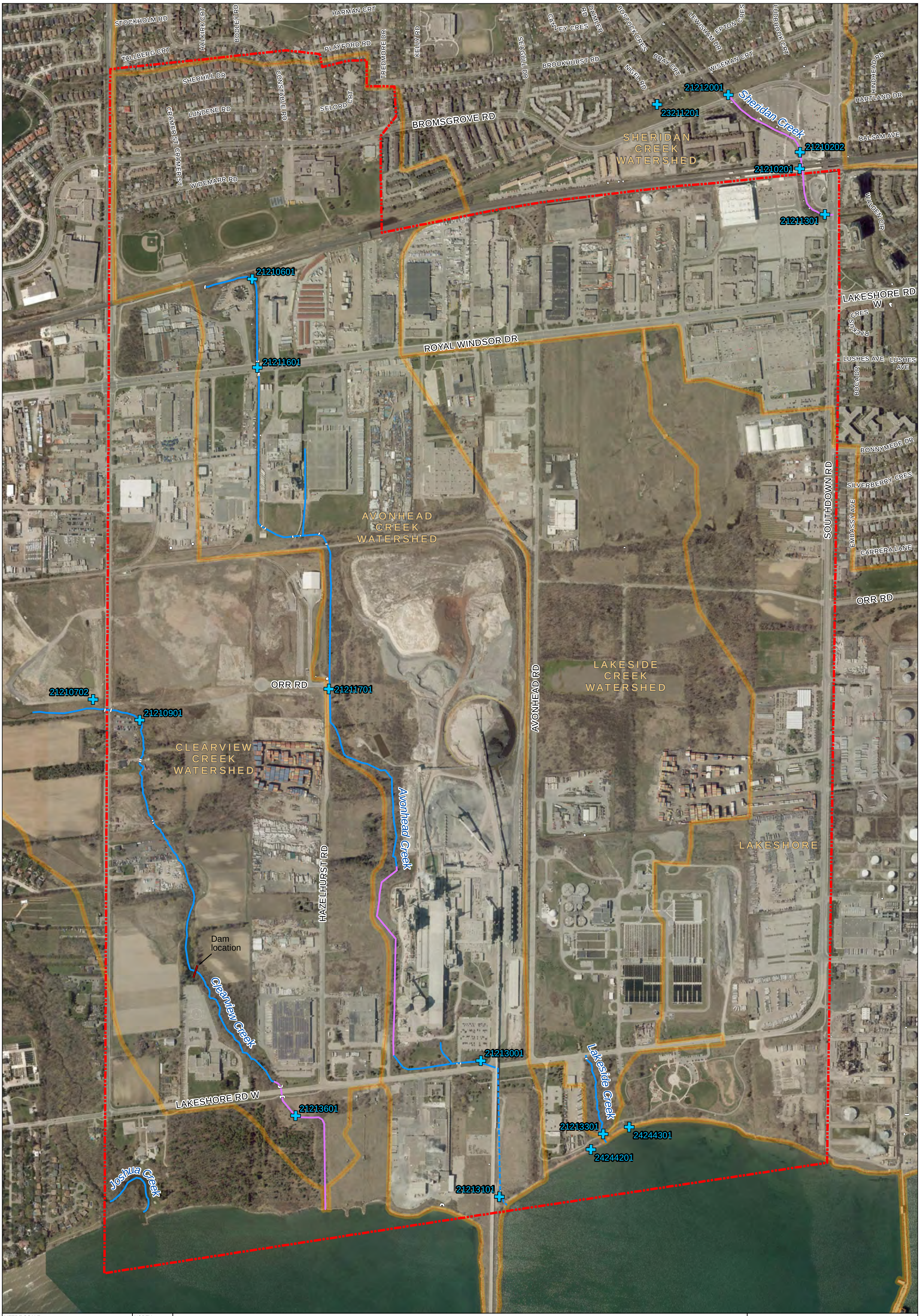
4.6 Wildlife

Given the urban nature of the project study area, wildlife habitat opportunities within the study area likely include common, generalist and urban-adapted species (e.g. urban species of birds, Raccoon [*Procyon lotor*], Skunk (*Mephitis mephitis*] and Grey Squirrel [*Sciurus carolinensis*]).

As identified in the Natural Area Surveys (2014), a high faunal diversity is supported in the mid- to late successional and edge forest habitat provided by the large natural areas within the study area. These areas serve important linkage functions along creek corridors and as important areas for migrating birds along the lakeshore. Higher quality habitat is afforded to urban-tolerant species in these designated Natural Areas. Wildlife habitat and habitat linkages functions are provided by the range of natural vegetation communities associated with the Avonhead, Clearview and Joshua Creek corridor. Wildlife habitat opportunities are limited through the remainder of the study area as a result of the industrial and business employment land uses.

4.7 Aquatic Habitat and Fish Communities

The study area occurs predominately with the Lake Ontario Shoreline West Subwatershed (Clearview Creek, Avonhead Creek, Lakeside Creek and Sheridan Creek), under the jurisdiction of Credit Valley Conservation (CVC). A small area within the southwest corner of the study area occurs within the Oakville East Urban Creeks Subwatershed (Joshua Creek) under the jurisdiction of Conservation Halton (CH) (**Figure 6**).



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DATE: Mar 20, 2019

DRAWN: BE

CHECKED: RA

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

LEGEND:

- Study Area
- Watercourse
- Piped Channel
- Hardened Channel
- Subcatchment[1]
- Culvert[2]
- CVC Fish Sampling Station[1]

1 - Data provided by Credit Valley Conservation
2 - Data provided by City of Mississauga

ADDITIONAL MAP NOTES:
Coordinate Reference System: NAD83 UTM 17
Imagery: study area - provided by client (2017); surrounds - Esri basemap service

CLIENT: TMIG The Municipal Infrastructure Group Ltd.

PROJECT: Southdown District

TITLE: Existing Aquatic Conditions

FIGURE NO.	REVISION:	PROJECT NO.
6	2	1301129

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4.7.1 Lake Ontario West Subwatershed (CVC)

Clearview Creek

Clearview Creek supports a warmwater fish community typical of urban streams. Fish surveys were completed by CVC at five locations (**Figure 6**). The following fish species were recorded at the fish sampling locations: Creek Chub (*Semotilus atromaculatus*), Fathead Minnow (*Pimephales promelas*) Blacknose Dace (*Rhinichthys atratulus*). These results include sampling conducted between 2003 and 2018.

Fish habitat was assessed by CVC as part of the Clearview Creek Feasibility Study (March 2018), from Lake Ontario to Winston Churchill Blvd in non-ice conditions on December 4, 2017. This assessment of fish habitat identified numerous barriers to fish habitat on Clearview Creek including the concrete channel downstream of Lakeshore Road, a boulder cascade upstream of Lakeshore Road which may be impassable under certain flow conditions, an online pond and associated outlet structure, numerous nickpoints and a stormwater pond and buried headwater system. The downstream extent of the creek has a densely vegetated riparian area. The mid-reaches and upstream extent of the creek have narrower riparian areas dominated by invasive trees and shrubs. Instream habitat is diverse with deep pools, over hanging vegetation and dense shade provided by mature trees, sorted substrate forming point bars and riffles and instream woody material (CVC, 2018).

Clearview Creek south of Lakeshore Road West has been channelized, with steep banks. At the time of the field reconnaissance site visit (September 19, 2018) flow was described as less than 5 cm in depth with significant algae present. Flow depth is approximately 15 cm deep further upstream, on the north side of Lakeshore Road. Creek is channelized through this area, though slightly wider, with rocks and leaf litter. The creek on the east side of Winston Churchill Blvd is characterized as having deep, opaque standing water with abundant floating duckweed and dense canopy cover.

Avonhead Creek

Avonhead Creek supports a warn to cool water fish community. Fish surveys were completed by CVC at five locations (**Figure 6**). The following fish species were recorded at the fish sampling stations: Longnose Dace (*Rhinichthys cataractae*), Common Carp (*Cyprinus carpio*), Pumpkinseed (*Lepomis gibbosus*), Fathead Minnow, White Sucker (*Catostomus commersonii*), Lake Chub (*Couesius plumbeus*), Northern Redbelly Dace (*Chrosomus eos*) and Threespine Stickleback (*Gasterosteus aculeatus*). These records include sampling conducted between 2004 and 2018.

Avonhead Creek along the north side of Lakeshore Road West is characterized as a narrow ditch with grassed banks and scattered trees, with no water visible at the time of field reconnaissance site visit (September 19, 2018). At the northern limit of the study area, on the south side of Royal Windsor Drive, Avonhead Creek is channelized and flows through a 3m wide cement culvert. At the time of the field reconnaissance survey, the creek supported standing water, approximately 30 cm deep, with dense Common Reed (*Phragmites australis*) and scattered floating green algae.

Lakeside Creek

Lakeside Creek supports a fish community with a temperature regime that has not yet been determined. Fish surveys were completed by CVC at one location (**Figure 6**). There were no fish species recorded at this sampling station.

Observations recorded during the field reconnaissance visit noted that Lakeside Creek is not visible north of Lakeshore Road West. Flow, approximately 1 m wide and 10 cm deep was recorded from a box culvert under Lakeshore Road West through flowing through gradual and rocky banks, over rocky substrate. Canopy cover over the creek in this area provides 100% cover, from predominately Elm and Locust trees.

Sheridan Creek

Sheridan Creek supports a warmwater fish community typical of urban streams. Fish surveys were completed by CVC at four locations upstream of the study area (**Figure 6**). The following fish species were recorded at the fish sampling locations: Fathead Minnow, Creek Chub, carp/minnow (*Cyprinus* sp.) and Common Shiner (*Luxilus cornutus*). These records include sampling conducted between 1993 and 2008. Sheridan Creek through the study area does not exist. This area is currently paved parking lot and retail buildings.

4.7.2 East Urban Creeks Subwatershed (CH)

Joshua Creek

Joshua Creek supports a warmwater fish community typical of urban streams. Fish surveys were completed by CH at three locations upstream of the study area (**Figure 6**). The following fish species were recorded at the fish sampling locations: Blacknose Dace, Bluntnose Minnow (*Pimephales notatus*), Common Shiner, Creek Chub, Johnny Darter (*Etheostoma nigrum*), Lake Chub, Longnose Dace, White Sucker, Brook Stickleback (*Culaea inconstans*), Common Carp, Goldfish (*Carassius auratus*), Rainbow Trout (*Oncorhynchus mykiss*), Rock Bass (*Ambloplites rupestris*), Round Goby (*Neogobius melanostomus*), Alewife (*Alosa pseudoharengus*), Fathead Minnow, Rosyface Shiner (*Notropis rubellus*), Yellow Perch (*Perca flavescens*) and Emerald Shiner (*Notropis athernoides*).

4.8 Species at Risk

MNRF was contacted for information on SAR occurrences or potential presence in and surrounding the study area. Information obtained from MNRF indicates that there are records of the following species in the vicinity of the study area:

- Peregrine Falcon (*Falco peregrinus*) – Special Concern
- Common Nighthawk (*Chordeiles minor*) – Special Concern

Additionally, the NHIC database contains records of the following species in the general area:

- Bank Swallow (*Riparia riparia*) – Threatened
- American Chestnut (*Castanea dentate*) – Endangered

Table 7 presents the habitat screening for these SAR species records.

Table 7. SAR Habitat Screening for NHIC SAR Records

Species	Habitat Requirement Overview	Habitat Suitability
Bank Swallow	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 m), natural and anthropogenic habitats, including: lake and ocean bluffs; stream and river banks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials. Nest burrows are nearly always in a vertical or near-vertical bank	Absent
American Chestnut	The American Chestnut prefers dryer upland deciduous forests with sandy, acidic to neutral soils. In Ontario, it is only found in the Carolinian Zone between Lake Erie and Lake Huron (as recorded by the Ontario NHIC).	Absent
Peregrine Falcon	Peregrine Falcons typically nest on tall, steep cliff ledges close to large bodies of water. Urban peregrines raise their young on the ledges of tall buildings.	Absent
Common Nighthawk	Habitat for Common Nighthawk consists of open areas with little to no ground vegetation, such as logged or burned-over areas, forest clearings, rock barrens, peat bogs, lakeshores and mine tailings. Although the species also nests in cultivated fields, orchards, urban parks, mine tailings and along gravel roads and railways, they tend to occupy natural sites.	Potential

5. Assessment of Significance

Parts of the project study area have been designated as Core Areas of the Regional Greenlands System (Official Plan Schedule A). These large, predominately forested areas (**Figure 5**) are identified by the City of Mississauga OP as within the Urban System – Green System and are designated as Significant Natural Areas and Natural Green Space (OP Schedule 3). Natural Hazards have been designated within the study area, associated with shoreline areas, Avonhead Creek and Clearview Creek. A summary and evaluation of potential significance, functions and sensitivity of existing features on site is provided below.

Wetlands

Based on NHIC mapping, there are no Provincially Significant or unevaluated wetlands within the study area. Vegetation community information provided by CVC, identifies four (4) small wetland pockets in areas outside the designated Natural Areas (**Figure 5**).

Woodland

Criteria for determining woodland significance are provided in the City of Mississauga Official Plan and in the Natural Heritage Reference Manual (NHRM) (OMNR 2010).

The three significant natural areas within the study area (**Figure 5**) contain significant woodland. These areas are protected through Peel Region OP environmental policies as part of the Regional Greenlands System, and/or through the City of Mississauga policies as part of Green System and Natural System. Additionally, the cultural woodland community that occurs within the Avonhead Creek corridor is identified as a Core Area of Peel's Greenlands System.

Significant woodlands are defined under the City's OP (OP Section 6.3.12) as, those that meet one or more of the following criteria:

- woodlands, excluding cultural savannahs, greater than or equal to four hectares;
- woodlands, excluding cultural woodlands and cultural savannahs, greater than or equal to two hectares and less than four hectares;
- any woodland greater than 0.5 hectares that:
    - supports old growth trees (greater than or equal to 100 years old);
    - supports a significant linkage function as determined through an Environmental Impact Study approved by the City in consultation with the appropriate conservation authority;
    - is located within 100 metres of another Significant Natural Area supporting a significant ecological relationship between the two features;
    - is located within 30 metres of a watercourse or significant wetland; or
    - supports significant species or communities.

Further screening of available background information and mapping is required, in additional to site-specific field surveys, in order to identify Significant Woodlands based on the criteria above.

Species at Risk

Through correspondence with MNRF and a query of the NHIC database, records of the following species have been identified in the general area:

- Bank Swallow (*Riparia riparia*) – Threatened
- American Chestnut (*Castanea dentate*) – Endangered
- Peregrine Falcon (Falco peregrinus) – Special Concern
- Common Nighthawk (*Chordeiles minor*) – Special Concern

Based on consultation with MNRF and on the results of PECGs field surveys and habitat screening, potential SAR habitat for Common Nighthawk has been identified within the study area.

Correspondence with MNRF, and further field investigations will be required to address the presence/absence of Species at Risk in greater detail. No suitable habitat for Bank Swallow or Peregrine Falcon was observed during the field reconnaissance visit to the project study area. The potential presence or absence of Species at Risk and associated habitat requires confirmation through standard spring and summer field investigations. Should Species at Risk be identified, requirements under the *Endangered Species Act* (ESA) would need to be addressed to ensure conformity to the *Act*.

Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is considered a significant feature in Provincial, Regional, and Municipal policies. Significant Wildlife Habitat (SWH) is defined by the MNRF in the Significant Wildlife Habitat Technical Guide (OMNR 2000) and includes the following broad categories:

- seasonal concentration areas;
- rare vegetation communities or specialised habitats for wildlife;
- habitats of species of conservation concern, excluding the habitats of endangered and threatened species; and
- animal movement corridors.

Criteria for the identification of these features are also provided in the *Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E* (MNRF 2015). These criteria were used to screen wildlife habitat within the study area for potentially significant wildlife habitat.

Potential SWH present within the project study area would be associated with the large forested blocks (those identified a Natural Areas on **Figure 5**), and riparian corridors which function as a local landscape feature providing wildlife movement functions and connectivity between Lake Ontario and upstream habitat. Outside of these areas, the natural features within the study area are small in size, fragmented and habitat opportunities are limited.

Field surveys and further assessment would be required during subsequent phases of this study to screen for the potential presence of SWH based on the criteria above.

6. Discussion of Preliminary Constraints

In the context of the preceding policy framework and based on the results of PECG's background natural environmental assessments, the following discussion of recommendations for determining environmental (natural heritage and hydrogeological) constraints for the project study area is provided below (**Table 8**).

These recommendations for the identification of constraint features/areas are based on existing natural heritage systems designated through policy and on the identification and protection of environmentally significant and sensitive natural heritage features.

Table 8. Categories for the Identification of Constraints

Natural Environmental Feature/Area	Data Source	Rationale
Natural Heritage Systems designated through Municipal policy • Core Areas of the Region of Peel's Greenlands System • City of Mississauga's Natural Heritage System	• Region of Peel Official Plan Schedule A • City of Mississauga Official Plan Schedule 3	These are designated areas that contains ecological features and functions, identified for protection by the Region of Peel and the City of Mississauga. These areas are subject to the policies of the Regional and Municipal Official Plans. Significant Natural Areas are included within the City's Natural Heritage System
Conservation Authority (CA) Regulated Area and wetlands	• CH and CVC Regulated Area Mapping • ELC mapping (CVC and City of Mississauga)	CA Regulated Area strives to safeguard watershed health by preventing pollution and destruction of ecologically sensitive area such as significant natural features and areas, wetlands, shorelines, valleylands and watercourses. Small wetland pockets that occur outside of CA Regulated Area, but identified through ELC, have been included in this category
Forest, Woodland and Plantation Communities	• ELC mapping (CVC and City of Mississauga)	Forest, woodland and plantation communities, identified through ELC, may contain features and functions which support broader designated natural heritage systems. These communities require further study in order to determine appropriate protection measures based on an assessment of feature significance

Natural Environmental Feature/Area	Data Source	Rationale
Cultural Thicket and Meadows	• ELC mapping (CVC and City of Mississauga)	These areas are identified for their potential provision of habitat for Species at Risk birds. These communities require further study in order to determine appropriate protection measures based on a screening of potential habitat
Credit Valley and Halton Source Water Protection – HVA and IPZ/EBA	• Source Water Protection Information Atlas (MECP, 2018)	Areas designated as a HVA are susceptible to contamination through the release of pollutants on ground surface. These areas are subject to certain land use policies, including the application and/or handling and storage of road salt. Areas classified as IPZ-2 with a score of 4.5 and 4.8 are present. An IPZ-2 is defined as is the area around a surface water intake where water can reach the intake within 2 hours. An EBA associated with the Wastewater Treatment Plant and Sanitary Sewer, and an EBA associated with pipeline fuel and/or an oil spill have been identified. An Event Based Area (EBA) is an area delineated if modelling indicates that a spill from a specific activity may be transported to an intake and poses a significant threat to drinking water.
Groundwater Recharge Areas	• GIS-based water balance	Most infiltration is expected in areas corresponding with coarse grained glaciolacustrine deposits. It is recommended that infiltration based LID strategies should be implemented in regions where infiltration is expected to be high, and are outside of HVA designated areas. Consideration should be given to maintain the water balance of the natural areas present within the site boundary.

Preliminary Buffer Requirements

The City of Mississauga Official Plan directs that buffers *will be determined on a site-specific basis as part of an Environmental Impact Study or other similar study to the satisfaction of the City and appropriate conservation authority.* The CVC Watershed Planning and Regulation Policies (CVC 2010) lists the following minimum buffer recommendations:

i. 10 metres from the limit of flood hazards;
ii. 10 metres from the limit of erosion hazards;
iii. 10 metres from the limit of dynamic beach hazard;
iv. 10 metres from the drip line of significant woodlands;
v. 10 metres from the limit of other wetlands;
vi. 30 metres from the limit of provincially significant wetlands;
vii. 30 metres from the bankfull flow location of watercourses; and/or
viii. A distance to be determined through the completion of a comprehensive environmental study or technical report, to the satisfaction of CVC, from the limit of the following:
    a. significant wildlife habitat;
    b. significant habitat of threatened species and endangered species;
    c. regionally and provincially significant life science ANSIs;
    d. ESAs; and/or e. significant habitat of species of conservation concern.

Preliminary buffers width recommendations will be determined through consultation with CVC, CH and the City of Mississauga.

7. Conclusion and Next Steps

The consolidation of natural environmental existing conditions information for the Southdown District Stormwater Servicing study area was based on the review of background information, available mapping and agency consultation, and an analysis of data using current scientific understanding of the ecology and hydrogeology of the area and natural heritage policy requirements.

This information will inform the determination of environmental constraints and opportunities and the identification of lands suitable for future development/re-development, as well as provide the basis for appropriate management practices and buffer recommendations.

The following investigations/tasks are recommended in support of subsequent study phases:

1. Field surveys to confirm and refine the characterization and assessment of significance of the natural environment presented in this report, as necessary and where access to lands is permitted/granted;
2. Preparation of Constraints and Opportunities Mapping to include appropriate feature buffers;
3. Recommendations will be provided for future restoration and enhancement, including terrestrial linkage opportunities.

8. Certification

This report was prepared and reviewed by the undersigned:

Prepared by:	Prepared by:
Jennifer Paterson, M.Sc. Ecologist	Corinne Hanlon, M.Sc., P.Geo Hydrogeologist
Reviewed by:	Reviewed by:
Dirk Janas, B.Sc. Principal, Senior Ecologist	Jason Cole, M.Sc., P.Geo Principal, Senior Hydrogeologist

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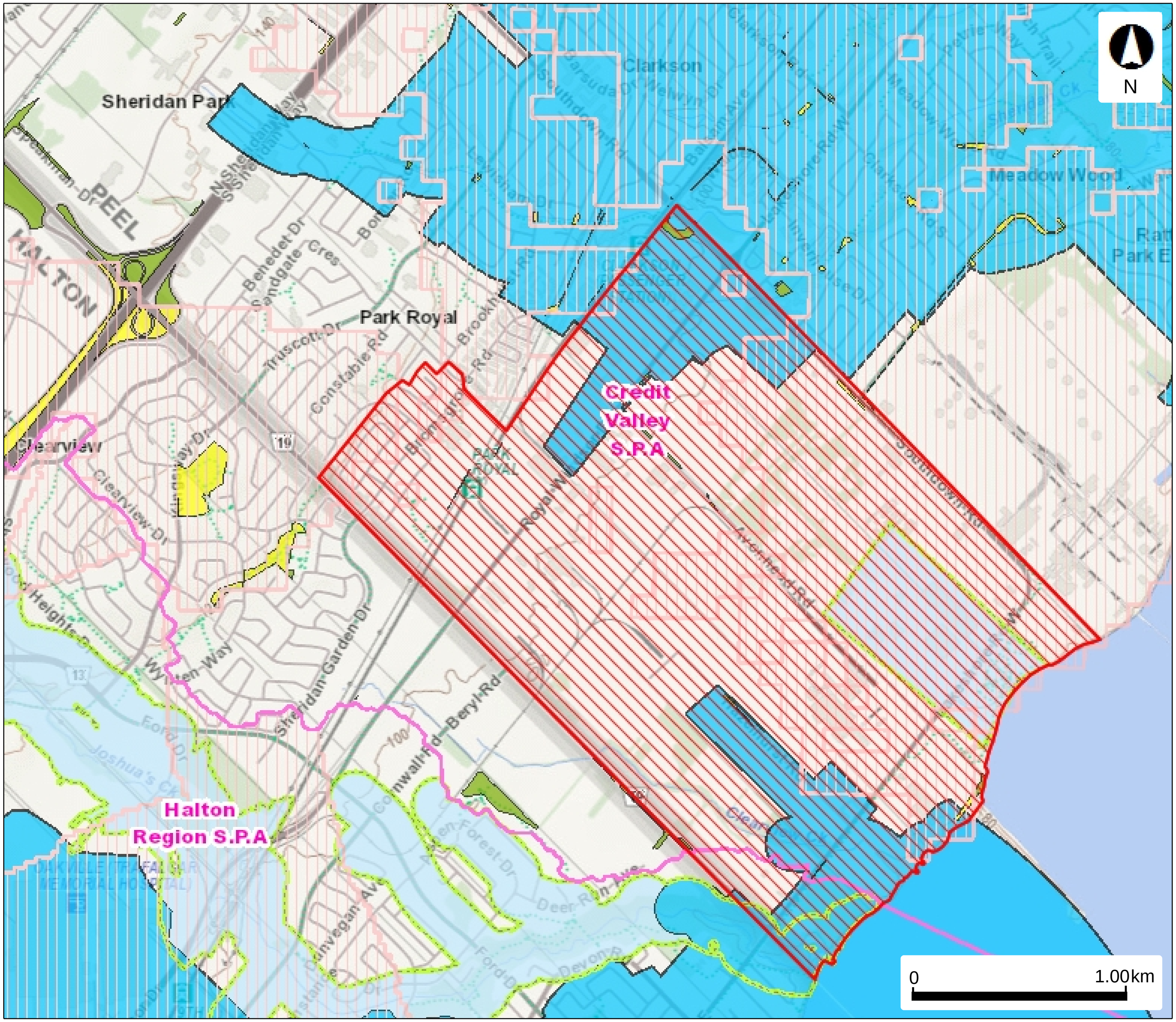
Appendix A

Source Water Protection Mapping

Source Water Protection



Legend

- Source Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Area
  - 2
  - 4
  - 6
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Intake Protection Zone 3
- Vulnerable Scoring Area - Surface Water
  - 0 - 3.9
  - 4 - 7.9
  - 8 - 8.9
  - 9 - 10

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 3/15/2019
Map Center: 43.5008 N, -79.63805 W

APPENDIX B

Archeological Report

ARCHEOWORKS INC.

Stage 1 Archaeological Assessment for the Stormwater Servicing and Environmental Management Plan for Southdown District in Mississauga Within Part of Lots 34-35, Concession 2 South of Dundas St. And Lots 31-35, Concessions 3 and 4 South of Dundas St. In the Geographic Township of Toronto Former County of Peel Now the City of Mississauga Regional Municipality of Peel Ontario

Project #: 080-MI8105-18
Licensee (#): Kassandra Aldridge (P439)
PIF#: P439-0055-2019

Original Report

April 15th, 2019

Presented to:
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Prepared by:
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EXECUTIVE SUMMARY

Archeoworks Inc. was retained by *The Municipal Infrastructure Group (TMIG) Limited* to conduct a Stage 1 AA in support of the Southdown District Stormwater Servicing and Environmental Management Plan which is roughly bounded by Winston Churchill Boulevard, Lake Ontario, Southdown Road, and Royal Windsor Drive/Bromsgrove Road/Sherhill Drive (a headwater drainage boundary), in the City of Mississauga. This property will herein be referred to as the "study area." The study area is located within part of Lots 34 and 35, Concession 2 South of Dundas Street and Lots 31 to 35 in Concessions 3 and 4 South of Dundas Street, in the Geographic Township of Toronto, formerly in the County of Peel, now in the City of Mississauga, in the Regional Municipality of Peel, Ontario.

Stage 1 AA background research revealed that portions of the study area have been previously subjected to a Stage 1 and/or Stage 2 AA. While areas of low or no archaeological potential exist within the study area, areas retaining archaeological potential still remain. Based on the findings within this Stage 1 AA study, the following recommendations are presented:

1. With previous assessments by *Archaeological Services Inc.* (2014, 2015) and *Golder Associates* (2014), having fulfilled the Stage 1 and 2 AA requirements within their respective portions of the current study area**,** it is recommended that these areas be exempt from further assessment within the scope of this project.

2. Parts of the study area that were identified as having archaeological potential removed are exempt from requiring Stage 2 AA (extents of these areas to be confirmed during the Stage 2 AA).

3. Parts of the study area that were identified as having no or low archaeological potential are exempt from requiring Stage 2 AA (extent of these areas to be confirmed during the Stage 2 AA).

4. All identified areas which contain archaeological potential, must be subjected to a Stage 2 AA.

No construction activities shall take place within the study area prior to the *MTCS* (Archaeology Programs Unit) confirming in writing that all archaeological licensing and technical review requirements have been satisfied.

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LIST OF TABLES

PROJECT PERSONNEL

Project Director..Kassandra Aldridge – MTCS licence P439

Report Preparation .... Ian Boyce – MTCS licence P1059

Report Review...Kim Slocki – MTCS licence P029

Historical Research...Lee Templeton – MTCS licence R454

Graphics .... Ian Boyce – MTCS licence P1059
Lee Templeton – MTCS licence R454

1.0 PROJECT CONTEXT

1.1 Objective

The objectives of a Stage 1 Archaeological Assessment (AA), as outlined by the 2011 *Standards and Guidelines for Consultant Archaeologists* (‘*2011 S&G*’) published by the *Ministry of Tourism, Culture, and Sport* (*MTCS*) (2011), are as follows:

- To provide information about the property’s geography, history, previous archaeological fieldwork and current land condition;
- To evaluate in detail, the property’s archaeological potential, which will support recommendations for a Stage 2 survey for all parts of the property; and
- To recommend appropriate strategies for a Stage 2 survey.

1.2 Development Context

In support of future urban development and redevelopment within the City’s Southdown District, the City of Mississauga requires a Stormwater Servicing and Environmental Management Plan, which would review, update and expand on the previous Southdown Master Drainage Plan that was prepared in 2000.

The purpose of the plan is to develop a stormwater servicing plan that will allow sustainable urban development and re-development within the Southdown District subject area while protecting, maintaining, and enhancing the existing surface water, groundwater, and natural environmental resources of the subject area. The resulting plan will provide guidance for future development/re-development activities by establishing stormwater management measures to minimize flooding, erosion, water quality degradation, and water balance impacts, as well as identifying stormwater retrofit opportunities within existing urban areas. The plan will also consider the potential impacts and benefits to the existing natural systems in the subject area and make recommendations for ecological restoration and enhancement.

To facilitate this plan, *Archeoworks Inc*. was retained by *The Municipal Infrastructure Group (TMIG) Limited* to conduct a Stage 1 AA in support of the Southdown District Stormwater Servicing and Environmental Management Plan which is roughly bounded by Winston Churchill Boulevard, Lake Ontario, Southdown Road, and Royal Windsor Drive/Bromsgrove Road/Sherhill Drive (a headwater drainage boundary), in the City of Mississauga. This property will herein be referred to as the “study area.” The study area is located within part of Lots 34 and 35, Concession 2 South of Dundas Street and Lots 31 to 35 in Concessions 3 and 4 South of Dundas Street, in the Geographic Township of Toronto, formerly in the County of Peel, now in the City of Mississauga, in the Regional Municipality of Peel, Ontario (***see Appendix A – Map 1***).

This study was triggered by the *Environment Assessment Act* in support of the Municipal Class Environmental Assessment (EA) regulatory process. It was conducted under the project direction of Ms. Kassandra Aldridge under the archaeological consultant licence number P439, in accordance with the *Ontario Heritage Act* (2009). Permission to investigate the study area was granted by *The Municipal Infrastructure Group (TMIG) Limited* on December 11th, 2018.

1.3 Historical Context

To establish the historical context and archaeological potential of the study area, a review of Aboriginal and Euro-Canadian settlement history, available historical mapping and imagery, and updated information on archaeological sites in the vicinity of the study area, was performed.

1.3.1 Pre-Contact Period

The Pre-Contact Period of Southern Ontario includes numerous Aboriginal groups that continually progressed and developed within the environmental constraints they inhabited. **Table 1** includes a brief overview and summary of the Pre-Contact Aboriginal history of Southern Ontario.

Table 1: Pre-Contact Period

Periods	Date Range	Overview and Attributes
PALEO-INDIAN		
Early	ca. 11000-8500 BC	Small groups of nomadic hunter-gathers who utilized seasonal and naturally available resources; sites are rare; hunted in small family groups who periodically gathered into larger groups/bands during favourable periods in the hunting cycle; campsites used during travel episodes and found in well-drained soils in elevated situations; sites found primarily along glacial strandlines due to current understanding of regionals geological history; artifacts include fluted and lanceolate stone points, scrapers, dart heads. - Gainey, Barnes, Crowfield Fluted Points (Early Paleo-Indian) - Holcombe, Hi-Lo, Lanceolates Points (Late Paleo-Indian) (Ellis and Deller, 1990, pp.37-64; Wright, 1994, p.25; Ellis, 2013, p.37).
Late	ca. 8500-7500 BC	
ARCHAIC		
Early	ca. 7800-6000 BC	Descendants of Paleo-Indian ancestors; lithic scatters are the most commonly encountered site type; trade networks appear; burial/grave goods and ritual items appear; artifacts include reformed fluted and lanceolate stone points with notched bases to attach to wooden shaft; ground-stone tools shaped by grinding and polishing; stone axes, adzes and bow and arrow. - Side-notched, corner-notched, bifurcate projectile points (Early Archaic) - Stemmed, Otter Creek/Other Side-notched, Brewerton side and corner-notched projectile points (Middle Archaic) - Narrow Point, Broad Point, Small Point projectile points (Late Archaic) (Ellis et al., 1990, pp.65-124; Wright, 1994, pp.26-28; Ellis, 2013, pp.41-46).
Middle	ca. 6000-2000 BC	
Late	ca. 2500-500 BC	
WOODLAND		

Periods	Date Range	Overview and Attributes
Early	ca. 800 to 0 BC	Evolved out of Late Archaic Period; introduction of pottery (ceramic) - the earliest were coil-formed, under-fired and likely utilitarian; two primary cultural complexes: Meadowood (broad extent of occupation in southern Ontario) and Middlesex (restricted to Eastern Ontario); poorly understood settlement-subsistence patterns; artifacts include cache blades, and side-notched points that were often recycled into other tool forms; primarily Onondaga chert; commonly associated with Saugeen and Point Peninsula complexes. - Meadowood side-notched projectile points (Spence et al., 1990, pp.125-142; Wright, 1994, pp.29-30; Ferris and Spence, 1995, p.89-97; Williamson, 2013, pp.48-61).
Middle	ca. 200 BC to AD 700	Three primary cultural complexes: Point Peninsula (generally located throughout south-central and eastern Southern Ontario), Saugeen (generally located southwestern Southern Ontario), and Couture (generally located in southwestern-most part of Ontario); introduction of large "house" structures and substantial middens; settlements have dense debris cover indicating increased degree of sedentism; incipient horticulture burial mounds present; shared preference for stamped, scallop-edged or tooth-like decoration, but each cultural complex had distinct pottery forms. - Saugeen Point projectile points (Saugeen) - Vanport Point projectile points (Couture) - Snyder Point projectile points (Spence et al., 1990, pp.142-170; Wright, 1994, pp.28-33; Ferris and Spence, 1995, p.97-102; Wright, 1999, pp.629-649; Williamson, 2013, pp.48-61).
Late (Transitional)	ca. AD 600 to 1000	Princess Point exhibits few continuities from earlier developments with no apparent processors; hypothesized to have migrated into Ontario; the settlement data is limited, but oval houses are present; artifacts include 'Princess Point Ware' vessel that are cord roughened, with horizontal lines and exterior punctation; smoking pipes and ground stone tools are rare; introduction of maize/corn horticulture; continuity of Princess Point and Late Woodland cultural groups. - Triangular projectile points. (Fox, 1990, pp.171-188; Ferris and Spence, 1995, pp.102-106).
Late (Early Ontario Iroquois Stage)	ca. AD 900 to 1300	Two primary cultures: Glen Meyer (located primarily in southwestern Ontario from Long Point on Lake Erie to southwestern shore of Lake Huron) and Pickering (encompassed north of Lake Ontario to Georgian Bay and Lake Nipissing); well-made and thin-walled clay vessels with stamping, incising and punctation; multi-family longhouses and some small, semi-permanent palisade villages; adoption of greater variety of harvest products; increase in corn-yielding sites; crudely made smoking pipes, and worked bone/antler present; evolution of the ossuary burials - Triangular-shaped, basally concave projectile points with downward projecting corners or spurs. (Williamson, 1990, pp.291-320; Ferris and Spence, 1995, pp.106-109).
Late (Middle Ontario Iroquois Stage)	ca. AD 1300 to 1400	Fusion of Glen Meyer and Pickering caused by conquest and absorption of Glen Meyer by Pickering'; two primary cultures: Uren (A.D. 1300-1350) and Middleport (A.D. 1350-1400); decorated clay vessels decrease; well-developed clay pipe complex that includes effigy pipes; increase in village sizes (0.5 to 1.7 ha) and campsites (0.1 to 0.6 ha) appear with some palisades; classic longhouse takes form; increasing reliance on maize and other cultigens such as beans and squash; intensive exploitation of locally available land and water species - Triangular and (side of corner or corner removed) notched projectile points - Middleport Triangular and Middleport Notched projectile points. (Dodd el al., 1990, pp.321-360; Ferris and Spence, 1995, pp.109-115).

Periods	Date Range	Overview and Attributes
Late (Late Ontario Iroquois Stage)	ca. A.D. 1400 to 1600	Ontario Iroquoian sites describes two major groups east and west of the Niagara Escarpment: the ancestral Neutral Natives to the west, and the ancestral Huron-Wendat and to the east; Huron-Wendat "concentrations of sites occur in the areas of the Humber River valley, the Rouge and Duffin Creek valleys, the lower Trent valley, Lake Scugog, the upper Trent River and Simcoe County" (Ramsden, 1990, p.363); longhouse; villages enlarged to 100 longhouses clustered together as horticulture (maize, squash, and beans) gained importance in subsistence patterns; villages chosen for proximity to water, arable soils, available fire wood and defendable position; diet supplemented with fish; ossuaries; tribe/band formation; relocation to north of Lake Simcoe; Pre-Contact ancestral Neutral (called Attiewandaron by the Huron-Wendat) Natives distributed west of the Niagara Escarpment; varying settlements include villages up to five acres in size to isolated fishing cabins; villages tend to be located along smaller creeks, headwaters and marshlands; diet dependent on hunting, gathering, fishing and farming; longhouses present; ossuaries; tribe/band formation; theorized that Credit River may have functioned as a boundary marker between the ancestral Neutral Natives and ancestral Huron-Wendat peoples; The Petun (Tionnontaté or Khionontateronon) were located along the Blue Mountains to the northwest, and are theorized to have arrived ca.1580 from Neutral territory; since the Grand River headwaters are located in the northwest corner of Dufferin County, the Petun are believed to have utilized Dufferin County (north of the study area) as hunting territory. - Huron-Wendat projectile points are limited but change from predominantly side-notched to unnotched triangular. - Neutral Native projectile points are typically small but long and narrow, frequently side- notched (Sawden, 1952, p.7; Heidenreich, 1978, pp.368-388; Lennox and Fitzgerald, 1990, pp.405-456; Ramsden, 1990, pp.361-384; Trigger, 1994, p.42-47; Ferris and Spence, 1995, pp.115-122; Warrick, 2000, p.446-454; Warrick, 2008, p.15; Brown, 2009, p.26; Garrad, 2014, pp.1, 147-148).

1.3.2 Contact Period

The Contact Period of Southern Ontario is dominated by the European arrival, interaction and influence with the established Aboriginal communities of Southern Ontario. **Table 2** includes an overview and summary of some of the main developments that occurred during the Contact Period of Southern Ontario.

Table 2: Contact Period

Periods	Date Range	Overview
European Contact	ca. AD 1600s	The area "south of Lake Simcoe and along the north shore of Lake Ontario remained a no-man's land, with no permanent settlements and traversed only by raiding parties from the north or from the south" (Robinson, 1965, p.11); Huron-Wendat villages north of Lake Simcoe; Neutral Native villages were clustered in the Niagara Peninsula; French arrival into Ontario; trade relationship with Huron-Wendat and French establish; Neutral Natives referred as *la Nation neutre* by Samuel de Champlain but limited European contact with Neutrals; no direct commercial trade relationship was formed between the French and Neutral natives; the Tionnontaté or Khionontateronon were called 'Petun' a term meaning tobacco; scant references

Periods	Date Range	Overview
		to the Petun were made by fur traders leading to the belief that fur traders assumed they were similar to the Huron-Wendat; trade goods begin to replace traditional tools/items; Jesuit and Recollét missionaries; epidemics (Jury, 1974, pp.3-4; Garrad and Heidenreich, 1978, pp.395-396; Heidenreich, 1978, pp.368-388; White, 1978, pp.407-411; Lennox and Fitzgerald, 1990, pp.405-456; Trigger, 1994, pp.47-55; Warrick, 2008, pp.12, 15, 80, 245; Garrad, 2014, pp.148, 167-168, 490).
Five Nation (Haudenosaunee) Arrival	ca. AD 1650s	The Five (later Six) Nations (or Haudenosaunee), originally located south of the Great Lakes, engaged in warfare with Huron-Wendat neighbours as their territory no longer yielded enough furs; Five Nations of Iroquois attacked and destroyed numerous Huron-Wendat villages in 1649-50; the small groups that remained became widely dispersed throughout the Great Lakes region, ultimately resettling in Quebec; to prevent the revival of Huron-Wendat settlements, the Five Nations of Iroquois attacked and destroyed the villages of the Huron-Wendat allies, the Petun Natives; in 1650, what remained of the Petun Natives migrated through Neutral Native territory prior to resettlement in America; the Five Nations of Iroquois attacked Neutrals ca.1650s and caused their dispersal Five Nations of Iroquois established settlements along the Lake Ontario shoreline at strategic locations along canoe-and-portage routes and used territory for extensive fur trade; villages along the northern shores of Lake Ontario; European fur trade and exploration continues (Robinson, 1965, pp.15-16; Schmalz, 1991, pp.12-34; Trigger, 1994, p.53-59; Williamson, 2013, p.60; Garrad, 2014, pp.501-505).
Anishinaabeg Arrival	ca. AD 1650s to 1700s	Algonquin-speaking and cultural groups within the Anishinaabeg (Ojibway, Chippewa, Odawa, Mississauga and others) began to challenge the Five Nations of Iroquois dominance in the region; by 1690s, Five Nations of Iroquois settlements were abandoned; battles fought throughout Southern Ontario; by 1701, Five Nations of Iroquois in Southern Ontario and groups within the Anishinaabeg gathered collectively as First Nations to participate in Great Peace negotiations; the term 'Mississauga' was applied to those on the north shore of Lake Ontario and were granted land extending northward of Lake Ontario and Lake Erie; Mississauga focused on hunting/fishing/gathering with little emphasis on agriculture; temporary and moveable houses (wigwam) left little archaeological material behind; the Credit River was known as *Missinnihe* (or *Messinnike*) translated to 'trusting creek' and was a favoured location of trade between the Mississauga and European traders; the Mississauga who settled along the west shore of Lake Ontario became known as the Credit River Indians and settled near Port Credit (Hathaway, 1930, p.433; Loverseed, 1987, pp.11,17; Trigger, 1994, pp.57-59; TRCA, 1998, p.18; Skeoch, 2000, pp.20-21; Johnston, 2004, pp.9-10; McMillian and Yellowhorn, 2004, pp.110-111; Gibson, 2006, pp.35-41; Smith, 2013, pp.16-20; Williamson, 2013, p.60).
Fur Trade Continues	ca. AD 1750s	The Anishinaabeg continued to trade with both the English and the French; establishment of the Métis; Seven Years War between France and Britain resulted in French surrender of New France in 1763; Royal Proclamation of 1763; Beaver Wars between groups within the (now) Six Nations of Iroquois and groups within the Anishinaabeg against the British; fur trade continued until Euro-Canadian settlement (Schmalz, 1991, pp.35-62, 81; Surtees, 1994, pp.92-97; Johnston, 2004, pp.13-14).
British Land Treaties	ca. AD 1750s to 1800s	American Revolution caused large number of United Empire Loyalists, military claimants, immigrants from the British Isle/European locations, and groups who faced persecution in the United States to arrive in Upper Canada; Treaty of Paris signed in 1784; in 1805 a tract of land was ceded from the Mississauga that included lands "reaching from the Etobicoke Creek on the East for twenty-six miles westward to the outlet of Burlington Bay, these lands stretching back from the Lake shore line for from five to six miles to what we now know as the Second Concession North of

Periods	Date Range	Overview
		Dundas (or Eglinton Avenue)" (Fix, 1967, p.13); one mile on either side of the Credit River and the 'flat lands' bordering the Etobicoke Creek were to remain property of the Mississaugas; the Mississauga obtained £1000 worth of goods and the right to retain their fishery sites at the mouths of the Credit River, Sixteen Mile Creek, and Twelve Mile Creek; a strip of land one-mile-wide on each side of the Credit River was reserved for the Mississauga Natives, with specific privileges for fishing; this treaty included lands in the southern parts of the Township of Toronto in Peel County and Trafalgar and Nelson Townships in Halton County; a confirmatory surrender was issued in 1806; included lands south of Eglinton Avenue (Department of Indian Affairs, 1891, p.lv; Weaver, 1913, p.65; Loverseed, 1987, p.21; Surtees, 1994, p.110; Government of Ontario, 2014)

1.3.3 Euro-Canadian Settlement Period (1800s to present)

1.3.3.1 Geographic Township of Toronto and the Community of Clarkson

After the signing of the British Land Treaties, the land was divided into the Township of Toronto in Peel County and Townships of Trafalgar and Nelson in Halton County, and is known as the "Old Survey" (Clarkson, 1977, p. 8; Riendeau, 2002, pp.123). Peel County was initially part of Home District, and the County of Peel was divided into townships: the preferred unit of land division by British administrators (Loverseed, 1987, p.23). The Old Survey of the Township of Toronto was completed in 1806 by Samuel Wilmot, Deputy Surveyor (Walker and Miles, 1877, p.86). Dundas Street, a military road conceptualized by Lieutenant-Governor John Graves Simcoe and constructed by the Queen's Rangers following a trail used by the Natives, was the only road, and consequently the main east-west roadway through the province, that penetrated the dense forest in Toronto Township, and until settlers arrived, remained a wagon-width trail (Clarkson, 1977, p.8; Riendeau, 2002, p.123). Initial settlement in the Township of Toronto was along Dundas Street and these first settlers were experienced farmers, many of which were United Empire Loyalists and Late Loyalists (Riendeau, 2002, pp.123-124).

The Napoleonic Wars in Europe had slowed immigration from the British Isle; only 175 individuals are listed in the Township of Toronto the 1809 Census Record (Riendeau, 2002, p.125). In June of 1812, the United States declared war on Great Britain and Upper Canada became a major battleground; however, no battles came closer than the Humber River (Clarkson, 1977, p.9). After the War of 1812, there was mounting pressure for new land to accommodate the "increasing amount of new settlers from the British Isles, to meet the demands of the demobilized military personnel for their promised land grants, and to provide the necessary land for children of the United Empire Loyalists who had settled in eastern Ontario and on the Niagara Frontier a generation earlier" (McKinney, 1967, p.244). To accommodate this influx of settlers, the remainder of the Mississauga Tract, within what is now Peel Region, was purchased by William Claus in 1818. The area belonged to the Credit River Mississauga who found themselves victim to encroachment on their lands and fisheries by Euro-Canadian settlers (Surtees, 1994, p.116). The Credit River Mississaugas, under the leadership of Ajetance, chief of the Credit River Mississauga, settled for goods in the value of £522.10 shilling annually per person in exchange for 648,000 acres of land, including some land along the Credit River. This Second Purchase, known as the Ajetance Purchase or Treaty 19, surrendered lands north of Eglinton Avenue and form the 'New Survey' of the Township of Toronto (Department of Indian Affairs, 1891, p.lv; Surtees, 1994, p.117; Riendeau, 2002, pp.123,127).

In 1826, the Mississauga village at the mouth of the Credit River was relocated to the Credit Mission, located on the site of what is now the Mississauga Golf and Country Club on Mississauga Road (FitzGibbon, 2009; Riendeau, 2002, p.125). By 1837, the Mississauga population was decimated by contagious diseases, such as smallpox, tuberculosis and measles, killing nearly two-thirds of the Mississaugas at the western end of Lake Ontario (Smith, 2002, p.110; Riendeau, 2002, p.125). Further constricted by the pressures of the agrarian way of life of the Euro-Canadian settler, the Mississaugas of the Credit River were relocated again to the Grand River Reserve (Riendeau, 2002, p.125).

By 1842, the population of the Township of Toronto included 5,377 individuals, and 28,468 of 59,26 acres taken up were under cultivation. There were four grist mills and 21 saw mills in the township. As the population of the Township of Toronto continued to grow, small communities began to form throughout the township. Clarkson, located along Lakeshore Road and west of Southdown Road and northeast of the study area, is the considered one of the oldest settled village in the County of Peel having been first settled in 1808 by Thomas Marigold and Benjamin Monger and their families. In 1811, an inn was opened on Middle Road, and in 1819, Warren Clarkson purchased 200 acres around the community. By 1835, Clarkson Road, which originally followed a trail, was constructed leading into the hamlet and an inn, store and a burying ground was established along this road. In 1853, the Great Western Railway, purchased land from Warren Clarkson to construct the railway. Originally, the hamlet was called 'Marigold's Point,' it was changed to 'Clarkson's Corners' and then 'Clarkson' when the train station on the Great Western Railway was completed in 1855. In 1875, the Clarkson post office was opened. After the railway was constructed through the community, business increased and the village grew (Smith, 1846, pp.192-193; Martin, 1967, p.273; Heritage Mississauga, 2018a).

By the end of the nineteenth century, fruit growing, packing, storing and shipping became an important industry in the community. In 1941, the British American Oil Company constructed their oil refinery consisting of a large complex of storage and refining facilities situated near the Lake Ontario shoreline (Martin, 1967, p.273).

1.3.3.2 The Community of Sheridan

Sheridan was located at the present-day intersection of Winston Churchill Boulevard and the Queen Elizabeth Way (QEW) (formerly Middle or Commissioners' Road), and northwest of the study area. It was originally known as Hammondville and was situated on the town line between the Township of Toronto and the Township of Trafalgar. Its development was slow due to the closely neighbouring Springfield (present-day Erindale). A post office was opened in 1857, which was likely when the community was renamed Sheridan after the British playwright Richard Brinsley Sheridan. By 1877, the community had a general store, post office, a Methodist (United) Church, a school, a Temperance Hall, a tannery, a blacksmith and a chair factory and was home to 100 individuals. By 1880, the community of Sheridan diminished in size (Walker & Miles, 1877, p.87; Martin, 1967, p.277; Heritage Mississauga, 2018b).

1.3.4 Past Land Use

To further assess the study area's potential for the recovery of Euro-Canadian remains, several documents were reviewed to gain an understanding of the land use history.

1.3.4.1 Pre-1900 Land Use

A review of the 1859 *Tremaine's Map of the County of Peel* and the 1877 *Illustrated Historical Atlas of the County of Peel* was conducted in order to gain an understanding of the land use history (***see Maps 2-3***). The study area primarily falls within property owned by several individuals (***Tables 3-4***).

Table 3: Historic Structures within the Study Area in the 1859 Tremaine Map

Lot, Con.	Portion	Owner	Structure(s) Present
34, 2 SDS*	Southwest part	John Marlan	No structure(s)
34, 2 SDS	Southeast part	W. Greeniaus	No structure(s)
35, 2 SDS	South half	Daniel Mills	No structure(s)
31, 3 SDS	West half	Captain C. H. Scholesfield	One structure (partially)
31, 3 SDS	East half	George Lees	One structure
32, 3 SDS	Northwest part	D. Hammond	One structure
32, 3 SDS	Northeast part	Captain C. H. Scholesfield	No structure(s)
32, 3 SDS	Southwest part	Rev. George Evans	No structure(s)
32, 3 SDS	Southeast part	Captain C. H. Scholesfield	One structure (partially)
33, 3 SDS	North part	J. F. Orr	No structure(s)
33, 3 SDS	Central part	Col. Wm. Thompson	No structure(s)
33, 3 SDS	South part	Oliver Thompson	No structure(s)
34, 3 SDS	North part	J. F. Orr	No structure(s)
34, 3 SDS	Central part	Wm. Thompson	One structure
34, 3 SDS	South part	Charles Lansley	No structure(s)
35, 3 SDS	North half	David Hammond	No structure(s)
35, 3 SDS	South half	Andrew Robertson	No structure(s)
31, 4 SDS	West half	Captain Foot	No structure(s)
31, 4 SDS	East half	Cap. C. N. Scoles	No structure(s)
32, 4 SDS	West half	Rev. George Evans	No structure(s)
32, 4 SDS	East half	Cap. C. N. Scoles	No structure(s)
33, 4 SDS	All	Col. Wm. Thompson	No structure(s)
34, 4 SDS	All	Unlisted	Partially marsh; No structure(s)
35, 4 SDS	All	Andrew Robertson	No structure(s)

* SDS = South of Dundas Street

According to the 1859 *Tremaine's Map of the County of Peel*, four historic structures are located in the study area and none are located within 300 metres of the study area. The Hamilton & Toronto Railway is depicted traversing the northern portion of the study area.

Table 4: Historic Structures within the Study Area in the 1877 Illustrated Atlas

Lot, Con.	Portion	Owner	Structure(s) Present
34, 2 SDS	Southwest part	Benjamin Marshal (N.R.)	No structure(s)
34, 2 SDS	Southeast part	Charles Cordingly	No structure(s)
35, 2 SDS	South half	John Wilson	One structure
31, 3 SDS	West half	Rev. George Evans	No structures
31, 3 SDS	East half	Edgar Bredin	One structure

Lot, Con.	Portion	Owner	Structure(s) Present
32, 3 SDS	Northwest part	David Hammond	No structures
32, 3 SDS	South half	Rev. George Evans	One structure
33, 3 SDS	North part	Charles Cordingly	No structure(s)
33, 3 SDS	South half	Job Hughes	One structure
34, 3 SDS	North part	Charles Cordingly	One structure
34, 3 SDS	Central part	Isaac Oliphant	One structure
34, 3 SDS	South part	P. Oliphant	One structure
35, 3 SDS	North half	David Hammond	One structure
35, 3 SDS	South half	Andrew Robertson	One structure; church
31, 4 SDS	West half	Rev. George Evans	No structure(s)
31, 4 SDS	East half	I. B. W	One structure
32, 4 SDS	All	Rev. George Evans	No structure(s)
33, 4 SDS	All	Job Hughes	No structure(s)
34, 4 SDS	West half	P. Oliphant	No structure(s)
34, 4 SDS	East half	Isaac Oliphant	No structure(s)
35, 4 SDS	All	Andrew Robertson	No structure(s)

According to the 1877 *Illustrated Historical Atlas of the County of Peel,* 10 historic homesteads and a church are located in the study area, while eight historic homesteads are located within 300 metres of the study area. A creek (likely Avonhead Creek) is depicted in the study area, while the Great Western Railway (formerly the Hamilton & Toronto Railway) continued to be depicted traversing the study area. It be noted that this map does not seem to accurately depict the Lake Ontario shoreline.

Additionally, the study area encompasses present-day Lakeshore Road, Royal Windsor Drive, Winston Churchill Boulevard and Southdown Road, which were originally laid out during the survey of the Township of Toronto. The Toronto & Hamilton Railway/Great Western Railway (now the Canadian National Railway) is also located within the study area. In Ontario, the *2011 S&G* considers areas of early Euro-Canadian settlements (e.g., pioneer homesteads, isolated cabins, farmstead complexes, early wharf or dock complexes, pioneer churches, and early cemeteries), early historic transportation routes (e.g., trails, passes, roads, railways, portage routes), and properties that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations are considered features or characteristics that indicate archaeological potential (per *Section 1.3.1* of the *2011 S&G*). Therefore, based on the proximity of both early Euro-Canadian settlements and historic transportation routes, there is elevated potential for the location of Euro-Canadian archaeological resources (pre-1900) within portions of the study area which lie within 300 metres and 100 metres, respectively, of these historic features.

1.3.4.2 Post-1900 Land Use

To facilitate the further evaluation of the established archaeological potential along the study area, a detailed review of topographic maps from 1909 (***see Map 4***), aerial imagery from 1954 (***see Map 5***) and satellite imagery from 2004, 2009 and 2018 was undertaken (***see Maps 6-8***).

The 1909 *Topographic Map* revealed the study area primarily encompassing land that had been cleared of overgrown vegetation, large woodlots, several creeks leading into Lake Ontario and several houses fronting Southdown Road, Lakeshore Road, Royal Windsor Drive and Winston Churchill Boulevard. The Toronto and Niagara Electric Power Line (present-day Ontario Hydro Corridor) and the Great Western Railway were both located within the study area. The study area remained unchanged to 1954.

By 1954, the study area consisted of open agricultural fields, large areas of replanted and rowed trees (possibly tree nurseries), several large woodlots, multiple homesteads, gravel roadways and a sandy shore along Lake Ontario. The Canadian National (CN) Railway (formerly the Great Western Railway) and the hydro corridor were still located within the study area. A large sewage treatment plant had been constructed adjacent to the study area at Southdown Road and Lakeshore Road.

By 2004, large portions of the study area had been developed and included large commercial and industrial companies (such as a cement plant and cement stockpiles), their paved parking areas and interior paved driveways, as well as a spur line of the Canadian National (CN) Railway to support the cement factory. The sewage plant had expanded onto lands west of Southdown Road, and a garden nursery (Sheridan Nursery), had also been established. Several walking trails along the Lake Ontario shoreline had been established and residential subdivision and a school had been constructed at the northwest portion of the study area. The remaining balance of the study area consisted of open agricultural fields, woodlots, manicured yardage fronting several commercial businesses, and areas of overgrown vegetation. The study area remained relatively unchanged until 2018.

1.3.5 Present Land Use

The present land use of the study area is categorized Business Employment, Industrial, Utility, Greenlands, Public Open Space, Mixed Use, Residential Low Density II and Residential Medium Density (City of Mississauga, 2015).

1.4 Archaeological Context

To establish the archaeological context and further establish the archaeological potential of the study area, *Archeoworks Inc*. conducted a comprehensive review of designated and listed heritage properties, commemorative markers and pioneer churches and early cemeteries in relation to the study area. Furthermore, an examination of registered archaeological sites and previous AAs within proximity to the study area limits, and a review of the physiography of the study area were performed.

The results of this background research are documented below and summarized in ***Appendix B – Summary of Background Research.***

1.4.1 Designated and Listed Cultural Heritage Resources

Per *Section 1.3.1* of the *2011 S&G*, property listed on a municipal register or designated under the *Ontario Heritage Act*, or that is a federal, provincial, or municipal historic landmark or site are considered features or characteristics that indicate archaeological potential. One designated heritage property resource is located in the study area and several designated and listed heritage resources are located within 300 metres of the study area (City of Mississauga, 2018; City of Mississauga, 2019a; Town of Oakville, 2019a; Town of Oakville, 2019b; ***see Tables 5-6***). Therefore, this feature contributes in establishing the archaeological potential within those portions of the study area that fall within 300 metres of this cultural heritage resource.

Table 5: Cultural Heritage Resources within the Study Area

Address	Description	Heritage Status
381 Winston Churchill Blvd	Robertson House, Gold Medal Farm. Built ca. 1851-1861: “This structure is a model of eclecticism. It draws on a diverse blend of architectural stylistic detail. Sources include Early Gothic Revival, Georgian Revival, Italianate and Neo-Classical. The property exemplifies the 19th century farm. It was awarded "The Gold Medal Farm" prize because it was the best looking farm over 100 acres in Peel” (City of Mississauga, 2019a)	Designated Part IV

Table 6: Cultural Heritage Resources within 300 metres of the Study Area

Address	Description	Heritage Status
1969 Lakeshore Road W	-	Listed
1998 Lakeshore Road W	-	Listed
2030 Lakeshore Road W	Stevenson House / Boulder Villa, Clarkson, built 1925-27: “This house, an example of California Bungalow or Airplane Bungalow, was built ca 1925-27 by David and Jennie Stevenson. David Stevenson, a builder and entrepreneur, was a professional tailor who co-owned an overcoat manufactory in Toronto in the 1920s. The stones required to build the house were taken from the Credit Valley.	Designated Part IV
2339 Lakeshore Road W	-	Listed
2682 Lakeshore Road W	-	Designated Part IV
555 Southdown Road	-	Listed
985 Southdown Road	Arts and Crafts style bungalow , built from 1919 to 1920 by Reuben Lush	Designated Part IV
989 Southdown Road	-	Listed
658 Winston Churchill Blvd	This property has potential cultural heritage value for its historic farmstead, including the Queen Anne and Edwardian style farmhouse and outbuildings.	Listed

“-” denotes details not provided.

1.4.2 Heritage Conservation Districts

Per *Section 1.3.1* of the *2011 S&G*, heritage resources listed on a municipal register or designated under the *Ontario Heritage Act* are considered features or characteristics that indicate archaeological potential. The study area is not located in or within 300 metres of a Heritage Conservation District (HCD) (City of Mississauga, 2019b; Town of Oakville, 2013; MTCS, 2019a). Therefore, this feature does not contribute in establishing the archaeological potential of the study area.

1.4.3 Commemorative Plaques or Monuments

Per *Section 1.3.1* of the *2011 S&G,* commemorative markers of Aboriginal and Euro-Canadian settlements and history which may include local, provincial, or federal monuments, cairns or plaques, or heritage parks are considered features or characteristics that indicate archaeological potential. The study area is not located in or within 300 metres of a commemorative plaque or monument (Ontario Historic Plaques, 2019). Therefore, this feature does not contribute in establishing the archaeological potential of the study area.

1.4.4 Pioneer/Historic Cemeteries

Per *Section 1.3.1* of the *2011 S&G,* pioneer churches and early cemeteries are considered features or characteristics that indicate archaeological potential. The study area is not located in or within 300 metres of a pioneer/historic church or cemetery (OGS, 2019a; OGS, 2019b). Therefore, this feature does not contribute in establishing the archaeological potential of the study area.

1.4.5 Registered Archaeological Sites

Per *Section 1.1, Standard 1* and *Section 7.5.8, Standard 1* of the *2011* S&G, the *Ontario Archaeological Sites Database* (OASD) maintained by the *MTCS* was consulted in order to provide a summary of registered or known archaeological sites within a minimum one-kilometre distance of the study area limits.

According to the OASD there are nine archaeological sites within a one-kilometre radius of the study area (MTCS, 2019) (***see Table 7***). Of these, one is located within the study area, and four more are located within a 300-metre radius.

Table 7: Registered Archaeological Sites within One Kilometre of the Study Area

Borden #	Name	Cultural Affiliation	Type
Registered site within the study area			
AjGv-56	Gable Site	Post-Contact	-
Other registered sites within 300 metres			
AiGv-4	Sheridan Nurseries 3	Paleo-Indian, Archaic	Unknown
AiGv-6	South of Tracks 1	-	-
AiGv-7	South of Tracks 2	-	-
AiGv-8	South of Tracks 3	-	-
Other registered sites within one kilometre			
AiGv-1	Buch	Archaic	Unknown
AiGv-2	Sheridan Nurseries 1	Archaic	Unknown
AiGv-3	Sheridan Nurseries 2	Paleo-Indian, Archaic	Unknown
AiGv-9	South of Tracks 4	-	-

"-" denotes details not provided in OASD

Per *Section 1.3.1* of the *2011 S&G*, previously registered archaeological sites are considered to be features or characteristics that indicate archaeological potential. Therefore, the presence of these sites establishes potential to encounter archaeological remains within portions of the study area that fall within 300 metres of the registered archaeological sites.

1.4.6 Previous Archaeological Assessments

To further establish the archaeological context of the study area, a review of previous AAs carried out within the limits of, or immediately adjacent (i.e., within 50 metres) to the study area, as documented by all available reports, was undertaken. Six reports have been identified (***see Table 8***):

Table 8: Previous Archaeological Assessments

Company, Report Date, PIF	Stage of Work	Relation to Study Area	Details and Recommendation
Archaeological Services Inc., 2015	Stage 1 AA	Encompasses part of the study area	Located at 388 Hazelhurst Road. A property inspection was conducted and, combined with background research, determined "there is no potential for the survival of any archaeological on the subject property." No further work was recommended.
Archaeological Services Inc., 2016	Stage 1 AA	Encompasses part of the study area	Located at 701-805 Winston Churchill Blvd. A property inspection was conducted and noted disturbances within the subject area that were considered too deep and extensive to warrant further survey. Disturbances accounted for 79% of the subject area and the remaining 21% was wet. It was recommended that no further archaeological assessment on the property be required.
Golder Associates, 2014	Stage 1 and 2 AA	Encompasses part of the study area	Associated with the Multi-Use Trail from Winston Churchill Blvd to South Sheridan Way within the Lakeshore-Royal Windsor Hydro Corridor. During the Stage 2 AA, a cluster of artifacts were found east of Indian Road and were determined to likely have been derived from a modern refuse context and composed part of a residential or recreational waste disposal event. This area is of no further cultural heritage value or interest. The negative test pits within the other portions of the proposed trail corridor indicate that there are no areas or items of cultural heritage value or interest that require further AA. It was recommended that the subject corridor may be considered free or archaeological concern.
The Archaeologists Inc., 2011	Stage 1 and 2 AA	Located within 50 metres of the study area	Located in Lot 1, Concession 3 SDS, in the Town of Oakville. Background research determined three sites (AiGv-6, AiGv-8 and AiGv-9) within the subject area. During the Stage 2 AA, no archaeological resources or sites were identified that required further assessment or mitigation of impacts. However, one previously identified site (AiGv-8) was described as containing 11 pieces and Stage 3 was recommended within the site area in an attempt to relocate the site, affix a cultural affiliation to the site and identify what the type of site may be. This site is located greater than 50 metres away from the subject area and will not be impacted.
WSP, 2018	Stage 1 AA	Encompasses part of the study area	Associated with the Metrolinx Regional Express Rail (RER) Program as part of The Big Move requiring infrastructure repairs to the Clarkson GO Station, located at Southdown Road to Bromsgrove Road, and extending onto Royal Windsor River and Lakeshore Road West. Stage 2 AA was recommended.

Company, Report Date, PIF	Stage of Work	Relation to Study Area	Details and Recommendation
Archaeological Assessment Ltd., 2002	Stage 1 AA	Encompasses part of the study area	Associated with the proposed natural gas pipeline located in the Town of Oakville to Southdown Station. Stage 2 AA was recommended on the corridor segments that includes land between Ford Drive and Winston Churchill Blvd, south of Royal Windsor Drive, and a segment located along a rail and oil pipeline west of the Southdown Site location.
AMEC Earth & Environmental., 2009	Stage 1 AA	Encompasses part of the study area	Located along the east side of Hazelhurst Road, approximately 380m north of Lakeshore Road West, and encompassing 11.50 hectares (28.42 acres) of land. A property inspection (described as a 'walk-through' visual assessment) occurred and determined Stage 2 AA was recommended on 12-acre southern portion, and the wooded lot and interspersed gardens that occupy the northern portion of the subject area (approximately 16 acres).
D.R. Poulton & Associates Inc., 2000a	Stage 1 AA	Encompasses part of the study area	Associated with the Proposed Southdown Station, an 800-megawatt combined cycle gas-fired power station, at 759-797 Winston Churchill Blvd. Background research determined potential has been degraded due to deposition of fill which effectively precludes an archaeological field assessment. Two areas not covered by fill (poorly drained lands in the southwest corner and remnant homestead in the northwest part of the property). Therefore, a limited Stage 2 AA was recommended on the remnant homestead and a field-based assessment of the balance of the property will be conducted.
D.R. Poulton & Associates Inc., 2000b	Stage 1 AA	Encompasses part of the study area	Associated with the study of a transmission line to connect the proposed Southdown Station to the existing Ontario Hydro transmission corridor to the north. These lands encompass part of the site assessment as part of D.R. Poulton & Associates Inc, 2000a. Background research determined the alignment of the proposed transmission line has moderate archaeological potential, but the extent to which that potential has been degraded by past construction impacts remains to be determined. Stage 2 AA recommended.
D.R. Poulton & Associates Inc., 2000c	Stage 2 AA	Encompasses part of the study area	Associated with the Proposed Southdown Station, an 800-megawatt combined cycle gas-fired power station and related facilities (the proposed transmission line), at 759-797 Winston Churchill Blvd and along the Right-Of-Way along the east or west side of Winston Churchill Blvd. During the Stage 2 AA, no archaeological remains whatsoever were found during the survey. For the proposed Southdown Station property, it is recommended that the archaeological conditions of plan approval be cleared in order that the development may proceed.

Company, Report Date, PIF	Stage of Work	Relation to Study Area	Details and Recommendation
Cornies, M.	Unknown	Encompasses part of the study area	The report documenting the discovery, and excavation of the Gable Site (AjGv-56). A copy of this report was requested from the MTCS (Templeton, 2019). No report was received by report submission.

1.4.7 Physical Features

1.4.7.1 Physiographic Region

The study area is located in the Iroquois Plains Physiographic Region of Southern Ontario. The Iroquois Plain physiographic region extends around the western part of Lake Ontario, from the Niagara River to the Trent River, its width varying from a few hundred yards to about eight miles. The lowland bordering Lake Ontario, when the last glacier was receding but still occupied the St. Lawrence Valley, was inundated by a body of water known as Lake Iroquois. The undulating till plains above the old shorelines of Lake Iroquois make up the Iroquois Plain. The plain, cut in previously deposited clay and till, is partly floored with sand deposits; from Scarborough to Trenton the plain widens until the old beach is six and one-half miles inland from the present shore of Lake Ontario. The old shoreline is well marked by bluffs or gravel bars while immediately below is a strip of boulder pavement and sandy off-shore deposits which vary in width. Poorly drained, this coarse sandy soil is not very productive. Prior to 1930, until 1940, the Iroquois plain was a general farming area, with a tendency for horticulture and growth of canning crops. Since the Second World War, the remaining farms have become larger while much of the land has been put to urban uses (Chapman and Putnam, 1984, pp.190-196).

1.4.7.2 Soil Types

Several soil types are found within the study area including Berrien sandy loam, Brady sandy loam, Cooksville clay loam, Fox sandy loam and Mississauga clay loam. These soil types are distributed across the study area: the majority of the study area is located in Berrien sandy loam, while Cooksville clay loam can be found along the western limits and a small east-central portion of the study area. Brady sandy loam is found at the northeast portion of the study area and Mississauga clay loam is found at the southwestern corner of the study area. A description of their characteristics may be found in **Table 9** (Ontario Agricultural College, 1953).

Table 9: Study Area Soil Types

Soil Series and Type	Great Soil Group	Natural Drainage	Topography	Stoniness	Profile Description of Cultivated Soil
Berrien sandy loam	Grey-Brown Podzolic	Imperfect	Smooth very gently sloping.	Stone free	5” dark brown sandy loam over slightly mottled sandy horizons which are usually fairly well defined. Heavy clay till occurs at depths off 3 ft. and less.
Brady sandy loam					6” dark grey-brown sandy loam over mottled less well defined A2 and B horizons; parent material is calcareous, grey sand.

Soil Series and Type	Great Soil Group	Natural Drainage	Topography	Stoniness	Profile Description of Cultivated Soil
Cooksville clay loam			Smooth gently sloping	Few stones	7" very dark grey clay loam over mottled less well defined A2 and B horizons; grey shale at depths of 3 feet and less.
Fox sandy loam		Good		Stone free	4" brown sandy or sandy loam underlain by well defined sand of sandy loam A2 and sandy loam or loam B horizons; parent material is grey sand
Mississauga clay loam	Dark Grey Gleisolic	Poor	Smooth very gently sloping.	Few stones	8" very dark grey to black clay loam over mottled poorly defined horizons; grey shale at depths of 3 feet and less.

1.4.7.3 Water Sources

Hydrological features such as primary water sources (i.e. lakes, rivers, creeks, streams) and secondary water sources (i.e. intermittent streams and creeks, springs, marshes, swamps) would have helped supply plant and food resources to the surrounding area and are indicators of archaeological potential, per *Section 1.3.1* of the *2011 S&G*. The study area encompasses Lake Ontario, Clearview Creek, Avonhead Creek, Lakeside Creek and Joshua Creek. Therefore, this feature contributes in establishing the archaeological potential in portions of the study area that fall within 300 metres of these hydrologic features.

1.4.8 Current Land Conditions

The study area is currently roughly bounded by Winston Churchill Boulevard, Lake Ontario, Southdown Road, and Royal Windsor Drive, Bromsgrove Road and Sherhill Drive, in the City of Mississauga. The study area encompasses a sewage treatment plant, a cement plant and cement stockpiles, several commercial businesses, paved and gravel parking areas and stockyards, a garden nursey (Sheridan Nursey), the Lakeside Park, a paved trail, paved roadways and sidewalks, a spur line of the Canadian National (CN) Railway, Clarkson Secondary School and its grounds, residential structures, open agricultural fields, woodlots, manicured yardage fronting several commercial business, and areas of overgrown vegetation. The topography within the study area is gently sloping from northwest to southeast, measuring between 77 and 127 metres above sea level.

1.4.9 Date of Review

A desktop review of field conditions using a historic aerial photograph, and past and current satellite imagery obtained through the Google Earth application was undertaken on March 8th, 2019.

1.5 Confirmation of Archaeological Potential

Based on the information gathered from the background research documented in the preceding sections, elevated archaeological potential has been established within the study area limits. Features contributing to archaeological potential are summarized in **Appendix B**.

2.0 ANALYSIS AND CONCLUSIONS

A desktop review of the study area was carried out using historical aerial photographs and Google Earth satellite imaging (***see Appendix C***). In combination with data gathered from background research (***see Sections 1.3 and 1.4***), an assessment of archaeological potential was performed. An inventory of the documented records can be found within **Appendix D**.

2.1 Previous Archaeological Assessments

Background research has revealed that portions of the study area have been previously subjected to a Stage 1 and/or Stage 2 AA, as reported by *Archaeological Services Inc.* (2015, 2016) and *Golder Associates* (2014).

With previous AAs having fulfilled the Stage 1 and/or Stage 2 AA requirements (***see Maps 9-10***) within their respective portions of the current study area, it is therefore recommended that these areas be exempt from further assessment within the scope of this project.

2.2 Identified Deep and Extensive Disturbances

The study area was evaluated for extensive disturbances that have removed archaeological potential. Disturbances include (but are not limited to): grading below topsoil, quarrying, building footprints, or sewage and infrastructure development. *Section 1.3.2* of the *2011 S&G* considers infrastructure development among those "features indication that archaeological potential has been removed."

It is clear from historic aerial and satellite imaging that large portions of the study area exhibit disturbed conditions associated with existing and razed former structures, paved parking areas and roadways, underground utilities, culverts, rail lines, and past grading (***see Maps 9-10; Images 1-9***). The aforementioned areas of deep and extensive disturbances should only be considered as likely not requiring Stage 2 survey. A Stage 2 visual inspection is still required to provide on-site confirmation and documentation of the actual condition and exact extent of the disturbances.

2.3 Physiographic Features of No or Low Archaeological Potential

The study area was also evaluated for physical features of no or low archaeological potential. These include (but are not limited to): permanently wet areas, exposed bedrock, and steep slopes (greater than 20^o) except in locations likely to contain pictographs or petroglyphs, as per *Section 2.1, Standard 2.a.* of the *2011 S&G.*

Physiographic features of no or low archaeological potential encountered within the study area include permanently wet areas consisting of drainage ditches, Avonhead Creek, Clearview Creek, Lakeside Creek, and Lake Ontario (***see Maps 9-10; Image 9***). On-site confirmation and documentation of the actual condition and exact extent of areas of no or low archaeological potential will, however, be required during the Stage 2 AA.

2.4 Identified Areas of Archaeological Potential

Portions of the study area that exhibit neither extensively disturbed conditions nor contain physical features of no or low archaeological potential are considered to have archaeological potential. These areas include agricultural fields, grassed margins, overgrown vegetation, woodlots, and manicured grass lawns (***see Maps 9-10; Images 10-16***).

Given the established potential to recover archaeological resources within these identified areas, a Stage 2 AA will be required. In areas where ploughing in advance of survey is not a viable option due to the presence of overgrown vegetation, woodlots, and existing infrastructure, a Stage 2 test pit survey at five-metre intervals must be performed, in accordance with the standards outlined in *Section 2.1.2* of the 2011 *S&G*.

2.5 Previously Registered Archaeological Sites

As noted within **Section 1.4.4**, the AjGv-56 site was identified within the study area limits. The site was discovered in the 1970s and was noted to be of post-contact cultural affiliation; however, the site type is unknown. A copy of this report has been requested from the MTCS (Templeton, 2019), but had yet to be received by report completion. Given that the supposed location of the site within the study area is developed (***see Image 8***) and no further information is currently available about this site, it is uncertain whether there are further archaeological concerns tied to the AjGv-56 Site.

3.0 RECOMMENDATIONS

Considering the findings detailed in preceding sections, the following recommendations are presented:

1. With previous assessments by *Archaeological Services Inc.* (2014, 2015) and *Golder Associates* (2014), having fulfilled the Stage 1 and 2 AA requirements within their respective portions of the current study area**,** it is recommended that these areas be exempt from further assessment within the scope of this project.

2. Parts of the study area that were identified as having archaeological potential removed are exempt from requiring Stage 2 AA (extents of these areas to be confirmed during the Stage 2 AA).

3. Parts of the study area that were identified as having no or low archaeological potential are exempt from requiring Stage 2 AA (extents of these areas to be confirmed during the Stage 2 AA).

4. All identified areas which contain archaeological potential, must be subjected to a Stage 2 AA.

   The manicured grassed areas that have been ploughed in the past will require pedestrian survey at five metre intervals, which involves systematically walking ploughed areas and mapping and collecting any artifacts found on the ground surface. The land must be recently ploughed and subjected to the appropriate weathering requirements, in accordance with *Section 2.1.1* of the *2011 S&G,* in advance of pedestrian archaeological survey.

   Areas of overgrown vegetation and manicured grassed which have never been ploughed before, will need to be subjected to a Stage 2 shovel test pit survey at five metre intervals, in accordance with *Section 2.1.2* of the *2011 S&G*.

No construction activities shall take place within the study area prior to the *MTCS* (Archaeology Programs Unit) confirming in writing that all archaeological licensing and technical review requirements have been satisfied.

4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

1. This report is submitted to the *MTCS* as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the *MTCS*, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

2. It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

3. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

4. The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the *Ministry of Consumer Services*.

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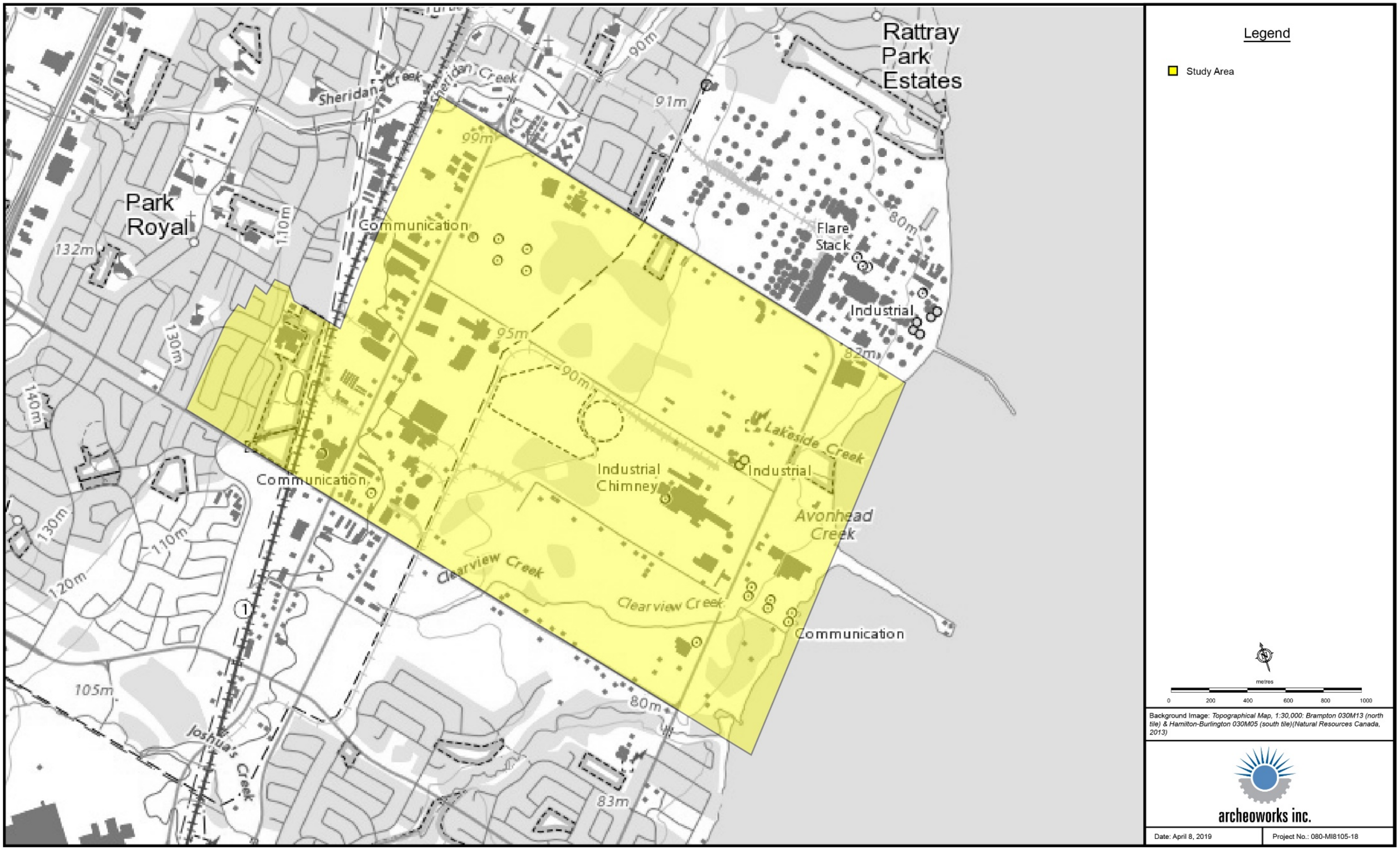
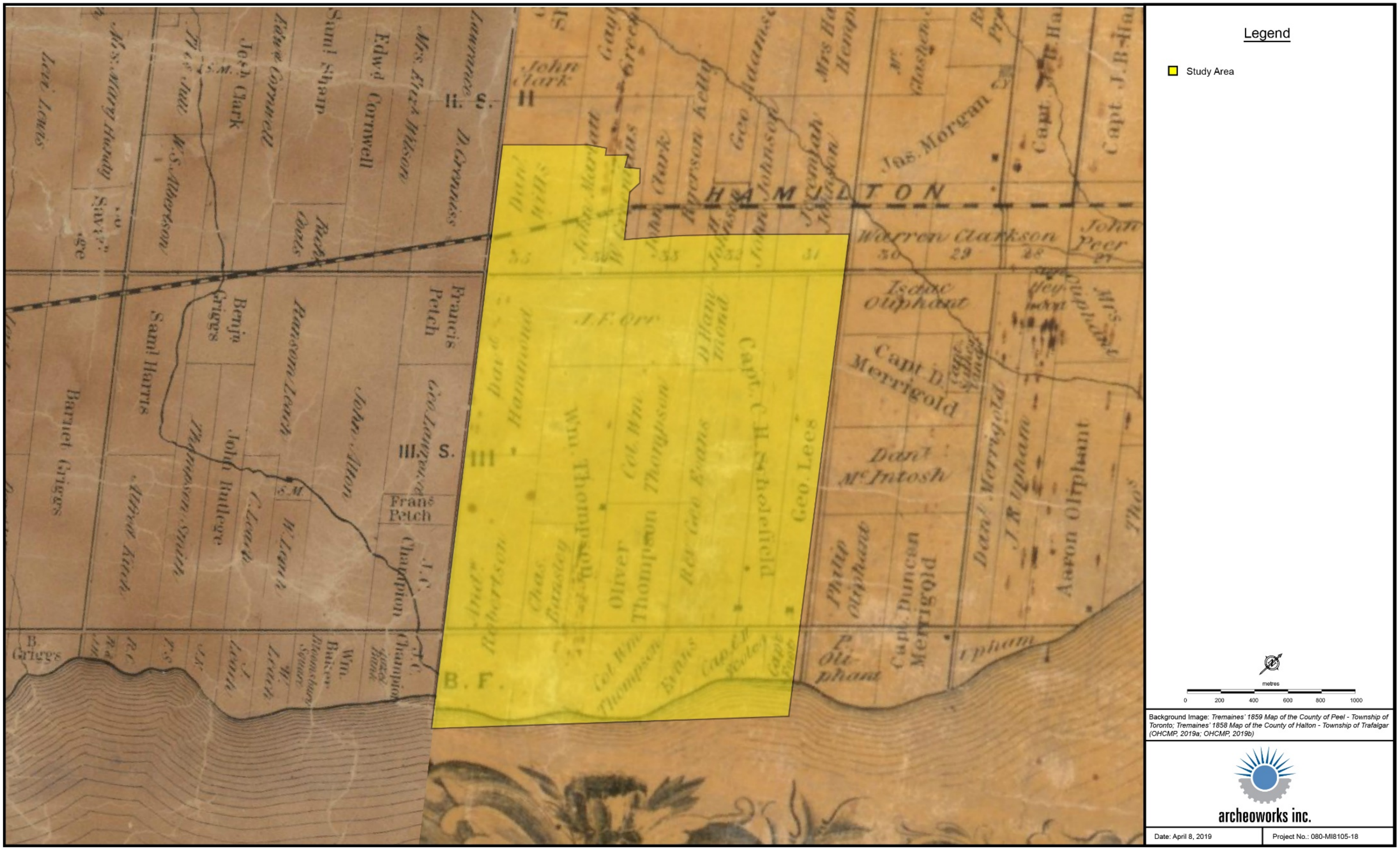
APPENDICES

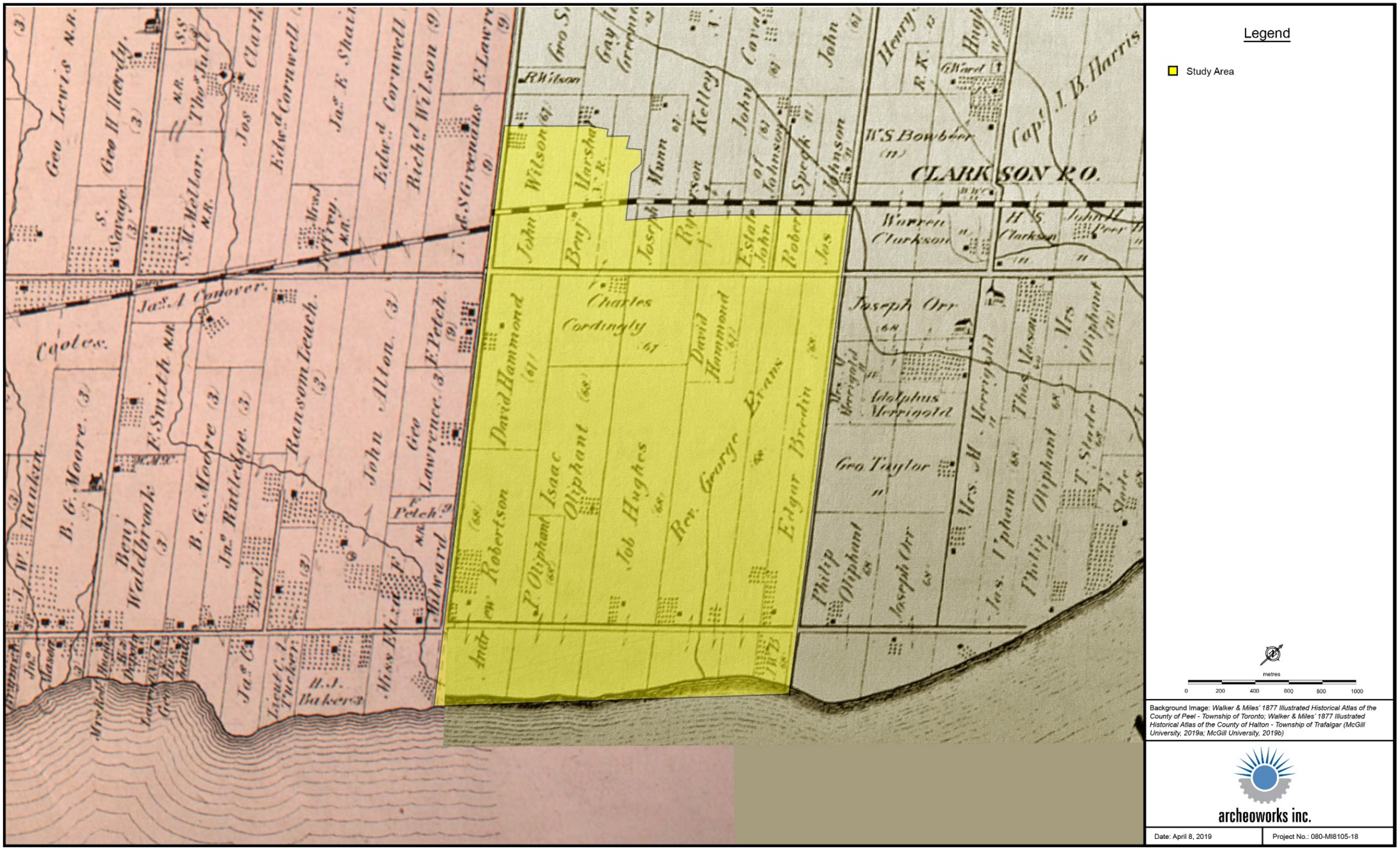
APPENDIX A: MAPS



Map 1: Topographical Map, 1:30,000, Brampton 030M13 and Hamilton-Burlington 030M05 (Natural Resources Canada, 2013) identifying the Stage 1 AA study area.



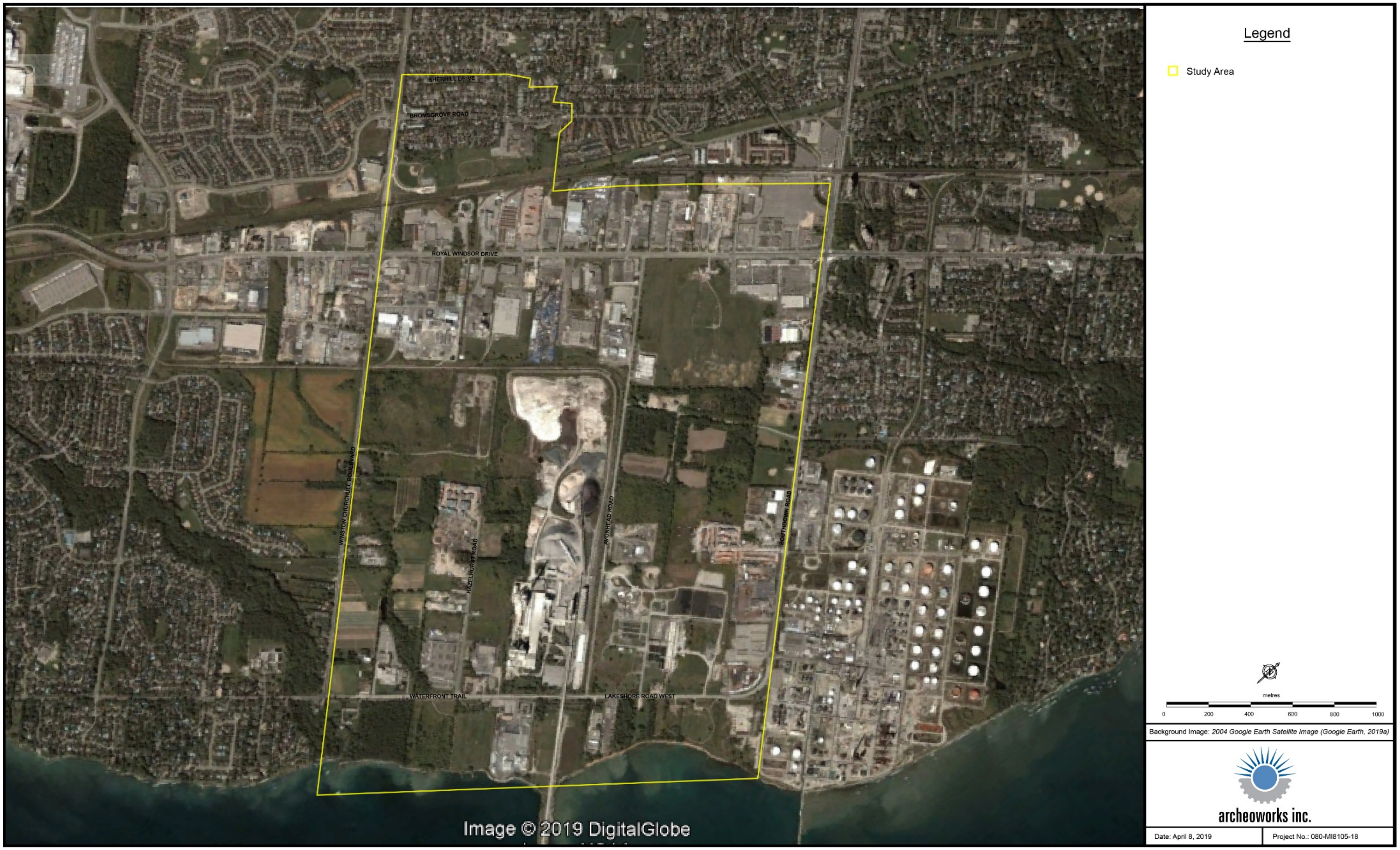
Map 2: Stage 1 AA study area within the 1859 Tremaine's Map of the County of County of Peel & 1858 Tremaine's Map of the County of County of Halton (OHCMP, 2019).



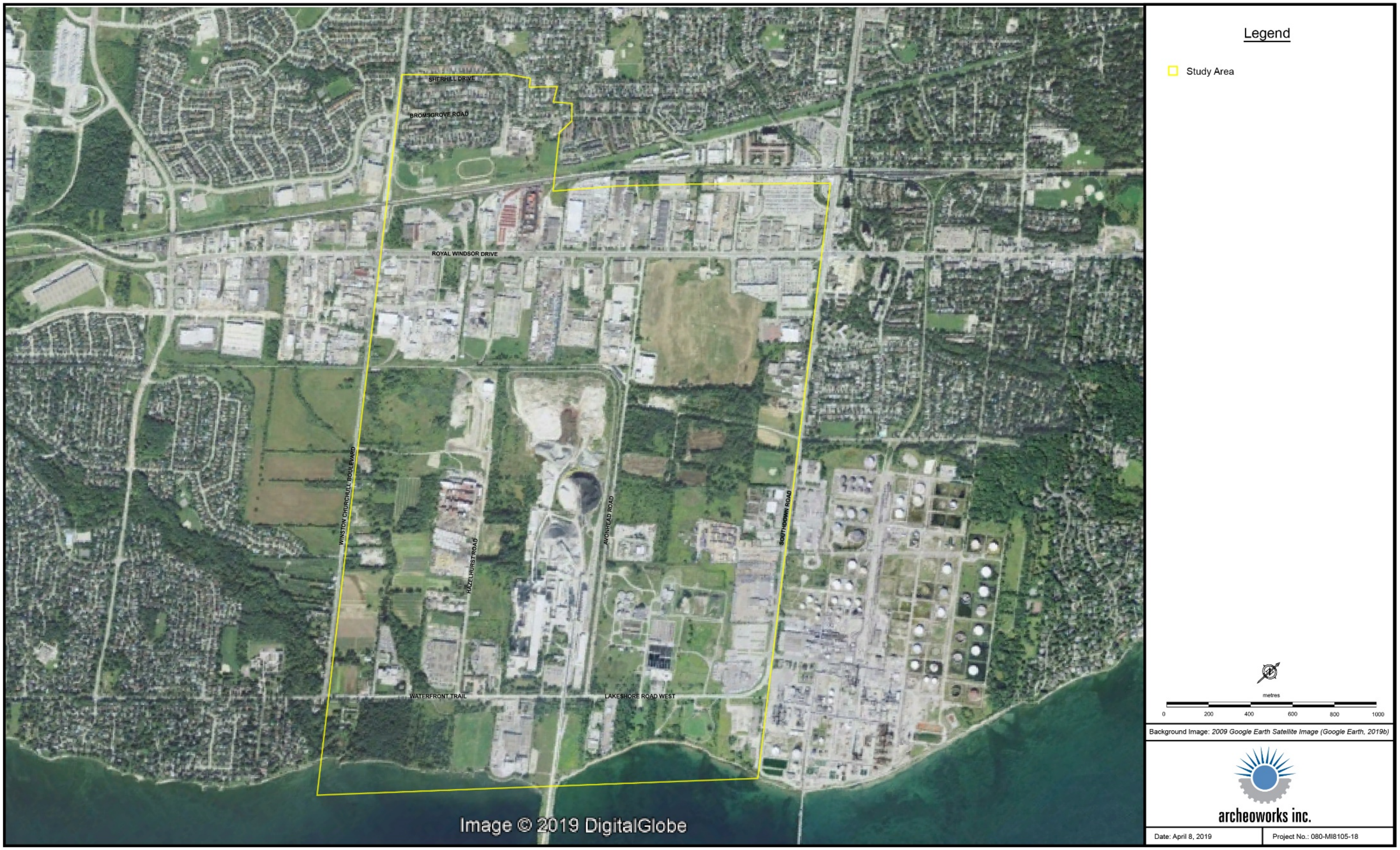
Map 3: Stage 1 AA study area within the Walker & Miles' 1877 Illustrated Historical Atlas of the County of Peel & the County of Halton (McGill University, 2019a; McGill University, 2019b).

Map 4: Stage 1 AA study area within a 1909 Topographic Map (Department of Militia and Defence,1909a; Department of Militia and Defence, 1909b).

Map 5: Stage 1 AA study area within a 1954 aerial photograph (courtesy of the University of Toronto Map and Data Library, 2019).

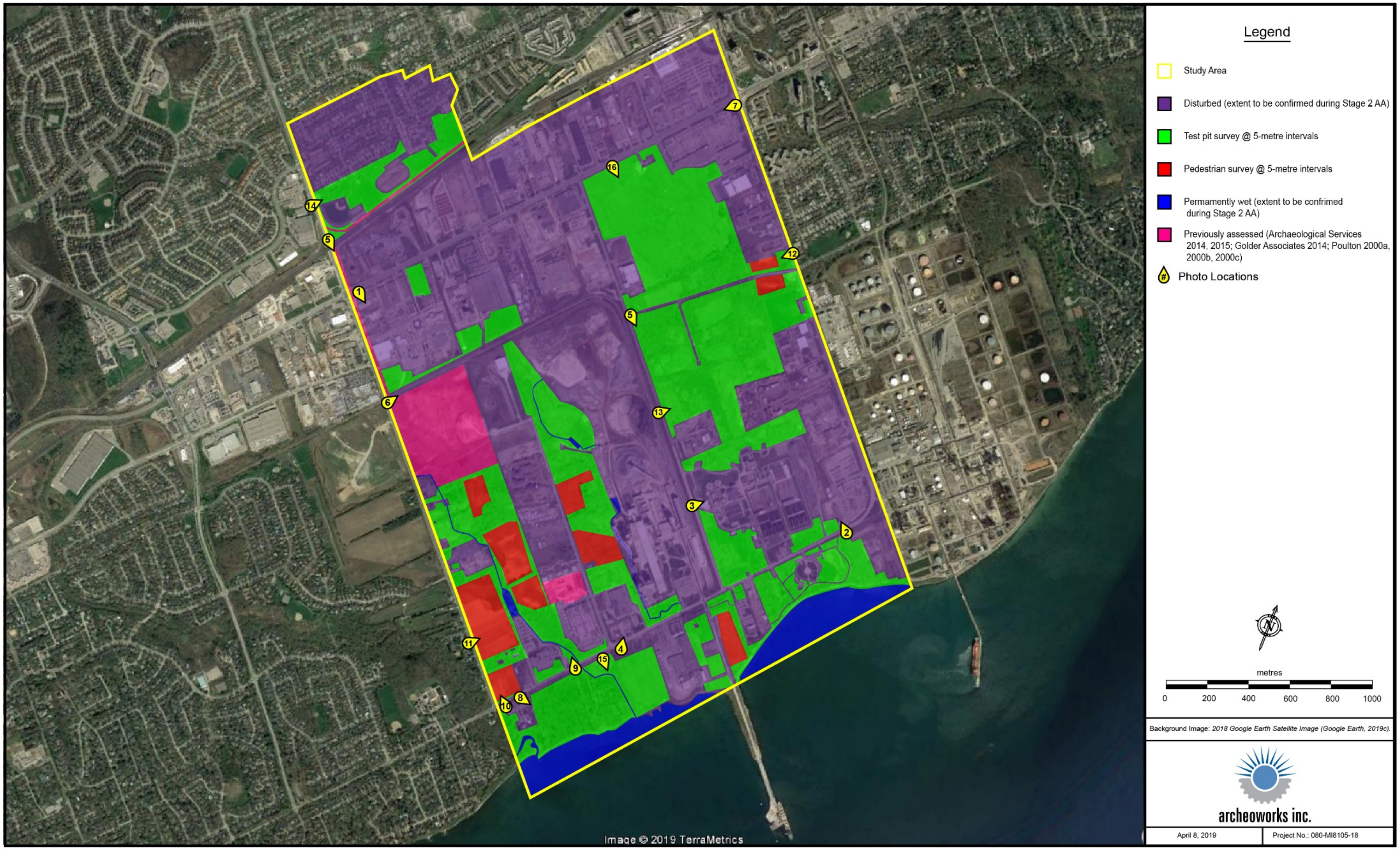


Map 6: Stage 1 AA study area within a 2004 satellite image (Google Earth, 2019a).

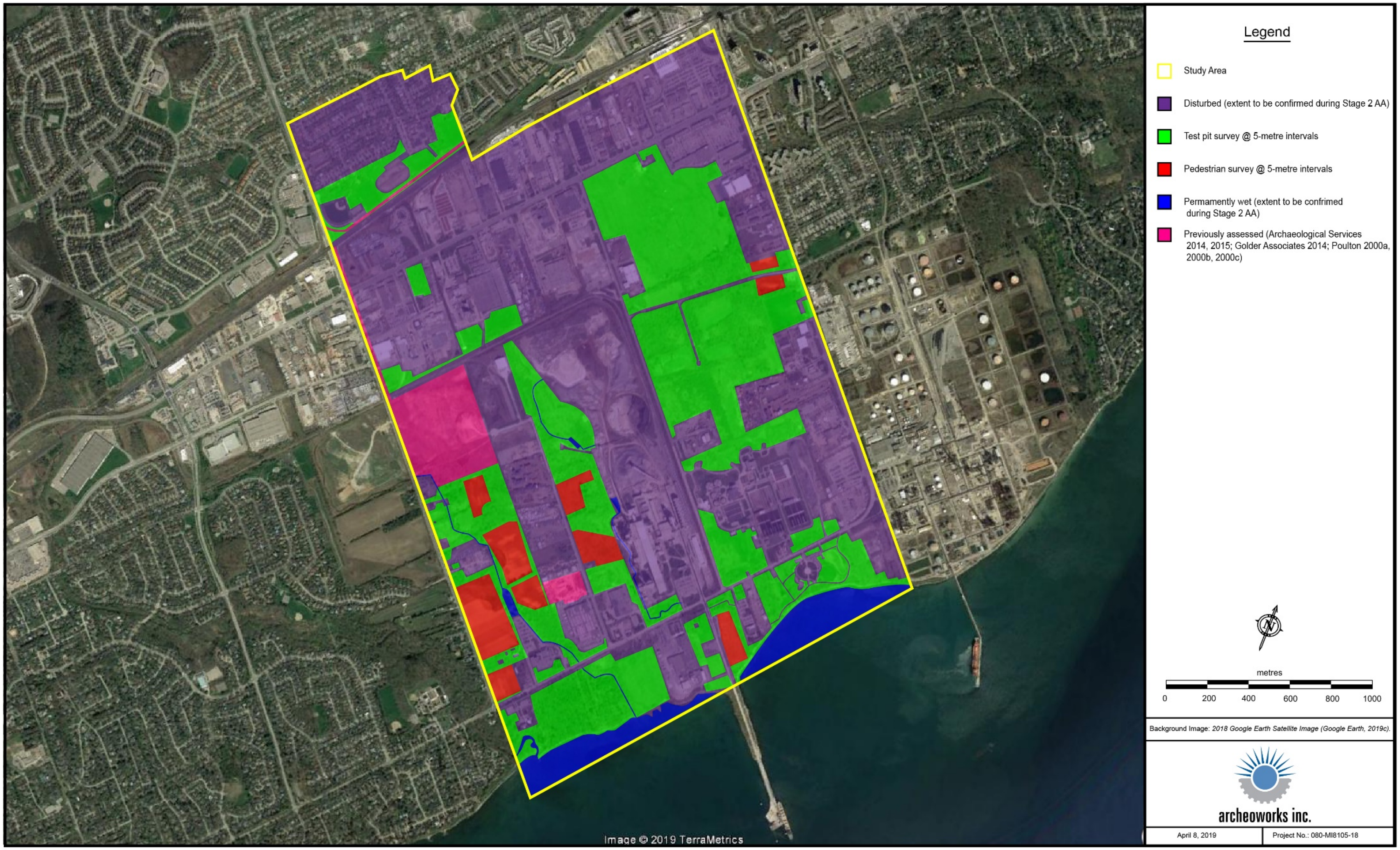


Map 7: Stage 1 AA study area within a 2009 satellite image (Google Earth, 2019b).

Map 8: Stage 1 AA study area within a 2018 satellite image (Google Earth, 2019c).



Map 9: Stage 1 AA results with image locations.



Map 10: Stage 1 AA results.

APPENDIX B: SUMMARY OF BACKGROUND RESEARCH

	Feature of Archaeological Potential	Yes	No	Unknown	Comment
1	Known archaeological sites within 300 m?	X			If Yes, potential confirmed
	Physical Features	**Yes**	**No**	**Unknown**	**Comment**
2	Is there water on or near the property?	X			If Yes, potential confirmed
2a	Presence of primary water source within 300 metres of the study area (lakes, rivers, streams, creeks)	X			If Yes, potential confirmed
2b	Presence of secondary water source within 300 metres of the study area (intermittent creeks and streams, springs, marshes, swamps)	X			If Yes, potential confirmed
2c	Features indicating past presence of water source within 300 metres (former shorelines, relic water channels, beach ridges)	X			If Yes, potential confirmed
2d	Accessible or inaccessible shoreline (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh)		X		If Yes, potential confirmed
3	Elevated topography (knolls, drumlins, eskers, plateaus, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
4	Pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
5	Distinctive land formations (mounds, caverns, waterfalls, peninsulas, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
	Cultural Features	**Yes**	**No**	**Unknown**	**Comment**
6	Is there a known burial site or cemetery that is registered with the Cemeteries Regulation Unit on or directly adjacent to the property?		X		If Yes, potential confirmed
7	Associated with food or scarce resource harvest areas (traditional fishing locations, food extraction areas, raw material outcrops, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
8	Indications of early Euro-Canadian settlement (monuments, cemeteries, structures, etc.) within 300 metres	X			If Yes to two or more of 3-5 or 7-10, potential confirmed
9	Associated with historic transportation route (historic road, trail, portage, rail corridor, etc.) within 100 metres of the property	X			If Yes to two or more of 3-5 or 7-10, potential confirmed
	Property-specific Information	**Yes**	**No**	**Unknown**	**Comment**
10	Contains property designated or listed under the Ontario Heritage Act	X			If Yes, potential confirmed
11	Local knowledge (aboriginal communities, heritage organizations, municipal heritage committees, etc.)		X		If Yes, potential confirmed
12	Recent ground disturbance, not including agricultural cultivation (post-1960, extensive and deep land alterations)	Parts of the study area exhibit recent ground disturbance.			If Yes, low archaeological potential is determined
	Feature of Archaeological Potential	**Yes**	**No**	**Unknown**	**Comment**
1	Known archaeological sites within 300 m?	X			If Yes, potential confirmed

Physical Features		Yes	No	Unknown	Comment
2	Is there water on or near the property?	X			If Yes, potential confirmed
2a	Presence of primary water source within 300 metres of the study corridor (lakes, rivers, streams, creeks)	X			If Yes, potential confirmed
2b	Presence of secondary water source within 300 metres of the study corridor (intermittent creeks and streams, springs, marshes, swamps)	X			If Yes, potential confirmed
2c	Features indicating past presence of water source within 300 metres (former shorelines, relic water channels, beach ridges)		X		If Yes, potential confirmed
2d	Accessible or inaccessible shoreline (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh)		X		If Yes, potential confirmed
3	Elevated topography (knolls, drumlins, eskers, plateaus, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
4	Pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
5	Distinctive land formations (mounds, caverns, waterfalls, peninsulas, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
Cultural Features		**Yes**	**No**	**Unknown**	**Comment**
6	Is there a known burial site or cemetery that is registered with the Cemeteries Regulation Unit on or directly adjacent to the property?		X		If Yes, potential confirmed
7	Associated with food or scarce resource harvest areas (traditional fishing locations, food extraction areas, raw material outcrops, etc.)		X		If Yes to two or more of 3-5 or 7-10, potential confirmed
8	Indications of early Euro-Canadian settlement (monuments, cemeteries, structures, etc.) within 300 metres	X			If Yes to two or more of 3-5 or 7-10, potential confirmed
9	Associated with historic transportation route (historic road, trail, portage, rail corridor, etc.) within 100 metres of the property	X			If Yes to two or more of 3-5 or 7-10, potential confirmed
Property-specific Information		**Yes**	**No**	**Unknown**	**Comment**
10	Contains property designated or listed under the Ontario Heritage Act		X		If Yes, potential confirmed
11	Local knowledge (aboriginal communities, heritage organizations, municipal heritage committees, etc.)		X		If Yes, potential confirmed
12	Recent ground disturbance, not including agricultural cultivation (post-1960, extensive and deep land alterations)	Parts of the study area exhibit recent ground disturbance.			If Yes, low archaeological potential is determined

APPENDIX C: IMAGES

Image 1: View of disturbances associated with paved parking area and extant structures

Image 2: View of disturbances associated with paved parking area and extant structures

Image 3: View of disturbances associated with paved roadways, extant structures, and underground utilities.

Image 4: View of disturbances associated with paved roadways, paved parking area, extant structures, and grading.

Image 5: View of disturbances associated with paved roadways and Canadian National railway line.

Image 6: View of disturbances associated with extant structures, a gravel roadway, and a railway line.

Image 7: View of disturbances associated with paved roadways at intersection of Southdown Road and Royal Windsor Drive.

Image 8: View of disturbances associated with a natural gas line, paved surfaces, and landscaping in the supposed location of AjGv-56.

Image 9: View of disturbances associated with a culvert and the permamently wet area associated with Clearview Creek.

Image 10: View of fallow, formerly ploughed field retaining archaeological potential.

Image 11: View of planted field retaining archaeological potential

Image 12: View of fallow, formerly ploughed field retaining archaeological potential.

Image 13: View of wooded area retaining arcaehological potential

Image 14: View of grassed area retaining archaeological potential.

Image 15: View of overgrown and wooded area retaining archaeological potential.

Image 16: View of fallow, formerly ploughed field retaining archaeological potential.

APPENDIX D: INVENTORY OF DOCUMENTARY AND MATERIAL RECORD

Project Information:				
Project Number:		080-MI8105-18		
Licensee:		Kassandra Aldridge (P439)		
MTCS PIF:		P439-0055-2019		
Document/ Material			**Location**	**Comments**
1.	Research/ Analysis/ Reporting Material	Digital files stored in: /2018/ 080-MI8105-18 – Southdown Mississauga	Archeoworks Inc., 16715-12 Yonge Street, Suite 1029, Newmarket, ON, Canada, L3X 1X4	Stored on Archeoworks network servers

Under Section 6 of Regulation 881 of the *Ontario Heritage Act*, *Archeoworks Inc*. will, “keep in safekeeping all objects of archaeological significance that are found under the authority of the licence and all field records that are made in the course of the work authorized by the licence, except where the objects and records are donated to Her Majesty the Queen in right of Ontario or are directed to be deposited in a public institution under subsection 66 (1) of the Act.”

APPENDIX C

Fluvial Geomorphological Assessment

Municipal Class Environmental Assessment Southdown District Stormwater Servicing and Environmental Management Plan

Fluvial Geomorphological Assessment Clearview Creek, Sheridan Creek, Avonhead Creek, Lakeside Creek and Joshua's Creek

Prepared for:
City of Mississauga
c/o The Municipal Infrastructure Group
8800 Dufferin Street, Suite 200
Vaughan, ON L4K 0C5

January 31, 2019
Project No. 18027

GEO MORPHIX
Geomorphology
Earth Science
Observations

Report Prepared by:	GEO Morphix Ltd. 2800 High Point Drive Suite 100A Milton, ON L9T 6P4
Report Title:	Municipal Class Environmental Assessment Southdown District Stormwater Servicing and Environmental Management Plan Fluvial Geomorphological Assessment Clearview Creek, Sheridan Creek, Avonhead Creek, Lakeside Creek and Joshua's Creek
Project Number:	18027
Status:	FINAL
Version:	1.0
First Submission Date:	January 31, 2019
Revision Date:	--
Prepared by:	Suzanne St. Onge, M.Sc. André-Marcel Baril, M.Sc.
Approved by:	Paul Villard, Ph.D., P.Geo., CAN-CISEC
Approval Date:	January 31, 2019

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Appendices

1 Introduction

GEO Morphix Ltd. was retained as part of an interdisciplinary team to complete the fluvial geomorphological assessment for the Stormwater Servicing and Environmental Management Plan in support of future urban development and redevelopment within the Southdown District in the City of Mississauga. The larger study is to review, update and expand upon the Southdown Master Drainage Plan prepared by Totten Sims Hubicki Associates (2000). Specifically, the current study aims to develop a stormwater management (SWM) strategy that will promote sustainable urban development and re-development while protecting, maintaining and enhancing existing surface and groundwater resources and the natural environment. The SWM plan is to minimize flooding, erosion and water quality degradation, as well as impacts to the water balance.

The study area is approximately 550 ha and is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, approximately Bromsgrove Drive to the north, and Lake Ontario to the south (**Figure 1**). The study area is located within the drainage areas of Clearview Creek, Avonhead Creek, Lakeside Creek, Sheridan Creek and Joshua's Creek. Each of these watersheds outlets directly to Lake Ontario. With the exception of Joshua's Creek, all watersheds are within the jurisdiction of Credit Valley Conservation (CVC). Joshua's Creek is situated within the jurisdiction of Conservation Halton. All of these watersheds have been significantly altered by historical agricultural land use activities (e.g., straightening, online pond installation) and adjacent industrial development (i.e., channel realignment/straightening and hardening).

The activities listed below were completed in support of Phase 1 of the study:

- Review of available mapping (e.g., soils, physiography, geology, and topography) and previous reporting for watersheds within the study area with a focus on the recently completed Avonhead Creek (Ecosystem Recovery Inc., 2015) and Clearview Creek (CVC, 2018) studies
- Completion of a historical assessment using aerial photographs to identify changes to the system due to land use and past channel modifications
- Delineation of preliminary meander belt widths for reaches within the study area, as appropriate, with potential for refinement at future project stages
- Completion of rapid geomorphological field assessments for portions of accessible watercourses to verify the results of the desktop assessment and previously completed studies

Activities to be completed in Phases 2 and 3 of the Stormwater Servicing and Environmental Management Plan include:

- Conduct detailed geomorphological assessments on reaches determined to be the most sensitive to erosion, as required
- Complete erosion threshold calculations and erosion mitigation modelling in support of the SWM strategy
- Develop recommendations to mitigate potential erosion that may result from development and re-development within the Southdown District
- Identify watercourse restoration/enhancement opportunities and constraints
- Provide input to the implementation plan from a fluvial geomorphic perspective
- Develop recommendations for environmental monitoring associated with watercourses (pre-, during and post-construction)

Legend

CC-7 Reach Break and ID

Watercourse

Study Area

Municipal Class EA Southdown District Stormwater Servicing and Environmental Management Plan

Location of Study Area and Reach Delineation

FIGURE 1

GEO MORPHIX

N

0 125 250 500

Metres

Study Area Boundary: TMIG, 2019.
Reach Break and Reach ID: ERI, 2015; CVC, 2018, GEO Morphix Ltd., 2019, City of Mississauga, 2017.
Watercourse and Waterbody: CVC, 2012 and City of Mississauga, 2018. Imagery: TMIG, 2017.
Print Date: March, 2019. Drawn by: W.B., A.M.B, S.S.

2 Previous Studies

2.1 Clearview Creek Subwatershed Study (McCormick Rankin Corporation and Ecoplans Limited, 2005)

A subwatershed study was completed for the upstream portion of Clearview Creek within the Town of Oakville and was intended to complement the previously completed Southdown Master Drainage Plan for the portion of Clearview Creek within the City of Mississauga. This study was completed in support of development within lands located south of the Canadian National Railway (CNR) line and west of Winston Churchill Boulevard. The SWS characterized Clearview Creek downstream (east) of Winston Churchill Boulevard as predominantly flats (80%) with pools (15%) and riffles (5%). Channel substrate was characterized as soft clay (55%), silt (20%) and hard pan clay (10%). Instream cover and vegetation included wood debris, overhanging shrubs, reeds and filamentous algae. This reach was also characterized as having an intermittent flow regime and had been historically straightened. The adjacent riparian zone was variable, with open old field vegetation on the north bank and woody vegetation on the south bank. A pre-development meander belt width of 34 m was delineated for the reach upstream (west) of Winston Churchill Boulevard; however, a meander belt width of 17 m was delineated in support of the conceptual natural corridor design. The constructed channel is apparent in 2013 Google Earth Pro imagery.

2.2 Lake Ontario Integrated Shoreline Strategy (Aquafor Beech Ltd., 2011)

Credit Valley Conservation initiated the Lake Ontario Integrated Shoreline Strategy (LOISS) to take an integrated systems approach to management of the shoreline within their jurisdiction. LOISS included portions of Clearview, Avonhead, Lakeside, and Sheridan Creeks within 2 km of the Lake Ontario shoreline. A fluvial geomorphological study was undertaken, and included the completion of a historical assessment, reconnaissance level field work, and baseflow measurements. The field component included a channel assessment from Lake Ontario to the greater of one reach upstream of the first fish barrier or one reach upstream of the historic lake effect. Reach delineation, a photographic inventory and rapid geomorphic assessments were completed along each watercourse, with the exception of Sheridan Creek due to ample existing information for that watershed. Data collected in support of LOISS was reviewed for the current study.

2.3 Lake Ontario Integrated Shoreline Strategy, Avonhead Creek Fluvial Geomorphology Assessment (Ecosystem Recovery Inc., 2015)

The Avonhead Creek study was initiated in response to the data gap analysis completed in support of the LOISS. This study characterized fluvial geomorphology within Avonhead Creek and explored options for daylighting the enclosed portion of channel downstream of Lakeshore Road. Similar to the LOISS, this study examined the portion of Avonhead Creek within 2 km of the Lake Ontario Shoreline. The assessment included reach delineation, a historical assessment, flow measurements, channel characterization and rapid geomorphic assessments, a detailed geomorphic assessment upstream of Lakeshore Road, preliminary meander belt widths for 2 reaches, and the development of initial channel concepts in support of daylighting approximately 400 m of channel along the downstream reach of Avonhead Creek. Geomorphic data collected by Ecosystem Recovery Inc. was used to inform existing conditions and delineate meander belt widths along Avonhead Creek in support of the current study. Relevant information is included in the following sections, where appropriate.

2.4 Clearview Creek Feasibility Study (CVC, 2018)

CVC undertook a detailed study of Clearview Creek to examine opportunities to improve watercourse function through the modification of watershed hydrology to better replicate pre-development conditions. The objectives of the study included increasing baseflow, improving water quality, reducing erosion, and reducing peak flows associated with flood risk. In support of these objectives, CVC completed a desktop review of available information, channel characterization and rapid geomorphic assessments, and an aquatic habitat assessment including backpack electrofishing surveys. The study examined retrofit opportunities for an existing dry SWM facility in the upstream extent of the watershed, implementation of LID measures in developed areas, and implementation of a natural corridor design in the downstream reach of the watershed that is currently concrete-lined. Relevant information is included in the following sections, where appropriate.

3 Historical Assessment

High-level historical assessments were completed for each watershed included in the LOISS (Aquafor Beech Limited, 2011). A more detailed historical assessment was completed for Avonhead Creek by Ecosystem Recovery Inc. (2015). To supplement these assessments a series of historical aerial photographs were also reviewed in the current study to determine changes to the channel and surrounding land use/cover. This information, in part, provides an understanding of the historical factors that have contributed to current channel morphodynamics, as well as the basis for understanding potential future changes to the channel. Aerial photographs from 1931 (scale 1:15,000), 1962 and 1979 (Scale 1:25,000) and 1986 (Scale 1:9,000) from the National Air Photo Library (NAPL), City of Mississauga interactive online mapping, and recent satellite imagery from Google Earth Pro (2005 and 2016) were reviewed. Refer to **Appendix A** for copies of the imagery.

3.1 Clearview Creek

Aquafor Beech (2011) completed a high level historical assessment in support of LOISS. Aerial photography available through the City of Mississauga's e-Maps was reviewed for the years 1954, 1966, 1975, 1985, 1995 and 2006. In 1954, land use within the Clearview Creek watershed was predominantly agricultural. The downstream reach of Clearview Creek appeared to be channelized prior to 1954 to facilitate agriculture.

Based on our review of NAPL aerial photography and City of Mississauga e-Map resources, reaches upstream of Lakeshore Road West had been straightened prior to 1931. Significant lengths of channel also lacked natural riparian vegetation. By 1954, additional rural residences and a large online pond had been constructed, and reaches east and west of Winston Churchill Boulevard had been realigned and channelized. By 1966, these channelized sections appeared to be developing a slightly meandering planform; however, there were no significant changes in land use or channel planform adjustment between 1962 and 1986. By 1986, the riparian area between the online pond and Lakeshore Road had began to naturalize, and sparse woody vegetation had established adjacent to the channel east of Winston Churchill Boulevard and along the lower reach south of Lakeshore Road West. Construction of the concrete-lined lower reach of Clearview Creek occurred between 1986 and 1989.

3.2 Avonhead Creek

Ecosystem Recovery Inc. (2015) reviewed a sequence of historical aerial photographs from the years 1954 to 2013 and an overlay of the 1954 and 2005 planform configurations was completed to determine the degree of channel modification to accommodate development. In 1954, predominant land uses consisted of agriculture. Between 1954 and 1962 the spur railway line was constructed. By 1966, establishment of the CRH Canada Group Inc. industrial development was well underway. Between 1966 and 1985, significant lengths of Avonhead Creek were realigned, largely to accommodate the industrial development. More specifically, Reaches R-2 to R-8 were realigned further to the west, with minor adjustments to the local alignment of Reach R-6 completed in 1985. Ecosystem Recovery Inc. (2015) noted that Reach R-1 was piped downstream of Lakeshore Road in 1975, while Reaches R-11 to R-14 were realigned in 1977. Historical aerial photos from NAPL show that Reach R-1 was piped prior to 1962, evidenced by construction in the immediate vicinity and the visible outlet to Lake Ontario. Between 1980 and 1985, the upstream reaches of Avonhead Creek had been removed from the drainage area. A pond was constructed in 2002 between Reach R-7 and the CRH Canada Group Inc. facility. A second pond was constructed in 2009, north of Orr Road, adjacent to Reach R-10. The construction of this pond approximately coincided with the flow diversion of Avonhead Creek to Clearview Creek, which is discussed further in **Section 5.2.**

3.3 Lakeside Creek

Similar to other watersheds in the study area, lands within Lakeside Creek were largely under active cultivation in 1931. Reaches of Lakeside Creek had been straightened, and natural riparian vegetation removed to facilitate agricultural activities. Woody riparian vegetation appeared to be limited to roadway crossings and in vicinity of rural residential dwellings. A relatively large woodland is visible in 1931 in the upstream reaches of the watershed. Open channels sections upstream of Lakeshore Road West remain visible in 1962 imagery; however, industrial development and the associated spur rail line, road network and shoreline pier systems were apparent. By 1979, open channel sections are not visible north of Lakeshore Road West in vicinity of the Clarkson Wastewater Treatment Plant. In addition, industrial development had encroached south of Lakeshore Road West. Woody vegetation had begun to establish immediately adjacent to the channel and minor channel meandering was visible in the 1986 imagery. By 2005, the lower reach of Lakeside Creek contained a continuous wooded riparian area.

3.4 Sheridan Creek

Aquafor Beech Limited (2011) noted that the Sheridan Creek watershed contained industrial, residential, agricultural land uses in 1954. By 2006, this had shifted to primarily residential uses, with some remaining industry, as well as park and open space areas along the channel corridor.

More specifically, in the northern portion of the study area and upstream areas, land use was primarily agricultural in 1954, and several reaches appeared to be straightened and lacked natural riparian vegetation. By 1966, significant residential development occurred between Highway 401 and Bromsgrove Road and southeast of the study area. This development was accompanied by the realignment of significant lengths of channel upstream of the study area, with hardening visible in several locations. By 1975, the reach within the study area and sections of channel east of Southdown Road had also been realigned and hardened to accommodate development. Due to the age of the development, these residential subdivisions lacked contemporary mitigation measures such as stormwater management facilities. This has resulted in a "flashy" response to precipitation events, characteristic of urbanized systems.

3.5 Joshua's Creek

The lower watershed of Joshua's Creek was largely under active cultivation in 1931. Significant natural areas occurred along the channel corridor north of Lakeshore Road West, although localized gaps were present. The large meander within the study area was visible, and the outlet to Lake Ontario appeared formalized. Between 1931 and 1954, the Harding Estate residence was established adjacent to the channel. By 1962, residential development within the Town of Oakville was encroaching from the west and relatively small residential developments had been constructed east of the channel, south of Lakeshore Road West. The majority of residential development upstream of the study area had been constructed by 1986, with limited changes since that time. Overall, the lower reach and outlet of Joshua's Creek to Lake Ontario has remained largely naturalized over the period of available record, with no significant changes in channel planform. This is likely largely due to the influence of Lake Ontario, and is consistent with backwater conditions noted during field reconnaissance.

4 Geology, Physiography and Soils

Geology and physiography act as primary governing variables with respect to channel geomorphology. These factors determine the nature and quantity of the availability and type of sediment. Secondary variables that affect the channel include land use and riparian vegetation. These factors are explored as they not only offer insight into existing conditions, but also potential changes that could be expected in the future as they relate to a proposed activity.

Based on published mapping, the bedrock geology for all watersheds within the study area consists of shale, limestone, dolostone, and siltstone (Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member, Eastview Member; OGS, 2011).

All watersheds are located within the Iroquois Plain physiographic region (Chapman and Putnam, 1984). Portions of the watersheds of Clearview Creek and Avonhead Creek north of the CNR spur line and approximately west of Southdown Road are located within the shale plains physiographic landform. Portions of these watersheds south of the CNR spur line and west of Southdown road are located within the Sand Plains physiographic landform (Chapman and Putnam, 2007). Refer to **Table 1** for a summary of the physiography and surficial geology of each watershed.

Table 1: Physiography, surficial geology and soils of each watershed within the study area

Watershed	Physiographic Region [a]	Physiographic Landform [b]	Surficial Geology [c]
Clearview Creek	Iroquois Plain	Sand Plains	• Halton Till (silt to clay) in the northern portion of the watershed and in a thin band south of Lakeshore Road West • Glaciofluvial sand in the southern portion of the watershed, south of the Winston Churchill Boulevard crossing • Limited area of bedrock or bedrock drift along the Lake Ontario shoreline

Watershed	Physiographic Region [a]	Physiographic Landform [b]	Surficial Geology [c]
Avonhead Creek	Iroquois Plain	Shale Plains (upstream of spur line) Sand Plains (downstream of spur line)	• Approximately upstream half of watershed contains Halton Till (silt to clay) • Glaciofluvial sand in the southern half of the watershed • Bedrock or bedrock drift along the Lake Ontario shoreline south of Lakeshore Road West
Lakeside Creek	Iroquois Plain	Shale Plains (upstream of spur line) Sand Plains (downstream of spur line)	• Predominantly Halton Till (silt to clay) • Glaciofluvial sand south of Lakeshore Road West
Sheridan Creek	Iroquois Plain	Shale Plains	• Bedrock or bedrock drift with isolated areas of alluvium and glaciolacustrine gravel and sand • Glaciolacustrine sands near the outlet to Lake Ontario
Joshua's Creek	Iroquois Plain	Sand Plains	• Bedrock or bedrock drift • Glaciofluvial sand and a thin band of Halton Till (silt to clay) east of Winston Churchill Boulevard

[a] Chapman and Putnam, 1984
[b] Chapman and Putnam, 2007
[c] CVC, 2018

Geotechnical borehole information is available for areas of Joshua's Creek upstream of Winston Churchill Boulevard, in vicinity of Avonhead Creek, along Sheridan Creek near Southdown Road, and within lands west of Lakeside Creek (MNDMF, undated). Borehole logs near Joshua's Creek, Avonhead Creek and Lakeside Creek generally contained shale bedrock, overlain by till (silt, clay sand, gravel in some locations) and sand. Geotechnical borehole logs in vicinity of Sheridan Creek in the northeastern corner of the study area noted the presence of bedrock (shale) as shallow as 1.5 m below the ground surface, which was overlain by materials ranging from clay to gravel. This is generally consistent with published mapping.

5 Drainage Basin Characteristics

As noted previously, the study area includes four relatively small watersheds that drain directly to Lake Ontario within the Lake Ontario Shoreline West Tributaries (Subwatershed 21; CVC, 2009). The small portion of the lower watershed of Joshua's Creek is located in the southwestern edge of the study area and is located within Conservation Halton's jurisdiction.

The Southdown Local Plan Area is an employment district with industrial and employment uses. There are two major industrial operations with extensive amounts of outdoor storage, the Petro Canada and CRH Canada Group Inc. facilities (City of Mississauga, 2010). The area also contains the CNR mainline and a network of spur lines. As of 2010, there were over 20 vacant land parcels within the Southdown Local Plan Area, representing 24% of the Local Plan Area (City of Mississauga, 2010).

5.1 Clearview Creek

Clearview Creek has a drainage area of approximately 3.7 km, is situated within the City of Mississauga and the Town of Oakville, and outlets directly to Lake Ontario (CVC, 2018). Approximately 31.4 ha of this watershed has been redirected to the Sheridan Creek Watershed and 12.13 ha of drainage area has been redirected to Lakeside Creek. In addition, flows from Avonhead Creek have been redirected to Clearview Creek through the storm sewer network at Lakeshore Road West, discussed further below (CVC, 2018).

There are three significant features that influence the form and function of this watercourse: the Sheridan Gardens stormwater management facility (SWMF; dry pond constructed in 1988) located northeast of the study area, an online agricultural pond located approximately 450 m upstream of Lakeshore Road, and the concrete lined channel downstream of Lakeshore Road (CVC, 2018 and MRC, 2005). This lower portion of channel also receives the redirected flows from Avonhead Creek. In addition, a portion of the watercourse appears to be piped in the upstream reaches, between the Sheridan Gardens SWMF and Royal Windsor Drive.

5.2 Avonhead Creek

The Avonhead Creek watershed is located entirely within the City of Mississauga and has a drainage area of approximately 2.11 km^2 (CVC, 2017). The headwaters are located north of Royal Windsor Drive and this watershed outlets directly to Lake Ontario. A significant portion of the Avonhead Creek headwaters were diverted to Clearview Creek via an 800 m long storm sewer system along Hazelhurst Road. Diversion of approximately 32.4 ha of drainage area was completed in the early 1990s, followed by the diversion of an additional 115.3 ha in 2008 through an extension of the storm sewer to intercept Avonhead Creek. These diversions have reduced the current drainage area of Avonhead Creek to approximately 80.8 ha, with baseflows from an additional 130.2 ha still conveyed to Avonhead Creek (Ecosystem Recovery Inc., 2015).

Land use within the Avonhead Creek Watershed consists predominantly of low and medium density residential subdivisions north of the CNR line and commercial and institutional developments south of the CNR line (CVC, 2017). Significant sections of this watershed have been channelized between Royal Windsor Drive and Lakeshore Road, where the watercourse was then piped to Lake Ontario (Ecosystem Recovery Inc., 2015).

5.3 Lakeside Creek

Lakeside Creek is a relatively small watershed, with a total drainage area of 1.51 km, and outlets directly to Lake Ontario. This watershed is located between Avonhead Creek and Southdown Road, and extends north to the CNR line (CVC, 2018). The open portion of watercourse, approximately 300 m in length, extends south of Lakeshore Road West in Lakeside Park. Upstream of Lakeshore Road, the watercourse has been piped through the Clarkson Wastewater Treatment Plant. Predominant land uses in the watershed include commercial/industrial and open space. This watershed was developed largely without stormwater management measures (CVC, 2018).

5.4 Sheridan Creek

Sheridan Creek has a drainage area of approximately 10.5 km^2 and outlets to Rattray Marsh on the shoreline of Lake Ontario. The middle portion of the watershed consists primarily of low density residential development with smaller areas of medium and high density residential development. There are also commercial, institutional and community-based land uses. The lower portion of the watershed, from Lakeshore Road to Rattray Marsh, is predominantly low density residential (Aquafor Beech Ltd., 2011 and City of Mississauga, 2018).

Approximately 80% of the watershed had been developed, largely without stormwater management measures, and has negatively impacted the hydrology of Sheridan Creek resulting in an urbanized, "flashy" system that responds rapidly to storm events (Aquafor Beech, 2011). Significant portions of channel have been straightened and hardened and headwater areas have been lost to facilitate development. The channel subsequently has a limited sediment supply and limited access to its floodplain due to channel downcutting, bank hardening and urban encroachment (Aquafor Beech Ltd., 2011). Remaining areas of more natural channel are over-widened to accommodate more peaked flows and contain large gravel bars. Rattray Marsh, the last remaining lakefront marsh between Toronto and Burlington, has been negatively impacted through increased sedimentation, resulting in significant ecological impacts. Restoration of the marsh was to be completed through a phased approach that commenced in 2014.

5.5 Joshua's Creek

Joshua's Creek is located within Conservation Halton's Oakville East Urban Creeks watershed (Conservation Halton, 2018). A small section of the lower portion of the watershed is located within the southwest corner of the study area. The headwaters drain the Trafalgar Moraine and portions of the North Oakville-East Milton Wetland Complex, designated as a provincially significant wetland (PSW). The upper reaches are considered intermittent, and drain agricultural fields, recreational areas, and a cemetery. Permanent flow occurs south of Queen Elizabeth Way (QEW) and is contained within a well-defined valley (Halton-Hamilton Source Protection Region, 2017). A 1 km section of the watercourse has been channelized south of the CNR line, east of the study area. The lower reaches of the watershed are urbanized and include residential and industrial land uses. There are three Environmentally Significant Areas (ESAs) within the watershed: Iroquois Shoreline Woods, Wildflower Woods and Joshua's Creek Valley, and are all located outside of the study area. The portion of Joshua Creek within the study area is designated as a Significant Natural Area and Natural Green Space (City of Mississauga, 2018).

6 Watercourse Characteristics

6.1 Reach Delineation

Reaches are homogeneous segments of channel used in geomorphological investigations. Reaches are studied semi-independently as each is expected to function in a manner that is at least slightly different from adjoining reaches. This method allows for a meaningful characterization of a watercourse as the aggregate of reaches, or an understanding of a reach, for example, as it relates to a proposed activity.

Reaches are typically delineated based on changes in the following:

- Channel planform
- Channel gradient
- Physiography
- Land cover (land use or vegetation)
- Flow, due to tributary inputs
- Soil type and surficial geology
- Historical channel modifications

Reaches are typically delineated following scientifically-defensible methodology proposed by Montgomery and Buffington (1997), Richards et al. (1997), and the Toronto and Region Conservation Authority (2004). For this study, the full length of each reach of Avonhead Creek, Clearview Creek and Sheridan Creek were not verified in the field due to site access limitations and/or previously completed detailed studies (Ecosystem Recovery Inc., 2015 and CVC, 2018). Reach delineation completed for previous studies was carried forward to this study, and relevant findings are summarized herein, where appropriate. **Table 2** provides a summary of the portions of watercourses assessed by GEO Morphix Ltd. In some instances, observations were collected within the right-of-way (ROW) to confirm assessments completed by others.

Table 2: Portions of watercourse assessed by GEO Morphix Ltd.

Watershed	Reach	Extent Assessed	Length (m)	Defining Characteristics
Clearview Creek	CC-4	555 Winston Churchill Drive to 50 m upstream of online pond	250	Low sinuosity, unconfined valley, fragmented riparian buffer
Clearview Creek	CC-5	Extent of online pond and backwatered area	180	Online pond and backwatered area
Clearview Creek	CC-6	Downstream section of reach within public park	150	Exposed shale on channel bed and banks, exposed tree roots, undercutting
Clearview Creek	CC-7	Reach assessed within ROW of Lakeshore Drive	70	Channel lined with armourstone and concrete
Avonhead Creek	R-2	Downstream half of the reach, directly upstream of culvert at Lakeshore Road East	70	Roadside ditch with no riparian buffer
Lakeside Creek	LC-1	Entire reach, from culvert at Lakeshore Road to Lake Ontario	300	Meandering mixed load channel within mature forest
Sheridan Creek	SC-1	Within the right-of way at Bromsgrove Road	70	Concrete lined channel
Joshua's Creek	JC-1	Entire reach, from municipal boundary to Lake Ontario shoreline	250	Backwater from Lake Ontario, medial bars, deposition on point bars

6.2 General Reach Observations

Field investigations were completed on October 22, 2018 and December 14, 2018 and included the following activities for portions of reaches listed in **Table 2**:

- Habitat sketch maps based on Newson and Newson (2000) outlining channel substrate, flow patterns, geomorphological units (e.g., riffle, run, pool), and riparian vegetation for the extent of each reach assessed
- Descriptions of riparian conditions
- Estimates of bankfull channel dimensions
- Bed and bank material composition and structure
- Observations of erosion, scour or deposition
- Collection of photographs to document the watercourses, riparian areas and/or valley, surrounding land use, and channel disturbances such as crossing structures

Observations and measurements collected by GEO Morphix are summarized below and in **Table 3**. The descriptions of reaches assessed by GEO Morphix Ltd. are supplemented with representative photographs contained in **Appendix B**. Field data collected by GEO Morphix Ltd., including reach summaries and habitat sketch maps are provided in **Appendix C**.

Bankfull channel dimensions and field observations collected by others for Avonhead Creek and Clearview Creek are also included in **Table 3** for reference, where available. For detailed descriptions of reaches of Clearview and Avonhead Creeks refer to the studies completed by CVC (2018) and Ecosystem Recovery Inc. (2015), respectively.

6.2.1 Clearview Creek

The upstream extent of **Reach CC-4** was located at the culvert conveying flow beneath Winston Churchill Boulevard approximately 900 m south of Royal Windsor Drive, and continued until the upstream extent of the backwatered area upstream of the online pond. The reach contained a meandering suspended load channel with bed and bank substrate predominantly composed of clay, silt and sand. Due to access constraints, the reach could only be assessed within the Hydro One ROW. Land uses within the portion of reach assessed were predominantly industrial and agricultural, with one mature isolated woodlot acting as a riparian buffer in the central portion of the reach. The channel maintained a perennial flow regime and was not confined within a valley. Woody debris was only observed where the channel conveyed flow through the woodlot. There was sparse vegetation within the channel, with rooted emergent plants noted within approximately 10% of the reach. The channel was dominated by run geomorphic units, with riffles and pools observed infrequently. Average bankfull width was 3.55 m, and the average bankfull depth was 0.93 m.

Reach CC-5 contained an online pond and its associated backwatered area upstream of an undersized culvert at the upstream extent of the pond. Significant sedimentation was observed within both the pond and backwatered area, with deposits predominantly composed of sand. Pond dimensions were not evaluated in the field due to the depth of water, however upstream of the culvert the average bankfull channel width measured as 7.2 m with a corresponding depth of 0.9 m. Surrounding the reach was a narrow, fragmented and mature riparian buffer consisting of deciduous trees.

Approximately 150 m of **Reach CC-6** was assessed at its downstream extent where the watercourse conveyed flow through a small unnamed park. The reach was a mixed-load meandering channel with a moderate gradient that was not confined within a valley. The channel had a mature and continuous riparian buffer zone that extended 4-10 times the channel width and consisted predominately of deciduous trees. A low density of woody debris was present in both the channel and banks with bank angles ranging from 60-90 degrees. Bank erosion was observed for 30-60% of the reach length, with undercuts measured up to 0.43 m. The average bankfull width and depth were 5 m and 0.7 m, respectively. A riffle-pool morphology was observed in the channel, with approximately 30% riffles and 10% pools. Bed material in riffles and pools consisted of gravel, cobble, and exposed shale, with bank materials consisting of clay, silt and shale.

Reach CC-7 was assessed within the Lakeshore Road West ROW. A steep, armoured cascade was present upstream of the road before the channel entered a double box culvert. Downstream of the road, the channel consisted of a two-tiered concrete trapezoidal channel with a top width of 6.5 m and a depth of 2 m. Algae overlaid much of the concrete near the crossing, and scrubland flanked both sides of the channel north and south of Lakeshore Road.

6.2.2 Avonhead Creek

Reach R-2 was located immediately north of Lakeshore Road and began where the channel turned from a southward direction to an eastward direction. The reach was a low gradient roadside ditch that ran parallel to Lakeshore Road. The channel riparian area consisted of predominantly manicured grass, which had encroached the channel throughout its length. The average bankfull width and depth were 1.1 m and 0.33 m, respectively. Bank angles ranged from 30 to 60 degrees, and bank erosion was observed for less than 5% of the reach length. Channel bed and bank materials consisted of clay, silt, and sand.

6.2.3 Lakeside Creek

Reach LC-1 began at a culvert under Lakeshore Road and conveyed flow southward for approximately 300 meters towards the pedestrian trail at Lake Ontario. The reach was a mixed-load meandering channel that occupied an unconfined valley and had a low gradient. The channel had a continuous riparian buffer zone that extended more than ten times the channel width, consisted predominately of mature deciduous trees. A moderate density of wood debris was observed within both the channel and cut banks. The average bankfull width and depth were 2.75 m and 0.53 m, respectively. Bank angles ranged from 60 to 90 degrees with undercuts measured up to 0.3 m. Bank erosion was observed for 30 to 60 percent of the reach length. The reach had a poorly developed riffle-pool morphology that consisted of 5% riffles and 5% pools. Bed material consisted of clay and silt in pools, and clay, silt, gravel in riffles, and banks were composed of a clay, silt, and sand mixture. Siltation in pools were observed, as well as deposition of fine material in the over-bank zone.

6.2.4 Sheridan Creek

Reach SC-1 was delineated based on recent digital imagery available from Google Earth Pro. The extent assessed in the field was limited to the portion of channel immediately downstream of a bridge crossing at Bromsgrove Road, where the channel conveyed flow eastward towards the bridge crossing at Lakeshore Road West. The portion of reach assessed contained a concrete-lined engineered channel, with a low gradient that occupied a confined valley. The channel had an established and continuous riparian buffer zone that extended 1-4 times the channel width and consisted predominately of deciduous trees. Bankfull indicators were absent due to the engineered channel. The channel bed and banks were composed of concrete, with some clay and gravel overlaying the concrete.

6.2.5 Joshua's Creek

Reach JC-1 began at the southwest corner of the Mississauga's municipal boundary and conveyed flow southeastward for approximately 250 m before discharging into Lake Ontario. The reach was a mixed-load meandering channel, with a low gradient that occupied a partially confined valley. The channel had a continuous riparian buffer that extended 1 to 4 times the channel width and consisted predominately of mature deciduous trees. A low density of woody debris was present in both the channel and cut banks. Depositional features such as lobate bars and medial bars were observed. The average bankfull width and depth were 18.5 m and 1.6 m, respectively. Bank angles range from 60 to 90 degrees, and bank erosion was observed for 5 to 30 percent of the reach length. The channel experienced a backwater effect from Lake Ontario, and therefore no riffle and pool development was observed. Channel bed and channel bank materials consisted of clay, silt, and sand.

Table 3: General reach observations

Watershed	Reach	Bankfull Channel Dimensions (m)		Substrate		Riparian Vegetation
		Width	Depth	Riffle	Pool	
Clearview Creek[a]	CC-4*	3.2 – 3.9	0.9 – 0.95	Clay, silt, sand		Shrubs, grasses and deciduous trees with localized gaps
	CC-5	N/A- online pond and backwatered area				Shrubs, grasses and deciduous trees
	CC-6*	4 – 5.8	0.7	Gravel and cobble, exposed shale		Trees
	CC-7	N/A – engineered/concrete lined channel				Trees, shrubs (west) and agricultural field (east)
Avonhead Creek[b]	R-1	5[c]	1.5[c]	Clay to sand at storm sewer outlet, cobble and boulder cascade near Lake Ontario shoreline		Trees and shrubs
	R-2*	1 – 1.3	0.25 – 0.40	Exposed till, clay to very fine sand, organics		Grasses and large Willow trees
	R-3	2.15 – 3.05	0.15 – 0.65	Clay to fine sand with local accumulations of pebbles (5 to 6 cm)		Dense shrubs and trees
	R-4	N/A – CSP lined channel				Shrubs
	R-5	N/A – concrete lined channel with localized sediment deposition				Grasses
	R-6	N/A - CSP lined channel with localized sediment deposition (e.g., medial bars) and algae				Grasses
	R-7	7.3 – 10.0	1.6 – 2.15	Clay to fine sand and organics		Trees and shrubs

Watershed	Reach	Bankfull Channel Dimensions (m)		Substrate		Riparian Vegetation
		Width	Depth	Riffle	Pool	
	R-8	2.45	0.39	Clay to fine sand and fine-grained alternating bar forms		Cattails and emergents (upstream), dense trees and shrubs (downstream)
	R-9	2.20 – 2.65	0.25 – 0.40	Silty clay and local accumulations of gravel, fine-grained lateral bar forms		Dense shrubs and trees
	R-10	2.3	0.55	Silty clay		Trees and shrubs
	R-11	2.3	0.55	Silty clay		Dense shrubs and trees
	R-12	1.4 – 2.2	0.3 – 0.47	Silt, clay with sand and organics		Phragmites in channel, shrubs, trees, grasses
	R-13	N/C		Silt, clay, fine sand and leaf litter		Maintained grass
	R-14	N/C		N/C		Dense shrubs and trees
Lakeside Creek	LC-1	2.75	0.53	Clay, silt, and gravel	Clay and silt	Deciduous trees
Sheridan Creek	SC-1	N/A – engineered channel				Deciduous trees
Joshua's Creek	JC-1	18.1	1.6	Clay, silt and sand		Mature deciduous trees

Notes:
* bankfull measurements collected by GEO Morphix Ltd.
N/C – not completed due to site access limitations
[a] Results summarized from the Clearview Creek Feasibility Study (CVC, 2018)
[b] Results summarized from the Lake Ontario Integrated Shoreline Strategy Avonhead Creek Fluvial Geomorphology Assessment (Ecosystem Recovery Inc., 2015)
c Bankfull channel dimensions measured by Aquafor Beech Limited (2011)

6.3 Reconnaissance-level Assessments

Channel stability was semi-quantified through the application of the Ontario Ministry of the Environment's (2003) Rapid Geomorphic Assessment (RGA), where applicable. Observations were quantified using an index that identifies channel sensitivity based on evidence of aggradation, degradation, channel widening, and planimetric form adjustment. The index produces values that indicate whether the channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40) or adjusting (score >0.41).

The Rapid Stream Assessment Technique (RSAT) was also employed to provide a broader view of the system and considers the ecological function of the watercourse (Galli, 1996), where appropriate. Observations were made of channel stability, channel scouring or sediment deposition, instream and riparian habitats, and water quality. The RSAT score ranks the channel as maintaining a poor (<13), fair (13-24), good (25-34), or excellent (35-42) degree of stream health.

Reaches were also classified according to a modified Downs (1995) Channel Evolution Model, where applicable. The Downs Model describes successional stages of a channel as a result of a perturbation, namely hydromodification. Understanding the current stage of the system is beneficial as this allows one to predict how the channel will continue to evolve or respond to an alteration to the system.

These reconnaissance-level assessments were applied to alluvial or semi-alluvial systems. For reaches field assessed by GEO Morphix Ltd, only Reach LC-1 (Lakeside Creek) and JC-1 were eligible. For ease of review, rapid geomorphic assessment results are included for reaches within watersheds assessed by Ecosystem Recovery Inc. (2015) and CVC (2018). The results are summarized in **Table 4**. Refer to **Appendix C** for rapid assessment field sheets completed by GEO Morphix Ltd.

Table 4: Summary of reconnaissance-level assessments

Watershed	Reach	RGA (MOE, 2003)			RSAT (Galli, 1996)			Downs (1995) Channel Evolution Model
		Score	Condition	Dominant Systematic Adjustment	Score	Condition	Limiting Feature	
Clearview Creek[a]	CC-4	0.32	In transition	Evidence of degradation	19	Fair	Riparian habitat, water quality	e - enlarging
	CC-5	0	In regime	Evidence of aggradation	25	Good	Riparian habitat, water quality	D - Depositional
	CC-6	0.37	In transition	Evidence of widening	26	Good	Water quality, channel scouring	E - enlarging
	CC-7	N/A – concrete lined channel						
Avonhead Creek[b]	R-1	0.14	In Regime	Aggradation	26	Fair	N/R	N/R
	R-2	0.23	In transition	Evidence of widening and planform adjustment	20	Fair	N/R	N/R
	R-3	0.34	In transition	Evidence of widening	21	Fair	N/R	N/R
	R-4	N/A – CSP lined channel			7	Poor	N/R	N/R
	R-5	N/A – concrete lined channel			9	Poor	N/R	N/R
	R-6	N/A – CSP lined channel			7	Poor	N/R	N/R
	R-7	N/A – significant backwater		Evidence of aggradation	29	Fair/Good	N/R	N/R
	R-8	0.20	In regime/ transition	Evidence of aggradation and planform adjustment	24	Fair	N/R	N/R

Watershed	Reach	RGA (MOE, 2003)			RSAT (Galli, 1996)			Downs (1995) Channel Evolution Model
		Score	Condition	Dominant Systematic Adjustment	Score	Condition	Limiting Feature	
	R-9	0.23	In transition	Evidence of aggradation	23	Fair	N/R	N/R
	R-10	0.19	In regime/ transition	Evidence of aggradation	19	Fair	N/R	N/R
	R-11	0.21	In transition	Evidence of widening and aggradation	24	Fair	N/R	N/R
	R-12	0.16	In regime	Evidence of aggradation	21	Fair	N/R	N/R
	R-13	N/C	N/C	N/C	N/C	N/C	N/C	N/C
	R-14	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Lakeside Creek	LC-1	0.286	In transition	Evidence of aggradation	23	Fair	Physical Instream Habitat	M – lateral migration
Sheridan Creek	SC-1	N/A – concrete lined channel						
Joshua's Creek*	JC-1	0.143	In regime	Evidence of aggradation	27	Good	Sediment Deposition	D - deposition

Notes:
* observations collected by GEO Morphix Ltd.
N/A – not applicable due to absence of alluvial or semi-alluvial channel
N/C – not completed due to site access limitations
N/R – not recorded in study
[a] Results summarized from the Clearview Creek Feasibility Study (CVC, 2018)
[b] Results summarized from the Lake Ontario Integrated Shoreline Strategy Avonhead Creek Fluvial Geomorphology Assessment (Ecosystem Recovery Inc., 2015)

6.4 Drainage Density

Drainage density is a measure of the degree of dissection of the drainage basin and is defined as the ratio of the total channel length over the drainage area of the basin and is usually expressed as km/km^2. The drainage density increases as the average area between adjacent channels decreases. Drainage density depends on the precipitation rate, the permeability of the surface materials, the resistance to erosion, and the degree of vegetation cover (Knighton, 1998; Bridge, 2003). Drainage density generally decreases with distance downstream from the headwaters, but is relatively lower (i.e., less than 10 km/km^2) in temperate regions due to greater vegetation cover and runoff (Bridge, 2003). Because the study area has undergone extensive alterations to its hydrologic network as a result of industrial development, it is not reasonable to expect that this system will act as a naturally draining watershed. Instead, it's drainage density will be indicative of the degree to which the site has been modified.

The existing drainage densities for three watersheds within the study area were calculated using existing drainage areas provided by TMIG, and stream and ditch GIS layers retrieved from CVC (2012) and the City of Mississauga. **Table 5** below contains the results of the drainage density analysis.

In completing this analysis, it was necessary to make the following assumptions:

- The watercourse and ditch layers outline all features within the subject site

- Because of the alterations to the property from extensive development, drainage has been re-directed in several locations, which has resulted in overlapping drainage areas
- These overlapping drainage areas were accounted for within each watershed
- It is assumed that the diversion pipe conveying flows from Avonhead Creek has catch-basins associated with it and is therefore treated as a drainage feature

Table 5: Drainage density calculations for Lakeside Creek, Avonhead Creek and Clearview Creek

Watershed	Drainage Area (km^2)	Stream Length (km)	Drainage Density (km/km^2)
Lakeside Creek	1.74	7.57	4.35
Avonhead Creek	2.097	12.637	6.03
Clearview Creek	5.814	18.097	3.11

7 Meander Belt Width Delineation

Most watercourses in southern Ontario have a natural tendency to develop and maintain a meandering planform, provided there are no spatial constraints. A meander belt width, or erosion hazard assessment, estimates the lateral extent that a meandering channel has historically occupied and will likely occupy in the future. This assessment is therefore useful for determining, for example, the potential limit of an activity (e.g., land development) adjacent to a watercourse, or the floodplain width required to restore a stream to a naturally functioning state.

A modelling approach can be used where the channel has been previously modified or its position cannot be determined in the imagery due to tree cover or poor photograph resolution. These models are scientifically-defensible and have been verified in past projects as suitable for use in southern Ontario. Due to extensive historical channel modifications within the study area, a modelling approach was taken for reaches of Avonhead Creek, Clearview Creek, and Lakeside Creek.

Empirical relations from Williams (1986) were applied using average bankfull channel dimensions measured in the field (by GEO Morphix Ltd. and others) to estimate the meander belt width (m), B_w:

$$B_w = 18A^{0.65} + W_b \quad \text{[Eq. 1]}$$

$$B_w = 4.3{W_b}^{1.12} + W_b \quad \text{[Eq. 2]}$$

where A is bankfull cross-sectional area (m^2) and W_b is average bankfull channel width (m). An additional 20% buffer, or factor of safety, was applied to the computed results to address issues of under prediction.

The Ward et al. (2002) model was also used to determine meander belt widths (ft), B_w:

$$B_w = 6{W_b}^{1.12} \quad \text{[Eq. 3]}$$

Again, an additional 20% factor of safety was applied to the results.

The modelled meander belt widths are presented in **Table 6** with the recommended meander belt widths shown graphically in **Appendix D**. As a conservative approach, Ward et al. (2002) was selected as the preferred method for determining meander belt widths.

As noted previously, Ecosystem Recovery Inc. (2015) estimated meander belt widths for **Reaches R-2** and **R-3** of Avonhead Creek using a modelling approach to inform the potential for daylighting of **Reach R-1**. Multiple empirical equations were examined, and an average was taken from selected results. The resulting averaged modelled meander belt width estimates provided by Ecosystem Recovery Inc. for **Reaches R-2** and **R-3** were 16.42 m and 25.78 m, respectively. Based on our results, we have recommended meander belt widths of 9 m and 24 m for **Reaches R-2** and **R-3**, respectively. While the belt widths for **Reach R-3** are comparable, there is a difference of approximately 7.5 m for **Reach R-2**. However, discrepancies between meander belt widths on small channels with limited erosion are not uncommon.

Due to the relatively natural conditions present within Joshua's Creek, the meander belt width for **Reach JC-1** was calculated by measuring local meander amplitudes using recent Google Earth Pro imagery. A meander amplitude of 60 m was measured upstream of the study area. A 20% factor of safety was added to this value, resulting in a meander belt width of 72 m, as illustrated in **Appendix D**.

Meander belt widths were not applied to reaches where backwatered areas were present that prevented natural channel migration and the collection of accurate measurements of bankfull channel dimensions, or where bankfull channel indicators were absent. Meander belt widths were also not calculated for reaches that had been straightened and lined with concrete and/or CSP as these measures prevent natural channel migration.

Meander belt widths should be refined in subsequent site-specific studies as properties undergo development or re-development as in some instances the full reach length could not be accessed by CVC, Ecosystem Recovery Inc. or GEO Morphix Ltd. Should any reaches be determined to be confined based on additional detailed field investigations, where the watercourse is within 15 m of the toe of the valley slope, the erosion hazard should be refined using MNR (2001) guidance or the completion of the detailed geomorphic study that identifies areas of active erosion, local surficial geology and local bank composition.

Table 6: Modelled meander belt widths for reaches within the study area

Watershed	Reach	Valley Confinement	Meander Belt Width (m)*			Recommended Meander Belt Width (m)
			Williams (1986) Area	Williams (1986) Width	Ward et al. (2002) Width	
Clearview Creek	CC-4	Unconfined	51	26	34	34
	CC-5	Unconfined	N/A - online pond and backwatered area			
	CC-6	Unconfined	55	37	50	50
	CC-7[a]	Unconfined	N/A – concrete-lined channel			
Avonhead Creek	R-1[a]	N/A – piped channel				
	R-2	Unconfined	13	7	9	9
	R-3	Unconfined	25	18	24	24
	R-4	Unconfined	N/A – CSP lined channel			

Watershed	Reach	Valley Confinement	Meander Belt Width (m)*			Recommended Meander Belt Width (m)
			Williams (1986) Area	Williams (1986) Width	Ward et al. (2002) Width	
	R-5	Unconfined	N/A – concrete lined channel			
	R-6	Unconfined	N/A – CSP lined channel			
	R-7	Unconfined	N/A – backwater due to concrete control structure at downstream reach break			
	R-8	Unconfined	24	17	23	23
	R-9	Unconfined	24	17	22	22
	R-10	Unconfined	28	16	21	21
	R-11	Unconfined	28	16	21	21
	R-12	Unconfined	19	12	16	16
	R-13	Unconfined	N/A – straightened grass-lined ditch on private property, no access granted to Ecosystem Recovery Inc. at time of study			
	R-14	Confined	N/A – straightened channel on private property, no access granted to Ecosystem Recovery Inc., armourstone retaining walls present, commercial development to the top of bank			
Lakeside Creek	LC-1	Unconfined	31	19	26	26
Sheridan Creek	SC-1	Confined	N/A – concrete lined channel, surrounding area developed (Clarkson GO Station, urban residential)			

*Includes 20% factor of safety

8 Watercourse Restoration Opportunities

Watercourse restoration and enhancement opportunities have been identified from a fluvial geomorphological perspective based on our background review and field assessment. No watercourse restoration or enhancement opportunities were identified along the portion of Joshua's Creek within the study area as this section of channel was evaluated to be in generally good condition. As only a limited section of Sheridan Creek occurred within the study area, the assessment of potential watercourse restoration and enhancement opportunities focussed on the watersheds of Clearview Creek, Avonhead Creek and Lakeside Creek. It should be noted that the restoration opportunities outlined below include works on or adjacent to private property and are located within highly urbanized and industrialized areas. As such, there may be other constraints associated with potential channel restoration works.

8.1 Clearview Creek

From a fluvial geomorphological perspective, there are two locations where watercourse restoration works would significantly improve conditions within Clearview Creek. The first location is the online pond and farm crossing of Clearview Creek in **Reach CC-5**. This pond was constructed between 1931 and 1954, likely to serve as a source of water for crop irrigation. CVC (2018) measured the pond to be approximately 1 m in depth with a surface area of 3,580 m^2. Significant sedimentation was observed within both the pond and backwatered area upstream of the farm crossing, with deposits predominantly composed of sand. The pond outlet consists of a 10 m wide structure with stop logs and was evaluated as a barrier to fish passage by CVC (2018). This pond likely also has a negative impact on water quality and temperature, particularly during the summer months.

Decommissioning of the pond and implementation of a dynamically stable channel would restore fish passage and channel form, provide temperature mitigation, and restore a more natural flow and sediment transport regime. To establish a direct connection to the floodplain and enhance terrestrial habitat, wetlands could be constructed in the footprint of the former pond, where feasible. These wetlands would be designed to be seasonally inundated in the spring and during significant precipitation events. A landscape restoration plan is recommended to provide channel stability, shade and overhanging cover, and a source of organic matter.

The second opportunity is to remove the concrete lining in **Reach CC-7** and construct a naturalized corridor with an appropriately sized channel. The concrete channel currently conveys the Regional storm under existing conditions, including flows diverted from Avonhead Creek. CVC (2018) completed a detailed geomorphic assessment within **Reach CC-6** to inform the conceptual channel design. Three conceptual design alternatives were developed that considered topography, natural heritage objectives, land ownership and construction costs. Removal of the concrete lining and implementation of a naturalized corridor would restore fish passage and aquatic habitat. Landscape restoration plantings are recommended within the corridor to provide a source of organic input, shade, and cover to the channel.

8.2 Avonhead Creek

Reach R-1 of Avonhead Creek is currently piped for approximately 400 m downstream of Lakeshore Road West to Lake Ontario. Ecosystem Recovery Inc. (2015) developed a preliminary design for daylighting **Reach R-1** within the CRH Canada Group Inc. property. Daylighting of **Reach R-1** would restore fish passage and aquatic habitat, and reinstate channel form and function. Ecosystem Recovery Inc. (2015) identified several design considerations and constraints including the watercourse crossing location at Lakeshore Road West, the presence of underground infrastructure including a sanitary sewer, watermain and storm sewer, volume of fill to be excavated and potential disposal requirements, the meander belt width of the designed channel, and available land area to construct the corridor. Local bedrock elevation is also an important consideration for construction, as available geotechnical boreholes recorded shale bedrock at depths as shallow as 1.6 m below the ground surface.

Ecosystem Recovery Inc. (2015) noted that CVC preferred the use of a rocky ramp, similar to the existing channel configuration, to address the drop in elevation towards the Lake Ontario shoreline. Based on the locations of existing infrastructure, the preliminary design recommended that the upstream tie-in with the proposed corridor occur south of Lakeshore Road, ideally south of the Waterfront Trail. This would negate the need for a pedestrian bridge crossing over Avonhead Creek. The recommended discharge to accommodate in the bankfull channel was 60% of the 2-year flow event with a tiered (nested) channel approach. It was also recommended that the floodplain include sources of relatively coarse sediment in the floodplain to replenish riffle substrates in the designed channel. This is of particular importance given the presence of concrete and CSP lined channel sections upstream of Lakeshore Road West.

In addition to daylighting of **Reach R-1**, removal of the concrete and CSP linings and the installation of dynamically stable channel along **Reaches R-4** to **R-6** would reinstate a more natural channel form and provide enhanced aquatic habitat. Corrosion was observed along the bottom of the CSP lining. In some locations, gaps were noted between the lining and the floodplain; however, it was not clear if this was caused by overbank erosion or was the method of initial installation (Ecosystem Recovery Inc., 2015). These works would be complemented by the removal of the concrete structure at the downstream extent of **Reach R-7**. It is assumed that these measures were implemented to protect adjacent infrastructure. Therefore, the feasibility of this opportunity should be explored further through consultation with CRH Canada Group Inc. and the multi-disciplinary project team.

8.3 Lakeside Creek

A significant portion of Lakeside Creek is piped under the Clarkson Wastewater Treatment Plant, which is operated by the Region of Peel. Potential opportunities to daylight the portion of Lakeside Creek north of Lakeshore Road West could be explored in consultation with the Region, City and CVC. Design considerations and constraints would include avoiding impacts to operation of the treatment plant and the location of existing underground infrastructure. If daylighting is deemed feasible, a dynamically stable channel could be designed and constructed within a naturalized corridor. Offline wetland features and additional habitat elements would enhance local terrestrial habitat and provide a significant improvement over existing conditions.

9 Summary

GEO Morphix Ltd. was retained to complete a fluvial geomorphic assessment of watercourses within the Southdown District in support of the Stormwater Servicing and Environmental Management Plan to inform future urban development and redevelopment. The Southdown District is bounded by Lake Ontario to the south, Southdown Road to the east, Winston Churchill Boulevard to the west, and approximately Bromsgrove Road to the north. Portions of five watersheds traverse the study area: Clearview Creek, Avonhead Creek, Lakeside Creek, Sheridan Creek and Joshua's Creek.

GEO Morphix Ltd. conducted a detailed review of previous studies, including those completed along Avonhead Creek (Ecosystem Recovery Inc., 2015) and Clearview Creek (CVC, 2018), among others. Confirmatory field work was largely limited to observations collected within ROWs, the lower reach of Joshua's Creek, and the remaining open channel section of Lakeside Creek. Relevant findings of previous studies are referenced herein; however, the reader is directed to original reporting for detailed descriptions of reaches not assessed directly by GEO Morphix Ltd.

Historical assessments previously completed in support of the LOISS (Ecosystem Recovery Inc., 2015 and Aquafor Beech Limited, 2011) were reviewed and summarized herein, supplemented with our review of historical aerial photographs from the NAPL and City of Mississauga interactive online mapping. In 1931, land use within the study area was largely agricultural. Significant lengths of channel had been channelized, and natural vegetation removed to maximize cultivated land area. Between approximately the mid-1950s to the mid-1980s, Clearview Creek, Avonhead Creek, Lakeside Creek and Sheridan Creek underwent extensive channel modifications to accommodate industrial and residential development. Due to the timing of development, contemporary mitigation measures such as stormwater management facilities are largely absent.

The existing drainage densities for Clearview Creek, Avonhead Creek and Lakeside Creek were calculated using existing drainage areas provided by TMIG, and stream and ditch GIS layers retrieved from CVC (2012) and the City of Mississauga. Because the study area has undergone extensive alterations to its hydrologic network, drainage densities are indicative of the degree to which the site has been modified.

Meander belt widths define the area that a watercourse currently occupies and may occupy in the future, and defines, in part, the limit of potential development adjacent to a watercourse. Due to extensive historical channel modifications, meander belt widths were determined using empirical modelling for reaches of Clearview Creek, Avonhead Creek and Lakeside Creek, as appropriate. As a conservative approach, meander belt widths calculated using Ward et al. (2002) were recommended. Due to the relatively natural conditions within reach Joshua's Creek, the meander belt width for **Reach JC-1** was determined using measured local meander amplitude and a 20% factor of safety. These values should be refined in subsequent site-specific studies as properties undergo development or re-development. Should any reaches be determined to be confined based on additional detailed field investigations, where the watercourse is within 15 m of the toe of the valley slope, the erosion hazard should be refined using MNR (2001) guidance or the completion of the detailed geomorphic study that identifies areas of active erosion, local surficial geology and local bank composition.

From a fluvial geomorphological perspective, there are several watercourse restoration and enhancement opportunities along Clearview Creek, Avonhead Creek and Lakeside Creek. In Clearview Creek, potential watercourse restoration opportunities include decommissioning of the online pond and farm crossing in **Reach CC-5** and removal of the concrete lining in **Reach CC-7**. Potential restoration opportunities in Avonhead Creek include the daylighting of **Reach R-1** and removal of CSP and concrete linings in **Reaches R-4** to **R-6**. Within Lakeside Creek, daylighting of piped channel sections upstream of Lakeshore Road West, within the Clarkson Wastewater Treatment Plant, should be explored further. Importantly, these opportunities are present on or immediately adjacent to private property and additional constraints may be present.

We trust this report meets your requirements at this time. Should you have any questions or concerns please contact the undersigned.

Suzanne St. Onge

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Director, Principal Geomorphologist

Suzanne St. Onge, M.Sc.
Senior Environmental Scientist

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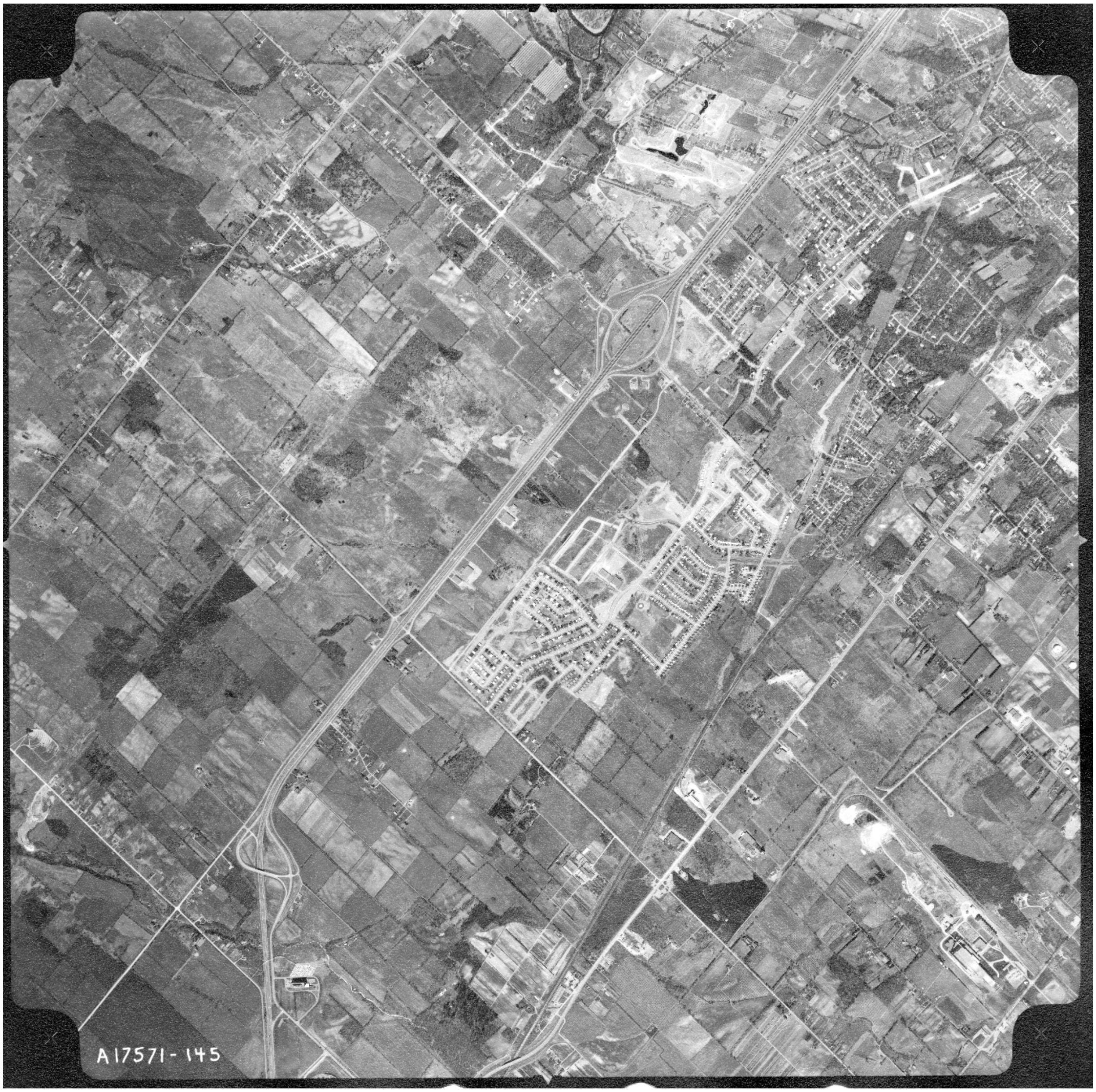
Appendix A
Historical Aerial Imagery

Location: Southdown District, City of Mississauga
(yellow dot indicates intersection of Lakeshore Road West and Winston Churchill Blvd)
Year: 1931
Scale: 1: 15,000
Source: National Air Photo Library

Location: Southdown District, City of Mississauga
Year: 1962
Scale: 1:25,000
Source: National Air Photo Library



Location: Southdown District, City of Mississauga
Year: 1962
Scale: 1:25,000
Source: National Air Photo Library

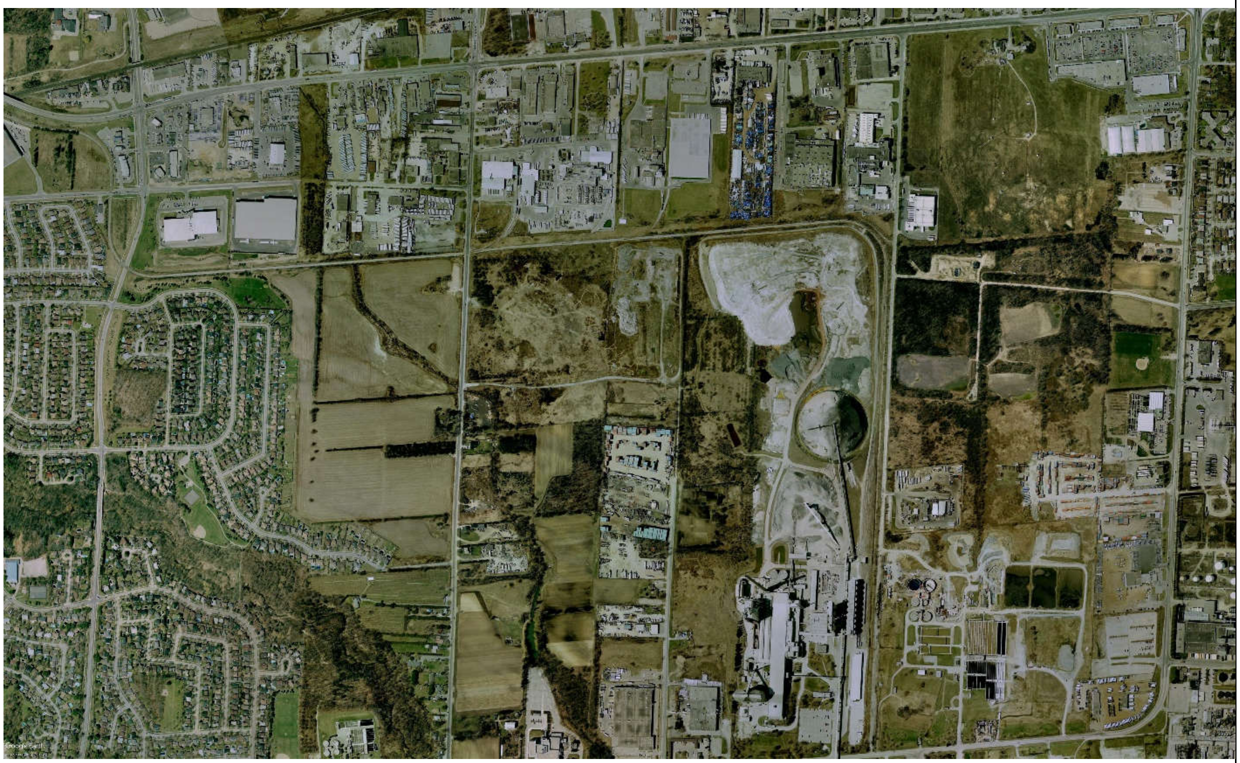
Location: Southdown District, City of Mississauga
Year: 1962
Scale: 1:25,000
Source: National Air Photo Library

Location: Southdown District, City of Mississauga
Year: 1979
Scale: 1:25,000
Source: National Air Photo Library

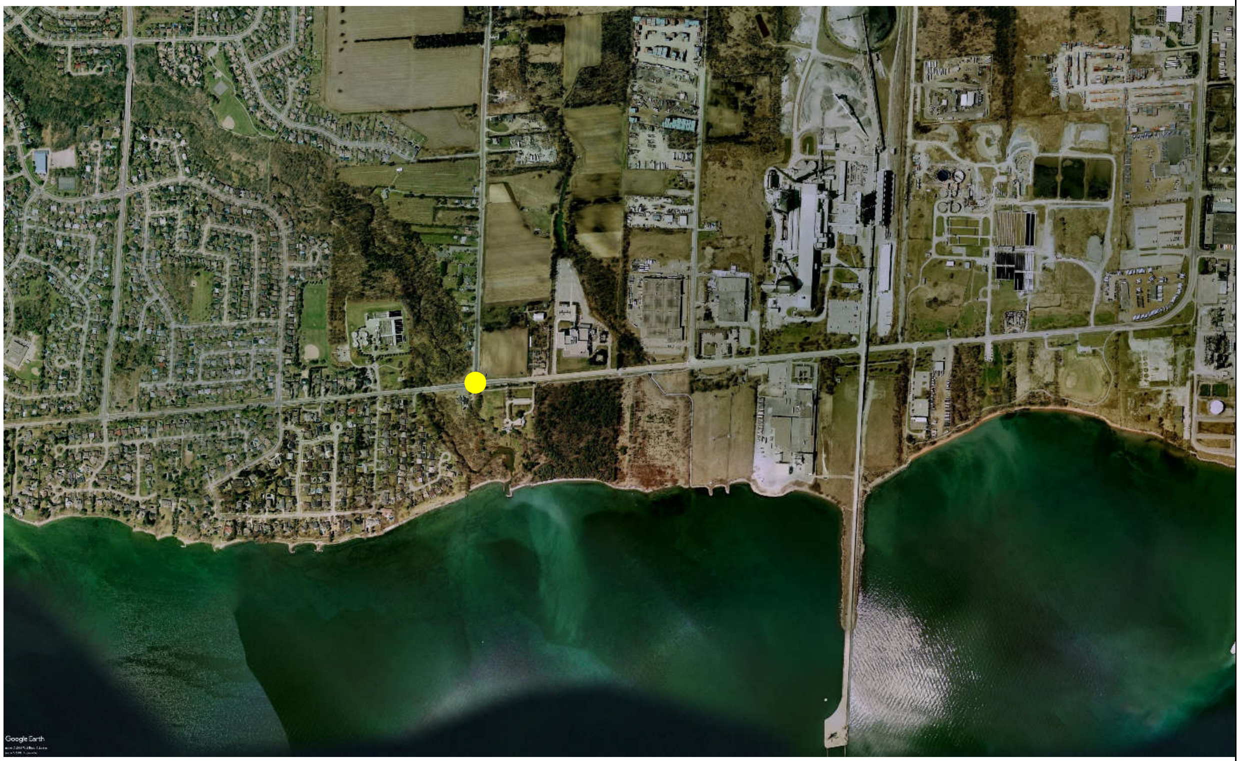
Location: Southdown District, City of Mississauga
Year: 1986
Scale: 1:9,000
Source: National Air Photo Library

Location: Southdown District, City of Mississauga
Year: 1986
Scale: 1:9,000
Source: National Air Photo Library

Location: Southdown District, City of Mississauga
Year: 2005
Scale: N/A
Source: Google Earth Pro



Location: Southdown District, City of Mississauga
Year: 2005
Scale: N/A
Source: Google Earth Pro



Location: Southdown District, City of Mississauga
Year: 2005
Scale: N/A
Source: Google Earth Pro

Location: Southdown District, City of Mississauga
Year: 2016
Scale: N/A
Source: Google Earth Pro

Location: Southdown District, City of Mississauga
Year: 2016
Scale: N/A
Source: Google Earth Pro

Location: Southdown District, City of Mississauga
Year: 2016
Scale: N/A
Source: Google Earth Pro

Appendix B
Photographic Record

Photo 1
Reach CC-4 – Clearview Creek, from Winston Churchill to the online agricultural pond.

The culvert at Winston Churchill Boulevard conveying flows from Clearview Creek was near capacity due to a beaver dam located immediately downstream of the structure.

Photo 2
Reach CC-4 – Clearview Creek, from Winston Churchill to the online agricultural pond.

The channel showed evidence of having been modified within the reach, including this segment near 555 Winston Churchill Boulevard where the creek was straightened.

Photo 3

Reach CC-4 – Clearview Creek, from Winston Churchill to the online agricultural pond.

Within a small wooded area upstream of the online agricultural pond, evidence of aggradation, including the deposition of material in the overbank zone, was observed.

Photo 4

Reach CC-5 – Clearview Creek, agricultural pond between Winston Churchill Boulevard and Lakeshore Road

An undersized culvert was impeding flows directly upstream of the agricultural pond, functionally changing this segment of channel as it acted as a depositional environment with poor hydraulic efficiency.

Photo 5
Reach CC-5 – Clearview Creek, agricultural pond between Winston Churchill Boulevard and Lakeshore Drive

The agricultural pond was surrounded by a narrow wooded riparian buffer, and a significant accumulation of sediment was observed within the feature.

Photo 6
Reach CC-6: Clearview Creek, from the online Agricultural Pond to 40 m upstream of Lakeshore Road

Riffle-pool morphology was observed within Reach CC-6, with roughly 30% of the channel composed of riffles and 10% pools.

Photo 7

Reach CC-6: Clearview Creek, from the online Agricultural Pond to 40 m upstream of Lakeshore Road

Bed material in the channel consisted of gravel, cobble, till and small boulders within the riffles, and gravel, cobble, and till within the pools.

Photo 8

Reach CC-6: Clearview Creek, from the online Agricultural Pond to 40 m upstream of Lakeshore Road

Channel banks were composed of a clay, silt and sand mixture, and their angles ranged from 60 to 90 degrees, with undercuts measured up to 0.43 m.

Photo 9
Reach CC-7: Clearview Creek, from 40 m upstream of Lakeshore Road to Lake Ontario

Immediately upstream of the crossing at Lakeshore Road the channel was lined with boulders and armourstone, forming a cascade.

Photo 10
Reach CC-7: Clearview Creek, from 40 m upstream of Lakeshore Road to Lake Ontario

Downstream of Lakeshore Road the reach was a two-tiered concrete engineered channel. Although there was no bank vegetation, the channel was flanked on either side by a wide riparian buffer.

Photo 11

Reach CC-7: Clearview Creek, from40 m upstream of Lakeshore Road to Lake Ontario

The crossing at Lakeshore Drive was a double box culvert, with an additional circular culvert discharging flows diverted from Avonhead Creek into the channel.

Photo 1 2

Reach R-2: Avonhead Creek from pedestrian bridge east of MJ Manufacturing to crossing at Lakeshore Road.

Reach 2 of Avonhead Creek was a roadside drainage ditch that ran parallel to Lakeshore Road for approximately 260 m.

Photo 13

Reach R-2: Avonhead Creek from the pedestrian bridge east of MJ Manufacturing to the crossing at Lakeshore Road.

Bank angles ranged from 30 to 60 degrees and were covered by turf grass, as was much of the channel bed.

Photo 14

Reach R-2: Avonhead Creek from the pedestrian bridge east of MJ Manufacturing to the crossing at Lakeshore Road.

The culvert at Lakeshore Road, the downstream extent of Reach 2, marked the last point in which flow from Avonhead Creek was conveyed at the surface before discharging into Lake Ontario.

Photo 15

Reach R-14: Avonhead Creek, Assessed within the ROW of Royal Windsor Drive.

Avonhead Creek at Royal Windsor Drive was approximately 5 m below the road grade and was conveyed through a single box culvert.

Photo 16

Reach R-14: Avonhead Creek, Assessed within the ROW of Royal Windsor Drive.

Where assessed Reach 14 was an engineered, straightened channel which was inaccessible due to surrounding railings and fences.

Photo 17
Reach R-14: Avonhead Creek, Assessed within the ROW of Royal Windsor Drive.

Substrate on the channel bed facilitated the establishment of Phragmites.

Photo 18
Reach LC-1: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario

Photograph taken facing downstream from the culvert at Lakeshore Road West. The coarse material at this location was installed to prevent bed scour at the outlet of the culvert conveying flows under Lakeshore Road West.

Photo 19
Reach LC-1: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario

Reach LC-1 was a mixed-load meandering channel that occupied an unconfined valley.

Photo 20
Reach LC-1: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario

The channel had a continuous riparian buffer composed predominately of deciduous trees that spanned more than 10 times the channel width.

Photo 21
Reach LC-1: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario

A low density of woody debris was observed within the channel and on its banks. No distinct debris jams were observed within the reach.

Photo 22
Reach LC-1: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario

The banks were composed of clay, silt, and sand, and their angles generally ranged from 60 to 90 degrees.

Photo 23 **Reach LC-1**: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario	 Point bar development was observed within the reach, with deposited material generally consisting of small gravels and sand.
Photo 24 **Reach LC-1**: Lakeside Creek, from the crossing at Lakeshore Road to Lake Ontario	 The culvert located at the boardwalk marking the downstream extent of the reach was severely blocked, causing backwatering within Reach LC-1.

Photo 25
Reach SC-1: Assessed within the ROW of Bromsgrove Road

Reach SC-1 was a straight engineered concrete channel. The concrete on the channel bed was overlaid by a thin layer of silt, sand and gravel.

Photo 26
Reach SC-1: Assessed within the ROW of Bromsgrove Road

The channel had a continuous riparian buffer composed predominately deciduous trees that extended 1 to 4 times the channel width.

Photo 27

Reach JC-1 : From municipal boundary to Lake Ontario

Reach JC-1 had a fragmented, forested riparian buffer consisting of mature deciduous trees. Point bar formation and erosion at outside meander bends were noted upstream of the subject site.

Photo 28

Reach JC-1 : From municipal boundary to Lake Ontario

Bed material in the channel consisted of clay, silt, and sand. No riffle-pool development was observed.

Photo 29

Reach JC-1 : From municipal boundary to Lake Ontario

Near Lake Ontario the channel had an oversized bankfull channel, likely because this area becomes a backwater site for the Lake during period of elevated water levels.

Photo 30

Reach JC-1 : From municipal boundary to Lake Ontario

Sparse large woody debris was observed within both the channel and at the banks. There was limited erosion in this portion of the reach.

Photo 31
Reach JC-1 : From municipal boundary to Lake Ontario

Cobbles from the beach at Lake Ontario lined the channel as it approached the lakeshore, and the channel’s width was reduced significantly

Photo 32
Reach JC-1 : From municipal boundary to Lake Ontario

The reach discharged into Lake Ontario through a relatively small channel given the size of the watershed, likely contributing to the backwater effect and depositional material observed upstream.

Appendix C
Field Sheets

GEO | MORPHIX
Geomorphology Earth Science Observations

General Site Characteristics

Project Code:

Date:	Dec. 17/18	**Stream/Reach:**	CC-4,5
Weather:	Rain, 3°C	**Location:**	Winston Churchill
Field Staff:	AB	**Watershed/Subwatershed:**	Clearview Creek

Features

- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

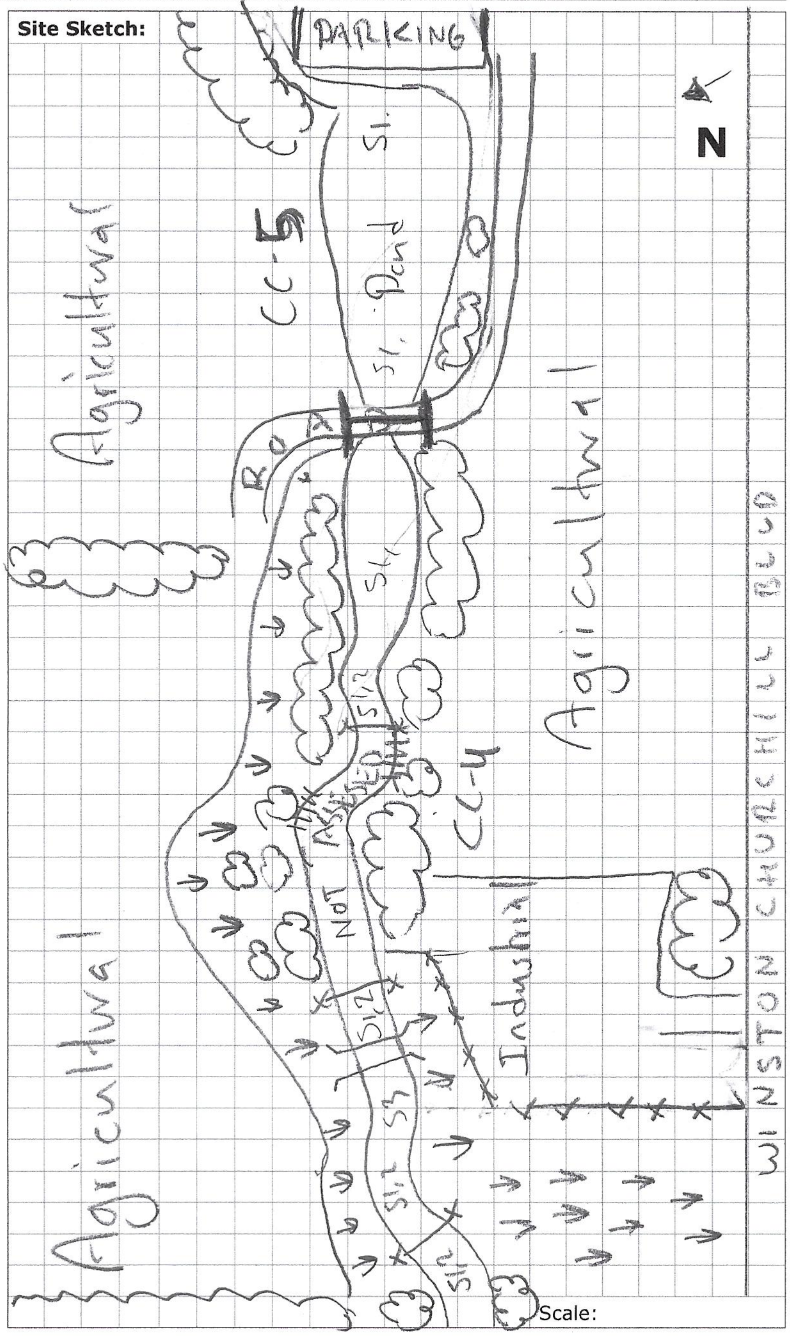
Substrate

S1	Silt	S6	Small boulder
S2	Sand	S7	Large boulder
S3	Gravel	S8	Bimodal
S4	Small cobble	S9	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point

Site Sketch:



Scale:

Additional Notes:

Completed by: ________ Checked by: ________

GEO | MORPHIX
Geomorphology Earth Science Observations

Reach Characteristics

Project Code: 18027

Date:	December 17, 2018	**Stream/Reach:**	CC-4
Weather:	Rain, 3°C	**Location:**	Winston Churchill & Lakeshore
Field Staff:	AB	**Watershed/Subwatershed:**	Clearview Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 3, 4 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 11 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☑ Groundwater | Evidence: Watercress

Riparian Vegetation

- **Dominant Type:** (Table 6) 1, 3
- **Species:** Deciduous,
- **Coverage:** ☐ None ☒ Fragmented ☐ Continuous
- **Channel widths:** ☒ 1-4 ☐ 4-10 ☐ > 10
- **Age Class (yrs):** ☐ Immature (<5) ☒ Established (5-30) ☐ Mature (>30)
- **Encroachment:** (Table 7) 2

Aquatic/Instream Vegetation

- **Type** (Table8): 1
- **Coverage of Reach (%):** 10
- **Woody Debris:** ☒ Present in Cutbank ☒ Present in Channel ☐ Not Present
- **Density of WD:** ☒ Low ☐ Moderate ☐ High
- **WDJ/50m:** 0.5

Water Quality

- **Odour** (Table 16): 1
- **Turbidity** (Table 17): 1

Channel Characteristics

- **Sinuosity (Type)** (Table 9): 1
- **Sinuosity (Degree)** (Table 10): 1
- **Gradient** (Table 11): 2
- **Number of Channels** (Table 12): 1
- **Entrenchment** (Table 13): 1
- **Type of Bank Failure** (Table 14): 1
- **Downs's Classification** (Table 15): D

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☑	☑	☐	☐	☐	☐	☐
Pool Substrate	☑	☑	☐	☐	☐	☐	☐
Bank Material	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	3.2	3.9	7.2
Wetted Width (m)	1.7	1.9	2.7
Bankfull Depth (m)	0.9	0.95	0.9
Wetted Depth (m)	0.26	0.2	0.28

Riffle/Pool Spacing (m): 50 | **% Riffles:** 10 | **% Pools:** 10 | **Meander Amplitude:** 5

Pool Depth (m): 0.1 | **Riffle Length (m):** 5 | **Undercuts (m):** 0.2 | **Comments:**

Velocity (m/s): / | / | / **Wiffle ball / ADV / Estimated**

Bank Angle: ☐ 0 – 30 ☐ 30 – 60 ☐ 60 – 90 ☐ Undercut

Bank Erosion: ☐ < 5% ☐ 5 – 30% ☐ 30 – 60% ☐ 60 – 100%

Notes:

Completed by: AB   Checked by: ________

General Site Characteristics

Project Code: 18027

Date:	Oct 22, 18	**Stream/Reach:**	CC-6,7
Weather:	Sun, 8°C	**Location:**	Lakeshore Road
Field Staff:	AB, EC	**Watershed/Subwatershed:**	Clearview Creek

Features

- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

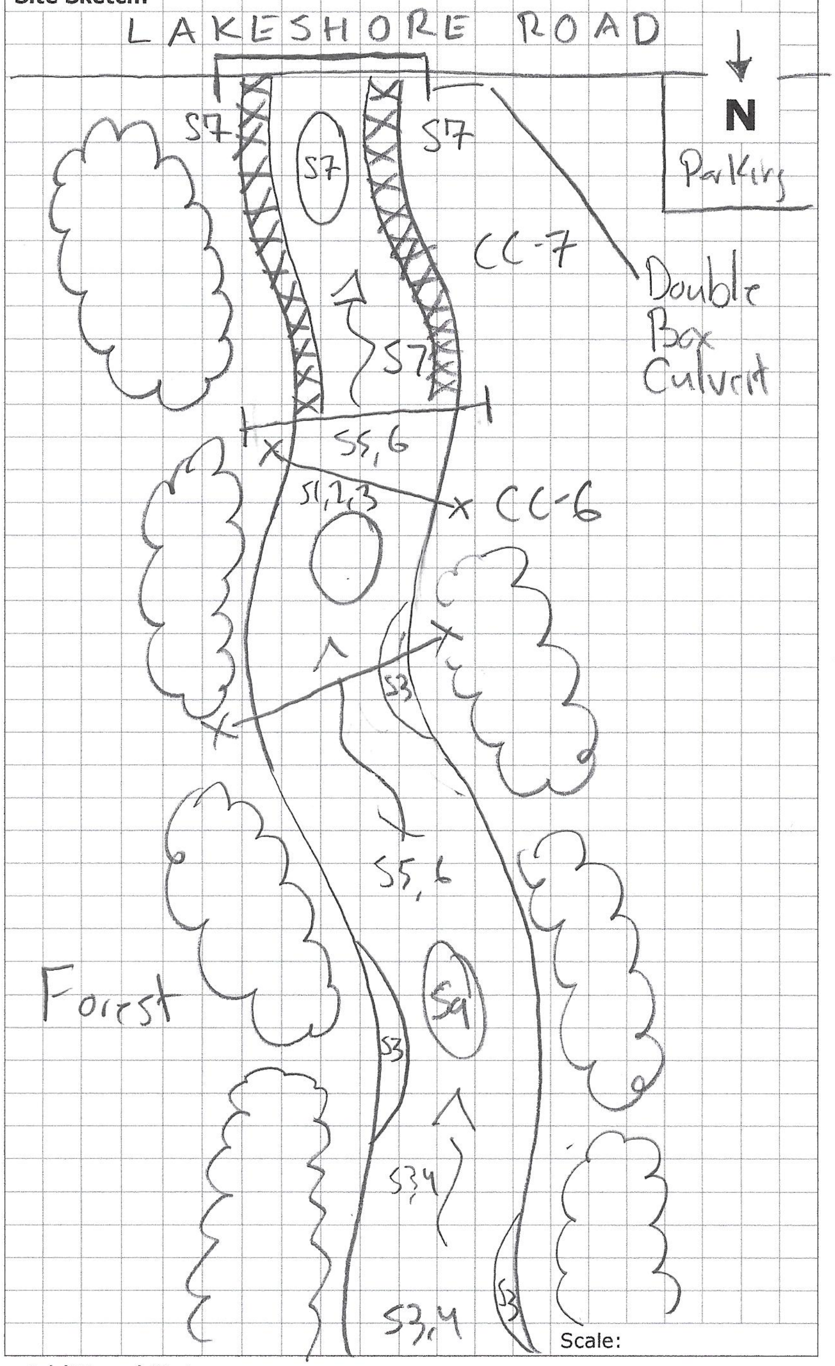
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Site Sketch:



Scale:

Additional Notes:

Completed by: ________ Checked by: ________

GEO | MORPHIX
Geomorphology Earth Science Observations

Reach Characteristics

Project Code: 18027

Date:	22 Oct / 18	**Stream/Reach:**	CC-6
Weather:	Sun 12°C	**Location:**	Lakeshore Rd.
Field Staff:	AB EC	**Watershed/Subwatershed:**	Clearview Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 4, 3 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 7 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Groundwater | Evidence: ______

Riparian Vegetation

Dominant Type: (Table 6) 1

Species: Deciduous.

Coverage:
- ☐ None
- ☐ Fragmented
- ☑ Continuous

Channel widths:
- ☑ 1-4
- ☐ 4-10
- ☐ > 10

Age Class (yrs):
- ☐ Immature (<5)
- ☐ Established (5-30)
- ☑ Mature (>30)

Encroachment: (Table 7) 2

Aquatic/Instream Vegetation

Type (Table8): N/A | Coverage of Reach (%): 0

Woody Debris:
- ☑ Present in Cutbank
- ☑ Present in Channel
- ☐ Not Present

Density of WD:
- ☑ Low
- ☐ Moderate
- ☐ High

WDJ/50m:

Water Quality

Odour (Table 16): 1

Turbidity (Table 17): 2

Channel Characteristics

Sinuosity (Type) (Table 9)	1
Sinuosity (Degree) (Table 10)	1
Gradient (Table 11)	2
Number of Channels (Table 12)	1
Entrenchment (Table 13)	1
Type of Bank Failure (Table 14)	2
Downs's Classification (Table 15)	E

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☐	☐	☑	☑	☑	☑	☐
Pool Substrate	☑	☐	☑	☑	☐	☑	☐
Bank Material	☑	☑	☐	☐	☐	☑	☐

Bankfull Width (m)	5.8	5.2	4
Wetted Width (m)	4.1	2.1	1.7
Bankfull Depth (m)	0.6	0.8	0.7
Wetted Depth (m)	0.07	0.10	0.65
Velocity (m/s)	0.1	0.05	0.2

Riffle/Pool Spacing (m): 40 | **% Riffles:** 30 | **% Pools:** 10 | **Meander Amplitude:**

Pool Depth (m): 0.2 | **Riffle Length (m):** 30 | **Undercuts (m):** 0.43 | **Comments:**

Wiffle ball / ADV / Estimated

Bank Angle:
- ☐ 0 – 30
- ☐ 30 – 60
- ☑ 60 – 90
- ☑ Undercut

Bank Erosion:
- ☐ < 5%
- ☐ 5 – 30%
- ☑ 30 – 60%
- ☐ 60 – 100%

Notes:

D/S of Lakeshore Rd.

Width Top = 6.5 m
Mid = 3.5 m
Bottom = 1 m

Depth Top = 2 m
Middle = 1 m.

Completed by: EC Checked by: ______

GEO | MORPHIX
Geomorphology Earth Science Observations

General Site Characteristics

Project Code: 18027

Date:	Oct 22, 18	**Stream/Reach:**	R-2
Weather:	Sun 12°C	**Location:**	Lakeshore Road.
Field Staff:	AB GC	**Watershed/Subwatershed:**	Avonhead

Features

- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

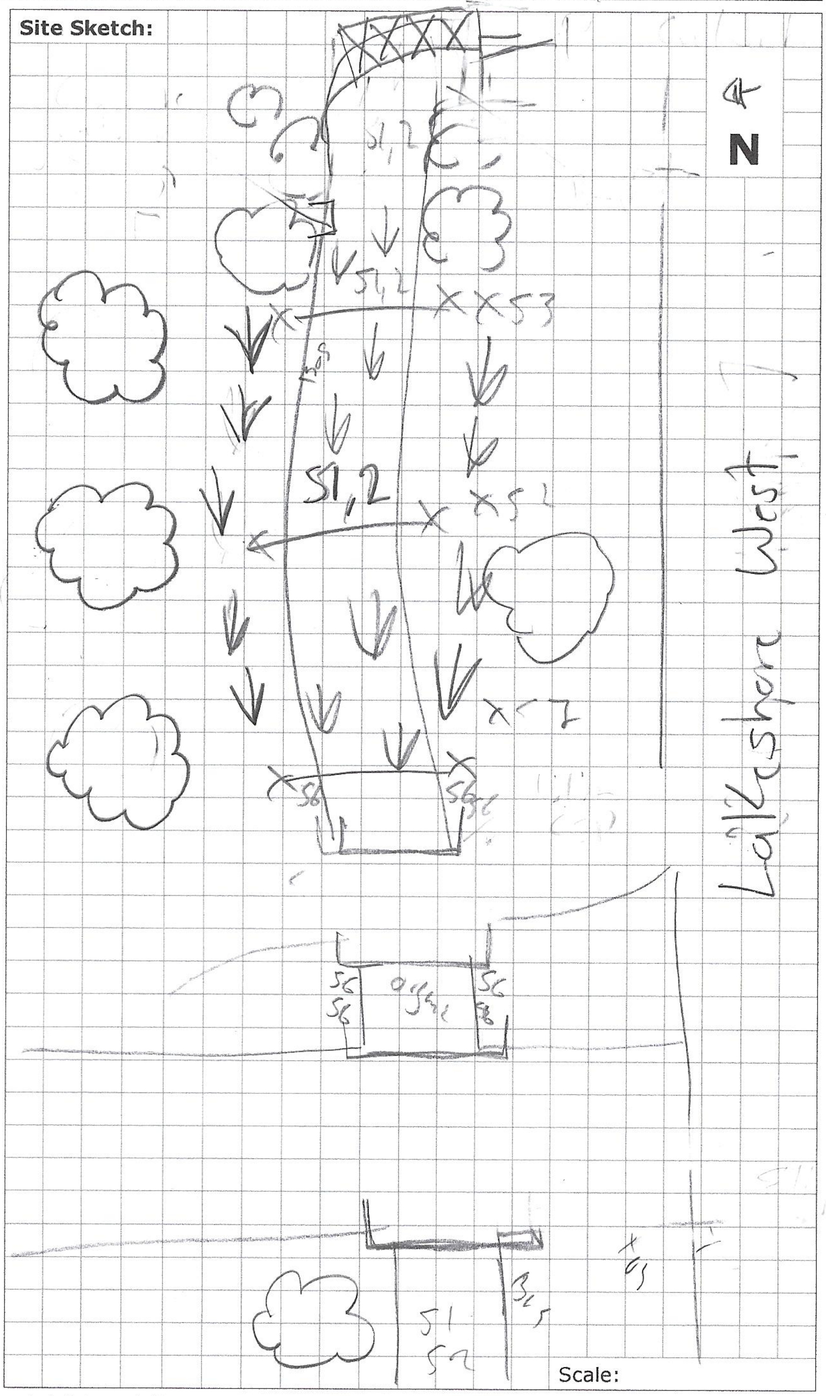
Substrate

S1	Silt	S6	Small boulder
S2	Sand	S7	Large boulder
S3	Gravel	S8	Bimodal
S4	Small cobble	S9	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point

Site Sketch:



Scale:

Additional Notes:

Completed by: GC Checked by: ________

GEO | MORPHIX
Geomorphology
Earth Science
Observations

Reach Characteristics

Project Code: 18027

Date:	Oct 22, 18	**Stream/Reach:**	R-2
Weather:	Sun 12°C	**Location:**	Lakeshore Rd West
Field Staff:	AB EC	**Watershed/Subwatershed:**	Avonhead Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 4 | Valley Type (Table 2): 1 | Channel Type (Table 3): 11 | Channel Zone (Table 4): 2 | Flow Type (Table 5): 3 | ☐ Groundwater | Evidence: ______

Riparian Vegetation

Dominant Type: (Table 6) 3

Species: Grass

Coverage: ☒ None ☐ Fragmented ☐ Continuous

Channel widths: ☐ 1-4 ☐ 4-10 ☐ >10

Age Class (yrs): ☒ Immature (<5) ☐ Established (5-30) ☐ Mature (>30)

Encroachment: (Table 7) 4

Aquatic/Instream Vegetation

Type (Table8): 1 | Coverage of Reach (%): 100

Woody Debris: Grass

☐ Present in Cutbank ☐ Present in Channel ☒ Not Present

Density of WD: ☒ Low ☐ Moderate ☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): /

Turbidity (Table 17): /

Channel Characteristics

Sinuosity (Type) (Table 9): 1 | Sinuosity (Degree) (Table 10): 1 | Gradient (Table 11): 1 | Number of Channels (Table 12): 1

Entrenchment (Table 13): 1 | Type of Bank Failure (Table 14): 6 | Downs's Classification (Table 15): N/A

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☒	☒	☐	☐	☐	☐	☐
Pool Substrate	☒	☒	☐	☐	☐	☐	☐
Bank Material	☒	☒	☐	☐	☐	☐	☐

Bankfull Width (m)	1	1.3	1	**Wetted Width (m)**	/	/	/
Bankfull Depth (m)	0.35	0.4	0.35	**Wetted Depth (m)**	/	/	/

Riffle/Pool Spacing (m): 0 | % Riffles: 0 | % Pools: 0 | Meander Amplitude:

Pool Depth (m): 0.35 | Riffle Length (m): / | Undercuts (m): /

Velocity (m/s): \ | \ | \ — Wiffle ball / ADV / Estimated

Comments: Ditch, dry channel

Bank Angle: ☐ 0 – 30 ☒ 30 – 60 ☐ 60 – 90 ☐ Undercut

Bank Erosion: ☒ < 5% ☐ 5 – 30% ☐ 30 – 60% ☐ 60 – 100%

Notes:

Completed by: EC Checked by: ______

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Geomorphology
Earth Science
Observations

General Site Characteristics

Project Code: 18027

Date:	oct 22, 18	**Stream/Reach:**	LC-1
Weather:	Sun 12°C	**Location:**	Lakeshore & Avonhead
Field Staff:	AB EC	**Watershed/Subwatershed:**	Lakeside creek

Features
- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

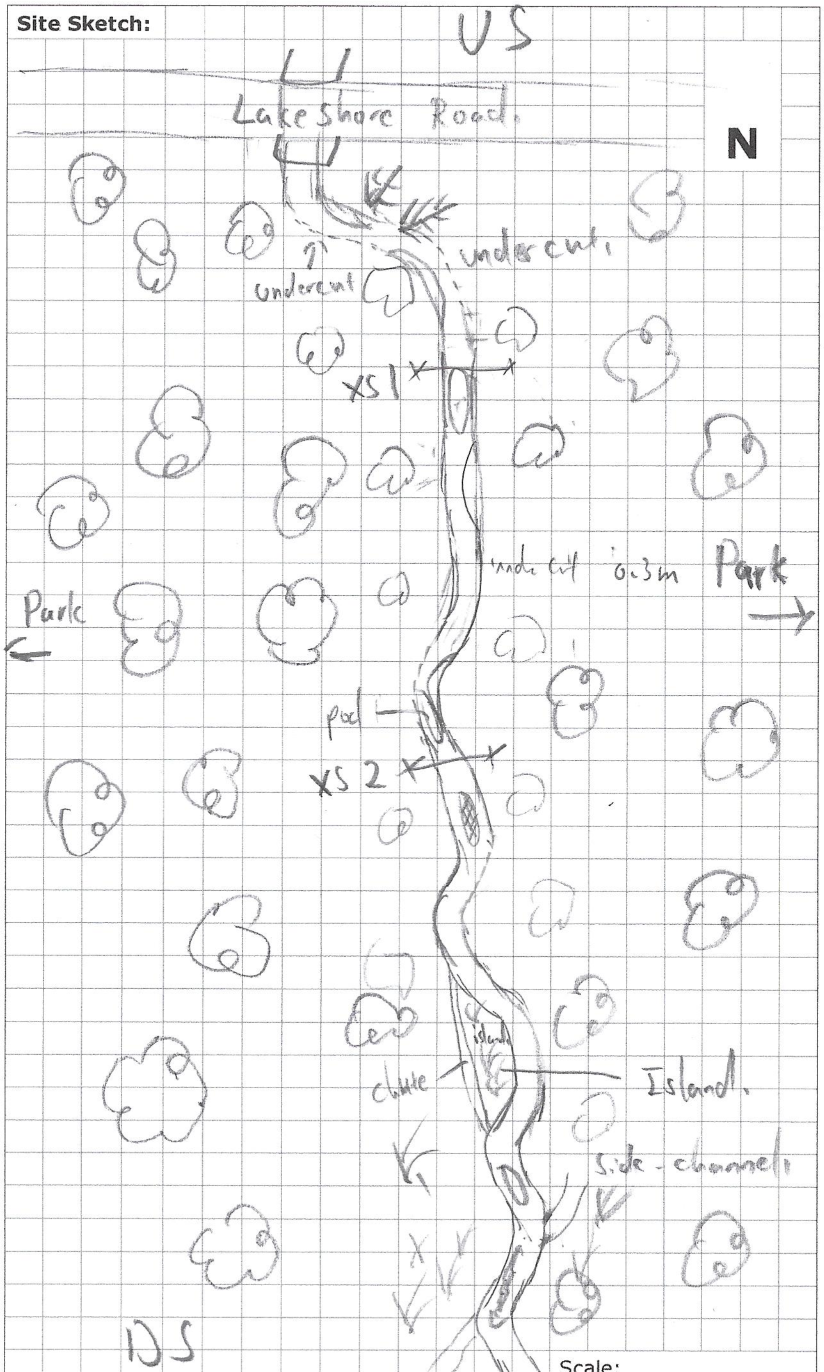
Substrate

S1	Silt	S6	Small boulder
S2	Sand	S7	Large boulder
S3	Gravel	S8	Bimodal
S4	Small cobble	S9	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point

Site Sketch:



Additional Notes:

Next page

Completed by: EC Checked by: ________

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Observations

General Site Characteristics

Project Code: 18027

Date:	Oct 22, 18	**Stream/Reach:**	LC-1
Weather:	Sun 12°C	**Location:**	Lakeshore; Newland
Field Staff:	AB EC	**Watershed/Subwatershed:**	Lake side creek

Features
- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

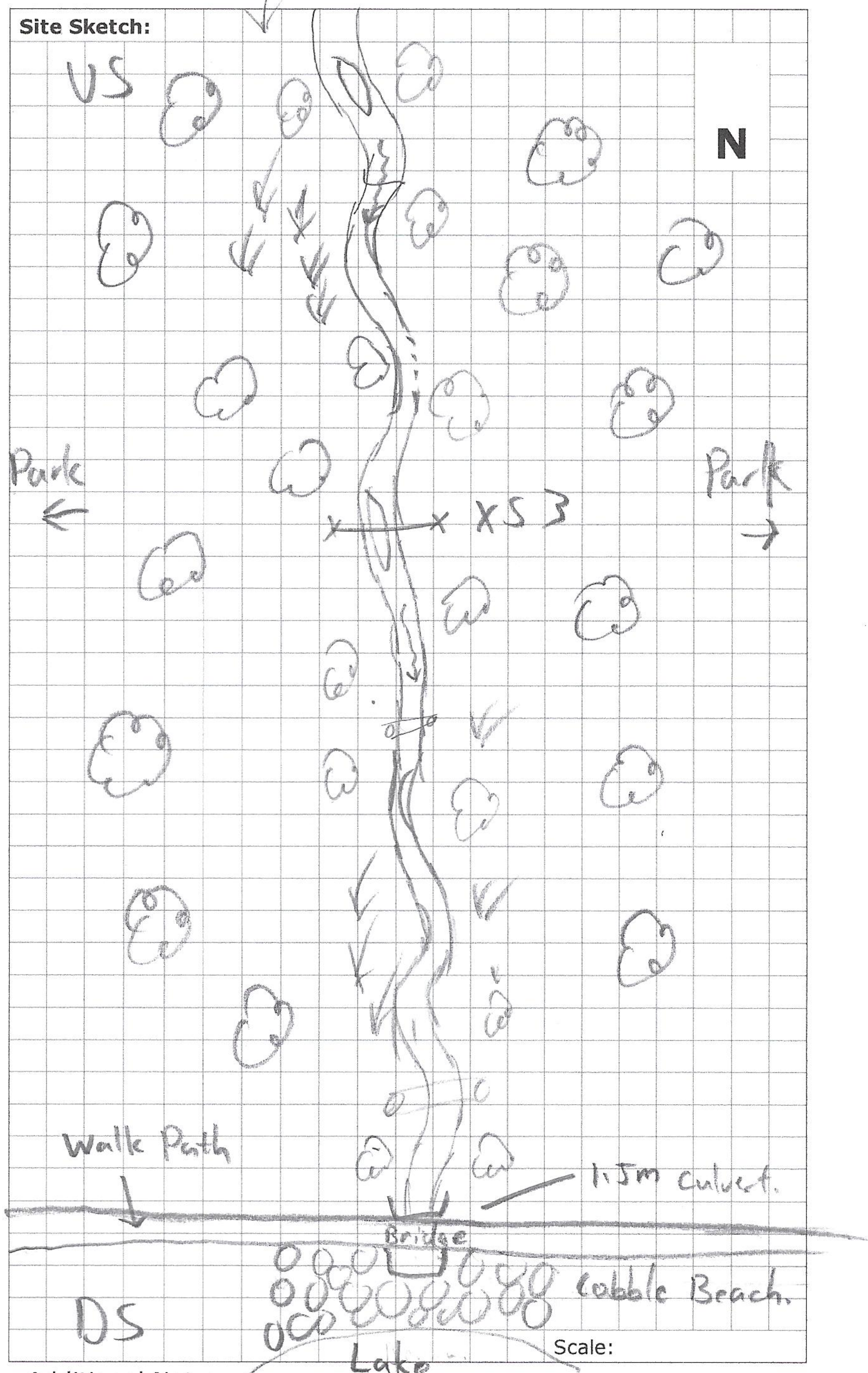
Substrate

S1	Silt	S6	Small boulder
S2	Sand	S7	Large boulder
S3	Gravel	S8	Bimodal
S4	Small cobble	S9	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	EP	Erosion pin
BS	Backsight	RB	Rebar
DS	Downstream	US	Upstream
WDJ	Woody debris jam	TR	Terrace
VWC	Valley wall contact	FC	Flood chute
BOS	Bottom of slope	FP	Flood plain
TOS	Top of slope	KP	Knick point

Site Sketch:



Scale:

Additional Notes:

Completed by: EC Checked by: ________

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Geomorphology Earth Science Observations

Reach Characteristics

Project Code: 18027

Date:	Oct 22, 18	**Stream/Reach:**	LC-1
Weather:	Sun 13°C	**Location:**	Lakeshore i Avenbrid
Field Staff:	AB EC	**Watershed/Subwatershed:**	Lake side Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 4,5 | **Valley Type** (Table 2): 1 | **Channel Type** (Table 3): 8 | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 2 intermittent | ☐ Groundwater | Evidence: ______

Riparian Vegetation

Dominant Type: (Table 6): 1

Species: Deciduous

Coverage:
- ☐ None
- ☐ Fragmented
- ☑ Continuous

Channel widths
- ☐ 1-4
- ☐ 4-10
- ☑ > 10

Age Class (yrs):
- ☐ Immature (<5)
- ☐ Established (5-30)
- ☑ Mature (>30)

Encroachment: (Table 7): 1 None.

Aquatic/Instream Vegetation

Type (Table8): N/A None | **Coverage of Reach (%)**: 0

Woody Debris
- ☑ Present in Cutbank
- ☑ Present in Channel
- ☐ Not Present

Density of WD:
- ☐ Low
- ☑ Moderate
- ☐ High

WDJ/50m: 1

Water Quality

Odour (Table 16): 1 NO

Turbidity (Table 17): 1 NO

Channel Characteristics

Sinuosity (Type) low (Table 9): 1 | **Sinuosity (Degree)** low (Table 10): 2 | **Gradient** low (Table 11): 1 | **Number of Channels** (Table 12): 2 up to 3

Entrenchment (Table 13): 1 | **Type of Bank Failure** (Table 14): 2 | **Downs's Classification** (Table 15): M

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☑	☐	☑	☐	☐	☐	☐
Pool Substrate	☑	☐	☐	☐	☐	☐	☐
Bank Material	☑	☑	☐	☐	☐	☐	☐

Bankfull Width (m)	4.0	2.0	2.25	**Wetted Width (m)**			
Bankfull Depth (m)	0.8	0.3	0.5	**Wetted Depth (m)**			

Riffle/Pool Spacing (m): 50-100 | **% Riffles:** 25% | **% Pools:** 25 | **Meander Amplitude:** 5

Pool Depth (m): 0.8 | **Riffle Length (m)**: 5 | **Undercuts (m)**: 0.3 | **Comments:** ______

Velocity (m/s): No flow | | | **Wiffle ball / ADV / Estimated** ______

Bank Angle
- ☐ 0 – 30
- ☐ 30 – 60
- ☑ 60 – 90
- ☑ Undercut

Bank Erosion
- ☐ < 5%
- ☐ 5 – 30%
- ☑ 30 – 60%
- ☐ 60 – 100%

Notes:

Completed by: EC   Checked by: ______

Rapid Geomorphic Assessment

Project Code: 18027

Date:	22 oct, 18	**Stream/Reach:**	LC-1
Weather:	Sun 12 °C	**Watershed/Subwatershed:**	Lake side creek.
Field Staff:	AB EC	**Location:**	Lakeshore & Avonhead

Process	No.	Description	Present? Yes	Present? No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar		✓	5/7
	2	Coarse materials in riffles embedded	✓		
	3	Siltation in pools	✓		
	4	Medial bars	✓		
	5	Accretion on point bars	✓		
	6	Poor longitudinal sorting of bed materials		✓	
	7	Deposition in the overbank zone	✓		
		Sum of indices =	5	2	0.714

Process	No.	Description	Yes	No	Factor Value
Evidence of Degradation (DI)	1	Exposed bridge footing(s)			0/6
	2	Exposed sanitary / storm sewer / pipeline / etc.			
	3	Elevated storm sewer outfall(s)			
	4	Undermined gabion baskets / concrete aprons / etc.			
	5	Scour pools downstream of culverts / storm sewer outlets		✓	
	6	Cut face on bar forms		✓	
	7	Head cutting due to knickpoint migration		✓	
	8	Terrace cut through older bar material		✓	
	9	Suspended armour layer visible in bank		✓	
	10	Channel worn into undisturbed overburden / bedrock		✓	
		Sum of indices =	0	6	0

Process	No.	Description	Yes	No	Factor Value
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		✓	2/7
	2	Occurrence of large organic debris	✓		
	3	Exposed tree roots	✓		
	4	Basal scour on inside meander bends		✓	
	5	Basal scour on both sides of channel through riffle		✓	
	6	Outflanked gabion baskets / concrete walls / etc.		✓	
	7	Length of basal scour >50% through subject reach		✓	
	8	Exposed length of previously buried pipe / cable / etc.			
	9	Fracture lines along top of bank		✓	
	10	Exposed building foundation			
		Sum of indices =	2	5	0.286

Process	No.	Description	Yes	No	Factor Value
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)	✓		1/7
	2	Single thread channel to multiple channel		✓	
	3	Evolution of pool-riffle form to low bed relief form		✓	
	4	Cut-off channel(s)		✓	
	5	Formation of island(s)		✓	
	6	Thalweg alignment out of phase with meander form		✓	
	7	Bar forms poorly formed / reworked / removed		✓	
		Sum of indices =	1	6	0.143

Additional notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 = 0.286

Condition	**In Regime**	**In Transition/Stress**	**In Adjustment**
SI score =	☐ **0.00 - 0.20**	☑ **0.21 - 0.40**	☐ **0.41**

Completed by: GC Checked by: ________

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Rapid Stream Assessment Technique

Project Code: 18 027

Date:	22 Oct, 18	**Stream/Reach:**	LC-1
Weather:	Sun 12°C	**Location:**	Lakeshore ; Arnold
Field Staff:	AB EC	**Watershed/Subwatershed:**	Lakeside creek

Evaluation Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• Stream bend areas highly unstable • Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) • Bank overhang > 0.8-1.0 m	• Stream bend areas unstable • Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) • Bank overhang 0.8-0.9m	• Stream bend areas stable • Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas) • Bank overhang 0.6-0.8 m	• Stream bend areas very stable • Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) • Bank overhang < 0.6 m
	• Young exposed tree roots abundant • > 6 recent large tree falls per stream mile	• Young exposed tree roots common • 4-5 recent large tree falls per stream mile	• Exposed tree roots predominantly old and large, smaller young roots scarce • 2-3 recent large tree falls per stream mile	• Exposed tree roots old, large and woody • Generally 0-1 recent large tree falls per stream mile
	• Bottom 1/3 of bank is highly erodible material • Plant/soil matrix severely compromised	• Bottom 1/3 of bank is generally highly erodible material • Plant/soil matrix compromised	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material
	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally V- or U-shaped	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4 ☐ 5	☑ 6 ☐ 7 ☐ 8	☐ 9 ☐ 10 ☐ 11

Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60-85% embedded for large mainstem areas)	• 25-49% embedded (35-59% embedded for large mainstem areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
	• Few, if any, deep pools • Pool substrate composition >81% sand-silt	• Low to moderate number of deep pools • Pool substrate composition 60-80% sand-silt	• Moderate number of deep pools • Pool substrate composition 30-59% sand-silt	• High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) • Pool substrate composition <30% sand-silt
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • No evidence of fresh sediment deposition on overbank
	• Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	• Point bars common, moderate to large and unstable with high amount of fresh sand	• Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	• Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand
Point range	☐ 0 ☐ 1 ☐ 2	☑ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

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Date:	22 oct '18	Reach:	LC-1	Project Code:	18027

Evaluation Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	• Wetted perimeter 40-60% of bottom channel width (45-65% for large mainstem areas)	• Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	• Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)
	• Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	• Few pools present, riffles and runs dominant. • Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	• Good mix between riffles, runs and pools • Relatively diverse velocity and depth of flow	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• Riffle substrate composition: predominantly gravel with high amount of sand • < 5% cobble	• Riffle substrate composition: predominantly small cobble, gravel and sand • 5-24% cobble	• Riffle substrate composition: good mix of gravel, cobble, and rubble material • 25-49% cobble	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	• Riffle depth 15-20 cm for large mainstem areas	• Riffle depth > 20 cm for large mainstem areas
	• Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	• Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	• Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	• Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure
	• Extensive channel alteration and/or point bar formation/enlargement	• Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	• Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	• No channel alteration or significant point bar formation/enlargement
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5-0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
	• Summer afternoon water temperature > 27°C	• Summer afternoon water temperature 24-27°C	• Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	☐ 0 ☐ 1 ☐ 2	☑ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

Water Quality	• Substrate fouling level: High (> 50%)	• Substrate fouling level: Moderate (21-50%)	• Substrate fouling level: Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	• Slightly grey colour • TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
	• Objects visible to depth < 0.15m below surface	• Objects visible to depth 0.15-0.5m below surface	• Objects visible to depth 0.5-1.0m below surface	• Objects visible to depth > 1.0m below surface
	• Moderate to strong organic odour	• Slight to moderate organic odour	• Slight organic odour	• No odour
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☑ 5 ☐ 6	☐ 7 ☐ 8

Riparian Habitat Conditions	• Narrow riparian area of mostly non-woody vegetation	• Riparian area predominantly wooded but with major localized gaps	• Forested buffer generally > 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks
	• Canopy coverage: <50% shading (30% for large mainstem areas)	• Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☐ 5	☑ 6 ☐ 7

Total overall score (0–42) = 23	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Completed by: EC Checked by: ________

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Geomorphology Earth Science Observations

Reach Characteristics

Project Code: PN 18027

Date:	Oct. 22/2018	**Stream/Reach:**	SC-1
Weather:	Sunny 8°C	**Location:**	Bromsgrove Rd
Field Staff:	AB, EC	**Watershed/Subwatershed:**	Sheridan Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 7,9 | **Valley Type** (Table 2): 2 | **Channel Type** (Table 3): N/A Concrete | **Channel Zone** (Table 4): 2 | **Flow Type** (Table 5): 1 | ☐ Groundwater | Evidence: ______

Riparian Vegetation

- Dominant Type: (Table 6) 1
- Species: Dead Trees
- Coverage: ☐ None, ☐ Fragmented, ☑ Continuous
- Channel widths: ☑ 1-4, ☐ 4-10, ☐ > 10
- Age Class (yrs): ☐ Immature (<5), ☑ Established (5-30), ☐ Mature (>30)
- Encroachment: (Table 7) 2 Low

Aquatic/Instream Vegetation

- Type (Table8): N/A
- Coverage of Reach (%): 0
- Woody Debris: None
  - ☐ Present in Cutbank
  - ☐ Present in Channel
  - ☑ Not Present
- Density of WD: ☑ Low, ☐ Moderate, ☐ High
- WDJ/50m: 0

Water Quality

- Odour (Table 16): 1
- Turbidity (Table 17): 1

Channel Characteristics

- Sinuosity (Type) (Table 9): 1
- Sinuosity (Degree) (Table 10): 2
- Gradient (Table 11): 1 Low
- Number of Channels (Table 12):
- Entrenchment (Table 13): 3
- Type of Bank Failure (Table 14):
- Downs's Classification (Table 15): N/A

Concrete

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☑	☑	☑	☐	☐	☐	☐
Pool Substrate	☑	☑	☑	☐	☐	☐	☐
Bank Material	☐	☐	☐	☐	☐	☐	☐

Bankfull Width (m)	5.5			Wetted Width (m)			
Bankfull Depth (m)	2.5m			Wetted Depth (m)			

Riffle/Pool Spacing (m): ____ % Riffles: ____ % Pools: ____ Meander Amplitude: ____

Pool Depth (m): ____ Riffle Length (m): 3 Undercuts (m): 0

Velocity (m/s): ____ ____ ____ Wiffle ball / ADV / Estimated

Bank Angle: ☐ 0 – 30, ☑ 30 – 60, ☐ 60 – 90, ☐ Undercut

Bank Erosion: ☑ < 5%, ☐ 5 – 30%, ☐ 30 – 60%, ☐ 60 – 100%

Comments: Concrete-lined channel, only assessed from ROW

Notes: XS. 14m top width (not BF)

Completed by: EC Checked by: ______

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Geomorphology Earth Science Observations

General Site Characteristics

Project Code: 18027

Date:	Oct. 22/18	**Stream/Reach:**	JC-1
Weather:	Sun, 12°C	**Location:**	Winston Churchill / Lakeshore
Field Staff:	MB, EC	**Watershed/Subwatershed:**	Joshua's Creek

Features

- Reach break
- Cross-section
- Flow direction
- Riffle
- Pool
- Medial bar
- Eroded bank
- Undercut bank
- Rip rap/stabilization/gabion
- Leaning tree
- Fence
- Culvert/outfall
- Swamp/wetland
- Grasses
- Tree
- Instream log/tree
- Woody debris
- Station location
- Vegetated island

Flow Type

H1	Standing water
H2	Scarcely perceptible flow
H3	Smooth surface flow
H4	Upwelling
H5	Rippled
H6	Unbroken standing wave
H7	Broken standing wave
H8	Chute
H9	Free fall

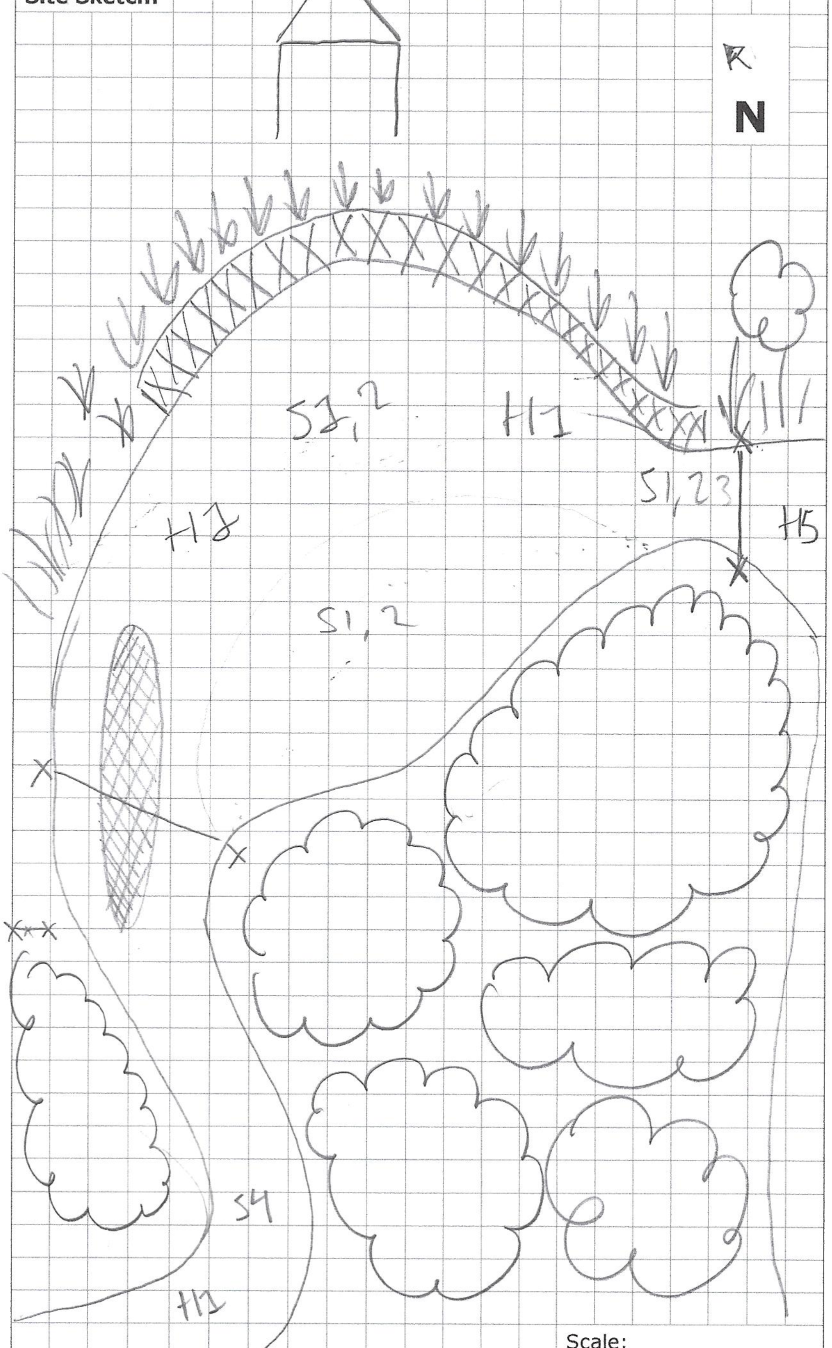
Substrate

S1	Silt	**S6**	Small boulder
S2	Sand	**S7**	Large boulder
S3	Gravel	**S8**	Bimodal
S4	Small cobble	**S9**	Bedrock/till
S5	Large cobble		

Other

BM	Benchmark	**EP**	Erosion pin
BS	Backsight	**RB**	Rebar
DS	Downstream	**US**	Upstream
WDJ	Woody debris jam	**TR**	Terrace
VWC	Valley wall contact	**FC**	Flood chute
BOS	Bottom of slope	**FP**	Flood plain
TOS	Top of slope	**KP**	Knick point

Site Sketch:



Scale:

Additional Notes:

Completed by: EC Checked by: ________

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Earth Science
Observations

Reach Characteristics

Project Code: 18027

Date:	Oct 22 /18	**Stream/Reach:**	JC-1
Weather:	Sun 12°C	**Location:**	S Lakeshore, Winston Churchill drive
Field Staff:	AB EC	**Watershed/Subwatershed:**	Joshua's Creek
UTM (Upstream)		**UTM (Downstream)**	

Land Use (Table 1): 4, 3 | Valley Type (Table 2): 2 | Channel Type (Table 3): 8 | Channel Zone (Table 4): 3 | Flow Type (Table 5): 1 | ☐ Groundwater | Evidence: ______

Riparian Vegetation

Dominant Type: (Table 6) 1
Species: Deciduous Trees

Coverage:
- ☐ None
- ☑ Fragmented
- ☐ Continuous

Channel widths:
- ☑ 1-4
- ☐ 4-10
- ☐ > 10

Age Class (yrs):
- ☐ Immature (<5)
- ☐ Established (5-30)
- ☑ Mature (>30)

Encroachment: (Table 7) 1

Aquatic/Instream Vegetation

Type (Table8): 1 | Coverage of Reach (%): 10

Woody Debris:
- ☑ Present in Cutbank
- ☑ Present in Channel
- ☐ Not Present

Density of WD:
- ☑ Low
- ☐ Moderate
- ☐ High

WDJ/50m: 0

Water Quality

Odour (Table 16): 1
Turbidity (Table 17): 1

Channel Characteristics

Sinuosity (Type) (Table 9): 1 | Sinuosity (Degree) (Table 10): 2 | Gradient (Table 11): 1 | Number of Channels (Table 12): 1

Entrenchment (Table 13): 1 | Type of Bank Failure (Table 14): 1 | Downs's Classification (Table 15):

	Clay/Silt	Sand	Gravel	Cobble	Boulder	Parent	Rootlets
Riffle Substrate	☑	☑	☐	☐	☐	☐	☐
Pool Substrate	☑	☑	☐	☐	☐	☐	☐
Bank Material	☑	☑	☐	☐	☐	☐	☐

Bankfull Width (m): 25 | 12 |
Wetted Width (m): / | / | /
Bankfull Depth (m): 1.1 | 2 |
Wetted Depth (m): / | / | /

Bank Angle:
- ☐ 0 – 30
- ☐ 30 – 60
- ☑ 60 – 90
- ☐ Undercut

Bank Erosion:
- ☐ < 5%
- ☑ 5 – 30%
- ☐ 30 – 60%
- ☐ 60 – 100%

Riffle/Pool Spacing (m): 0 | % Riffles: 0 | % Pools: 0 | Meander Amplitude: 80+

Pool Depth (m): 0 | Riffle Length (m): 0 | Undercuts (m): 0 | Comments: Partially backwatered from Lake Ontario

Velocity (m/s): / | / | / Wiffle ball / ADV / Estimated
No flow

Notes:

Completed by: EC Checked by: ______

GEO | MORPHIX

Rapid Geomorphic Assessment **Project Code:** 18027

Date:	Oct 22 / 18	**Stream/Reach:**	JC-1
Weather:	Sun 12°c	**Watershed/Subwatershed:**	Joshua's Creek
Field Staff:	AB EC	**Location:**	S Lakeshore, Winston Churchill

Process	No.	Description	Present? Yes	No	Factor Value
Evidence of Aggradation (AI)	1	Lobate bar	/		4/7
	2	Coarse materials in riffles embedded		/	
	3	Siltation in pools		/	
	4	Medial bars	/		
	5	Accretion on point bars	/		
	6	Poor longitudinal sorting of bed materials	/		
	7	Deposition in the overbank zone		/	
		Sum of indices =	4	3	0.571
Evidence of Degradation (DI)	1	Exposed bridge footing(s)			0/4
	2	Exposed sanitary / storm sewer / pipeline / etc.			
	3	Elevated storm sewer outfall(s)			
	4	Undermined gabion baskets / concrete aprons / etc.			
	5	Scour pools downstream of culverts / storm sewer outlets		/	
	6	Cut face on bar forms			
	7	Head cutting due to knickpoint migration		/	
	8	Terrace cut through older bar material			
	9	Suspended armour layer visible in bank		/	
	10	Channel worn into undisturbed overburden / bedrock		/	
		Sum of indices =	0	4	0
Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc.		/	0/7
	2	Occurrence of large organic debris		/	
	3	Exposed tree roots		/	
	4	Basal scour on inside meander bends		/	
	5	Basal scour on both sides of channel through riffle		/	
	6	Outflanked gabion baskets / concrete walls / etc.			
	7	Length of basal scour >50% through subject reach		/	
	8	Exposed length of previously buried pipe / cable / etc.			
	9	Fracture lines along top of bank		/	
	10	Exposed building foundation			
		Sum of indices =	0	7	0
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chute(s)		/	0/7
	2	Single thread channel to multiple channel		/	
	3	Evolution of pool-riffle form to low bed relief form		/	
	4	Cut-off channel(s)		/	
	5	Formation of island(s)		/	
	6	Thalweg alignment out of phase with meander form		/	
	7	Bar forms poorly formed / reworked / removed		/	
		Sum of indices =	0	7	0

Additional notes:

Stability Index (SI) = (AI+DI+WI+PI)/4 =			0.143
Condition	**In Regime**	**In Transition/Stress**	**In Adjustment**
SI score =	☑ **0.00 - 0.20**	☐ **0.21 - 0.40**	☐ **0.41**

Completed by: EC Checked by: ________

Rapid Stream Assessment Technique

Project Code: 18027

Date:	2018-10-22	**Stream/Reach:**	JC-1
Weather:	Sun Nice	**Location:**	S of Lakeshore at Winston Churchill
Field Staff:	AB, EC	**Watershed/Subwatershed:**	Joshua's Creek

Evaluation Category	Poor	Fair	Good	Excellent
Channel Stability	• < 50% of bank network stable • Recent bank sloughing, slumping or failure frequently observed	• 50-70% of bank network stable • Recent signs of bank sloughing, slumping or failure fairly common	• 71-80% of bank network stable • Infrequent signs of bank sloughing, slumping or failure	• > 80% of bank network stable • No evidence of bank sloughing, slumping or failure
	• Stream bend areas highly unstable • Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas) • Bank overhang > 0.8-1.0 m	• Stream bend areas unstable • Outer bank height 0.9-1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) • Bank overhang 0.8-0.9m	• Stream bend areas stable • Outer bank height 0.6-0.9 m above stream bank (1.2-1.5 m above stream bank for large mainstem areas) • Bank overhang 0.6-0.8 m	• Stream bend areas very stable • Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) • Bank overhang < 0.6 m
	• Young exposed tree roots abundant • > 6 recent large tree falls per stream mile	• Young exposed tree roots common • 4-5 recent large tree falls per stream mile	• Exposed tree roots predominantly old and large, smaller young roots scarce • 2-3 recent large tree falls per stream mile	• Exposed tree roots old, large and woody • Generally 0-1 recent large tree falls per stream mile
	• Bottom 1/3 of bank is highly erodible material • Plant/soil matrix severely compromised	• Bottom 1/3 of bank is generally highly erodible material • Plant/soil matrix compromised	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material	• Bottom 1/3 of bank is generally highly resistant plant/soil matrix or material
	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally trapezoidally-shaped	• Channel cross-section is generally V- or U-shaped	• Channel cross-section is generally V- or U-shaped
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☐ 8	☑ 9 ☐ 10 ☐ 11

Channel Scouring/ Sediment Deposition	• > 75% embedded (> 85% embedded for large mainstem areas)	• 50-75% embedded (60-85% embedded for large mainstem areas)	• 25-49% embedded (35-59% embedded for large mainstem areas)	• Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)
	• Few, if any, deep pools • Pool substrate composition >81% sand-silt	• Low to moderate number of deep pools • Pool substrate composition 60-80% sand-silt	• Moderate number of deep pools • Pool substrate composition 30-59% sand-silt	• High number of deep pools (> 61 cm deep) (> 122 cm deep for large mainstem areas) • Pool substrate composition <30% sand-silt
	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits common	• Streambed streak marks and/or "banana"-shaped sediment deposits uncommon	• Streambed streak marks and/or "banana"-shaped sediment deposits absent
	• Fresh, large sand deposits very common in channel • Moderate to heavy sand deposition along major portion of overbank area	• Fresh, large sand deposits common in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits uncommon in channel • Small localized areas of fresh sand deposits along top of low banks	• Fresh, large sand deposits rare or absent from channel • No evidence of fresh sediment deposition on overbank
	• Point bars present at most stream bends, moderate to large and unstable with high amount of fresh sand	• Point bars common, moderate to large and unstable with high amount of fresh sand	• Point bars small and stable, well-vegetated and/or armoured with little or no fresh sand	• Point bars few, small and stable, well-vegetated and/or armoured with little or no fresh sand
Point range	☐ 0 ☐ 1 ☐ 2	☑ 3 ☐ 4	☐ 5 ☐ 6	☐ 7 ☐ 8

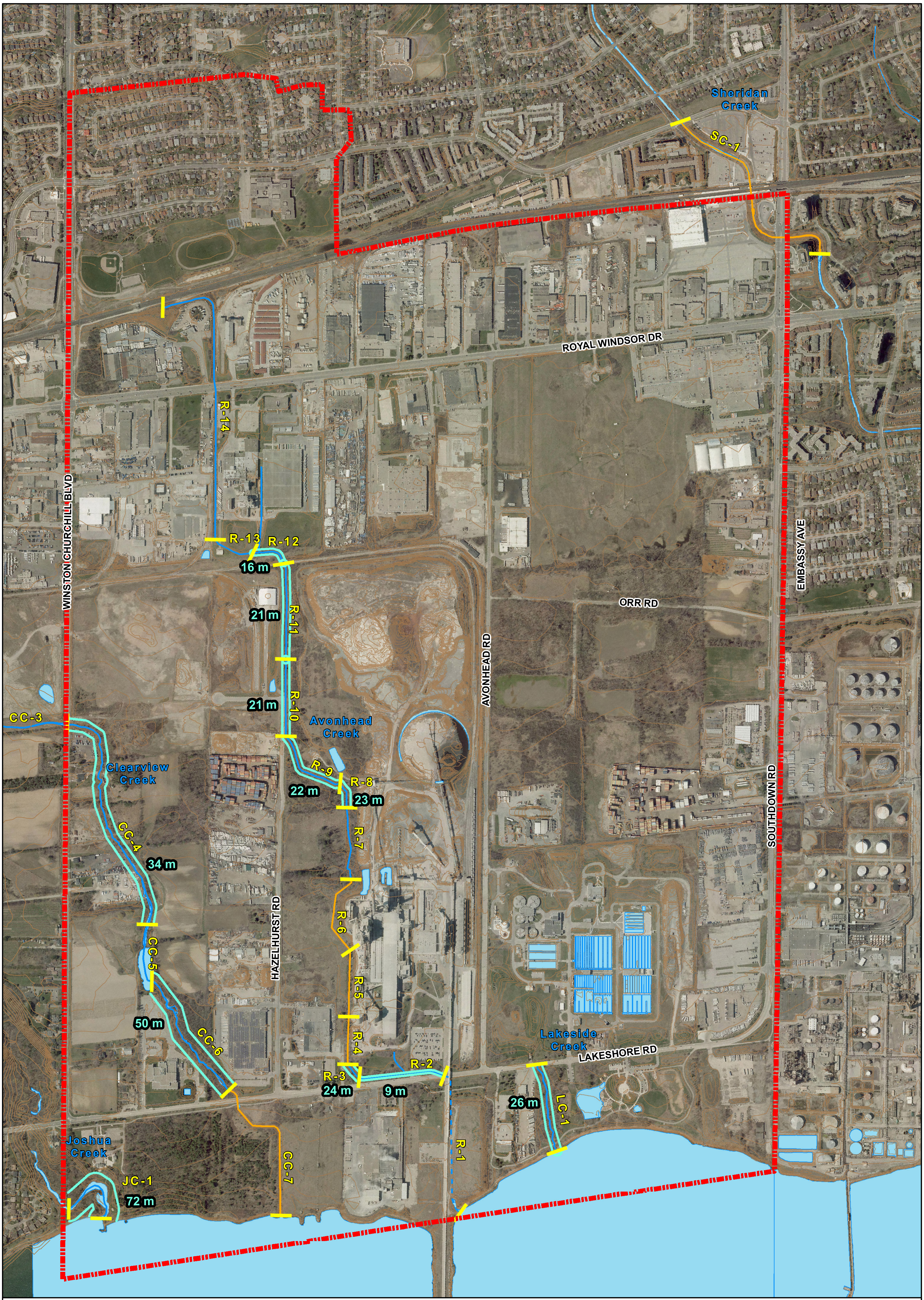
Date:	2018-10-22	Reach:	JC-1	Project Code:	18027

Evaluation Category	Poor	Fair	Good	Excellent
Physical Instream Habitat	• Wetted perimeter < 40% of bottom channel width (< 45% for large mainstem areas)	• Wetted perimeter 40-60% of bottom channel width (45-65% for large mainstem areas)	• Wetted perimeter 61-85% of bottom channel width (66-90% for large mainstem areas)	• Wetted perimeter > 85% of bottom channel width (> 90% for large mainstem areas)
	• Dominated by one habitat type (usually runs) and by one velocity and depth condition (slow and shallow) (for large mainstem areas, few riffles present, runs and pools dominant, velocity and depth diversity low)	• Few pools present, riffles and runs dominant. • Velocity and depth generally slow and shallow (for large mainstem areas, runs and pools dominant, velocity and depth diversity intermediate)	• Good mix between riffles, runs and pools • Relatively diverse velocity and depth of flow	• Riffles, runs and pool habitat present • Diverse velocity and depth of flow present (i.e., slow, fast, shallow and deep water)
	• Riffle substrate composition: predominantly gravel with high amount of sand • < 5% cobble	• Riffle substrate composition: predominantly small cobble, gravel and sand • 5-24% cobble	• Riffle substrate composition: good mix of gravel, cobble, and rubble material • 25-49% cobble	• Riffle substrate composition: cobble, gravel, rubble, boulder mix with little sand • > 50% cobble
	• Riffle depth < 10 cm for large mainstem areas	• Riffle depth 10-15 cm for large mainstem areas	• Riffle depth 15-20 cm for large mainstem areas	• Riffle depth > 20 cm for large mainstem areas
	• Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure	• Large pools generally 30-46 cm deep (61-91 cm for large mainstem areas) with little or no overhead cover/structure	• Large pools generally 46-61 cm deep (91-122 cm for large mainstem areas) with some overhead cover/structure	• Large pools generally > 61 cm deep (> 122 cm for large mainstem areas) with good overhead cover/structure
	• Extensive channel alteration and/or point bar formation/enlargement	• Moderate amount of channel alteration and/or moderate increase in point bar formation/enlargement	• Slight amount of channel alteration and/or slight increase in point bar formation/enlargement	• No channel alteration or significant point bar formation/enlargement
	• Riffle/Pool ratio 0.49:1 ; ≥1.51:1	• Riffle/Pool ratio 0.5-0.69:1 ; 1.31-1.5:1	• Riffle/Pool ratio 0.7-0.89:1 ; 1.11-1.3:1	• Riffle/Pool ratio 0.9-1.1:1
	• Summer afternoon water temperature > 27°C	• Summer afternoon water temperature 24-27°C	• Summer afternoon water temperature 20-24°C	• Summer afternoon water temperature < 20°C
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☑ 4	☐ 5 ☐ 6	☐ 7 ☐ 8
Water Quality	• Substrate fouling level: High (> 50%)	• Substrate fouling level: Moderate (21-50%)	• Substrate fouling level: Very light (11-20%)	• Substrate fouling level: Rock underside (0-10%)
	• Brown colour • TDS: > 150 mg/L	• Grey colour • TDS: 101-150 mg/L	• Slightly grey colour • TDS: 50-100 mg/L	• Clear flow • TDS: < 50 mg/L
	• Objects visible to depth < 0.15m below surface	• Objects visible to depth 0.15-0.5m below surface	• Objects visible to depth 0.5-1.0m below surface	• Objects visible to depth > 1.0m below surface
	• Moderate to strong organic odour	• Slight to moderate organic odour	• Slight organic odour	• No odour
Point range	☐ 0 ☐ 1 ☐ 2	☐ 3 ☐ 4	☐ 5 ☑ 6	☐ 7 ☐ 8
Riparian Habitat Conditions	• Narrow riparian area of mostly non-woody vegetation	• Riparian area predominantly wooded but with major localized gaps	• Forested buffer generally > 31 m wide along major portion of both banks	• Wide (> 60 m) mature forested buffer along both banks
	• Canopy coverage: <50% shading (30% for large mainstem areas)	• Canopy coverage: 50-60% shading (30-44% for large mainstem areas)	• Canopy coverage: 60-79% shading (45-59% for large mainstem areas)	• Canopy coverage: >80% shading (> 60% for large mainstem areas)
Point range	☐ 0 ☐ 1	☐ 2 ☐ 3	☐ 4 ☑ 5	☐ 6 ☐ 7

Total overall score (0–42) = 27	Poor (<13)	Fair (13-24)	Good (25-34)	Excellent (>35)

Completed by: AB Checked by: ________

Appendix D
Meander Belt Width Delineation



Legend

- Reach Break and ID
- Meander Belt Width (m)
- Watercourse
- Hardened Channel
- Piped Channel
- Contour (1 m intervals)
- Study Area

Municipal Class EA Southdown District Stormwater Servicing and Environmental Management Plan

Meander Belt Width Delineation

GEO MORPHIX

N

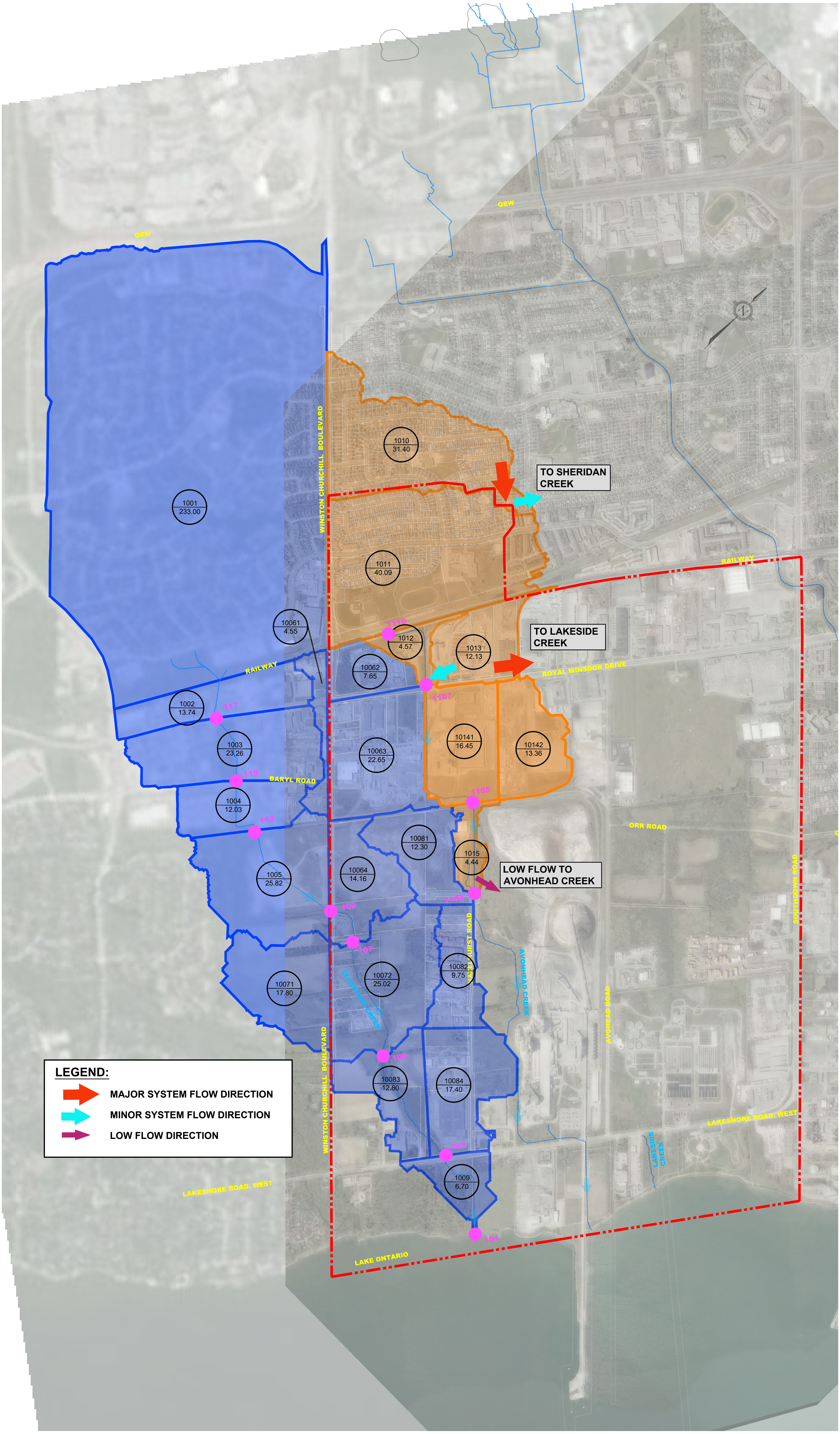
0 125 250 500

Metres

Meander Belt Width, and Study Area Boundary: GEO Morphix Ltd., 2019.
Reach Break and Reach ID: ERI, 2015; CVC, 2018, GEO Morphix Ltd., 2019, City of Mississauga, 2017.
Watercourse and Waterbody: CVC, 2012 and City of Mississauga, 2018.
Contour: City of Mississauga, 2018. Study Area Boundary and Imagery: TMIG, 2017.
Print Date: March, 2019. Drawn by: W.B., A.M.B, S.S. PN18027

APPENDIX D

Hydrological Model Development and Existing Conditions Output


QEW
WINSTON CHURCHILL BOULEVARD
1001
233.00
1010
31.40
TO SHERIDAN CREEK
1011
40.09
10061
4.55
1012
4.57
1013
12.13
TO LAKESIDE CREEK
RAILWAY
ROYAL WINDSOR DRIVE
10062
7.65
1002
13.74
1003
23.26
BARYL ROAD
10063
22.65
10141
16.45
10142
13.36
1004
12.03
ORR ROAD
10081
12.30
1015
4.44
LOW FLOW TO AVONHEAD CREEK
10064
14.16
1005
25.82
SOUTHDOWN ROAD
10082
9.75
AVONHEAD CREEK
AVONHEAD ROAD
10072
25.02
10071
17.80
10083
12.80
10084
17.40
1009
6.70
LAKESHORE ROAD WEST
LAKESIDE CREEK
LAKE ONTARIO
LEGEND:
MAJOR SYSTEM FLOW DIRECTION
MINOR SYSTEM FLOW DIRECTION
LOW FLOW DIRECTION

TMIG Project Number 18137

Date : September 2018

VO5 Model Input Parameters (scenario Existing 2-100yr storm)

Clearview Creek

Project name: Clearview_Hydrology_Existing _TMIG Updated-2018-09

Scenario: TMIG - Clearview Creek Existing 2-100yr Storm

Hydrologic Model Parameter Values (DT = 2)

ID	AREA [ha]	TIMP [%]	XIMP [%]	Pervious Area					Impervious Area				Tp	OUTLET / OUTFLOW NODE
				CN	Depression Storage / Ia [mm]	Length (m)	Slope [%]	Manning n	Depression Storage / Ia [mm]	Slope [%]	Impervious Length [m]	Manning n		
STANDHYD														
1001	220.90	37%	32%	71.0	5.2	40	2	0.25	2	1.40	1213.53	0.013	NA	1001/51
1002	13.74	77%	77%	66.0	6.6	40	2	0.25	2	0.70	302.65	0.013	NA	117 - Royal Windsor Drive
1003	23.26	88%	88%	61	8.2	40	2	0.25	2	0.80	393.79	0.013	NA	115
1004	12.03	77%	77%	58	9.3	40	2	0.25	2	0.50	283.20	0.013	NA	113
10061*	4.55	88%	88%	61	6.0	40	2	0.25	2	1.00	174.16	0.013	NA	1071
10062*	7.65	70%	70%	61	6.0	40	2	0.25	2	1.00	225.83	0.013	NA	1071
10063*	22.65	81%	81%	61	6.0	40	2	0.25	2	1.00	388.59	0.013	NA	1071
10082*	9.75	85%	85%	51	9.5	40	2	0.25	2	0.70	254.95	0.013	NA	90
10084*	17.40	67%	67%	51	9.5	40	2	0.25	2	0.70	340.59	0.013	NA	78
1010	31.40	42%	35%	74	4.6	40	2	0.25	2	2.50	457.53	0.013	NA	112
1011	39.99	45%	45%	71	5.2	40	2	0.25	2	1.30	516.98	0.013	NA	79
1012	4.57	29%	29%	71	5.2	40	2	0.25	2	0.80	174.55	0.013	NA	1107
1013	12.13	80%	80%	71	5.2	40	2	0.25	1	1.00	284.37	0.013	NA	1072
10141*	16.45	77%	77%	70	5.6	40	2	0.25	2	0.60	331.16	0.013	NA	1105
10142*	13.36	84%	84%	70	5.6	40	2	0.25	2	0.60	298.44	0.013	NA	1105
NASHYD														
1005	25.82	NA	NA	62	7.8	NA	NA	NA	NA	NA	NA	NA	1.17	109 - Winston Churchill Blvd
10064*	14.16	NA	NA	68	6.0	NA	NA	NA	NA	NA	NA	NA	0.58	107
10071*	17.80	NA	NA	59	8.9	NA	NA	NA	NA	NA	NA	NA	0.46	105
10072*	25.02	NA	NA	59	8.9	NA	NA	NA	NA	NA	NA	NA	0.43	105
10081*	12.30	NA	NA	56	10.1	NA	NA	NA	NA	NA	NA	NA	0.42	90
10083*	12.80	NA	NA	56	10.1	NA	NA	NA	NA	NA	NA	NA	0.31	78
1009	6.70	NA	NA	66	6.6	NA	NA	NA	NA	NA	NA	NA	0.79	101 - Lake Ontario
10111	7.86	NA	NA	71	5.2	NA	NA	NA	NA	NA	NA	NA	1.04	79
1015	4.44	NA	NA	60	8.3	NA	NA	NA	NA	NA	NA	NA	0.58	80

TOT AREA 576.73 ha

*Note: * Indicates TMIG changes*

Clearview Creek Routing Values (DT = 1)

NHYD/ NODE ID	Name	Outlet	ChLgth	ChSlope
21003	River CH	115	294	1.17
21004	River CH	113	323.6	0.51
21005	Route CH	109	900	0.34
21006	River CH	107	222.5	0.44
21007	River CH	105	548.75	0.76
21008	River CH	103	551.8	0.76
21009	River CH	101	428.7	0.74
21012	Road CH	1110	1200	0.5
21013	River CH	1107	374	0.46
21015	River CH	1105	680	0.56
21016	River CH	1104	372	0.96
21108	Road CH	103	1251	0.5

ORR diversion (Diversion ROUTINE) Outflow / Inflow Relationship

Flow 1 (cms)	Flow 2 (cms)	Flow 3 (cms)	Flow 4 (cms)	Flow 5 (cms)	Total (cms)
0	0	0	0	0	0
10.69	0	0	0	0	10.69
13.48	0.39	0	0	0	13.87

Pond Routing routines (658 Hazelhurst Pond) Nhyd = 80

Discharge (m3/s)	Storage (ha.m)
0	0
0.051	0.0493
0.1	0.1555
0.75	0.1636

DuHyd Routines

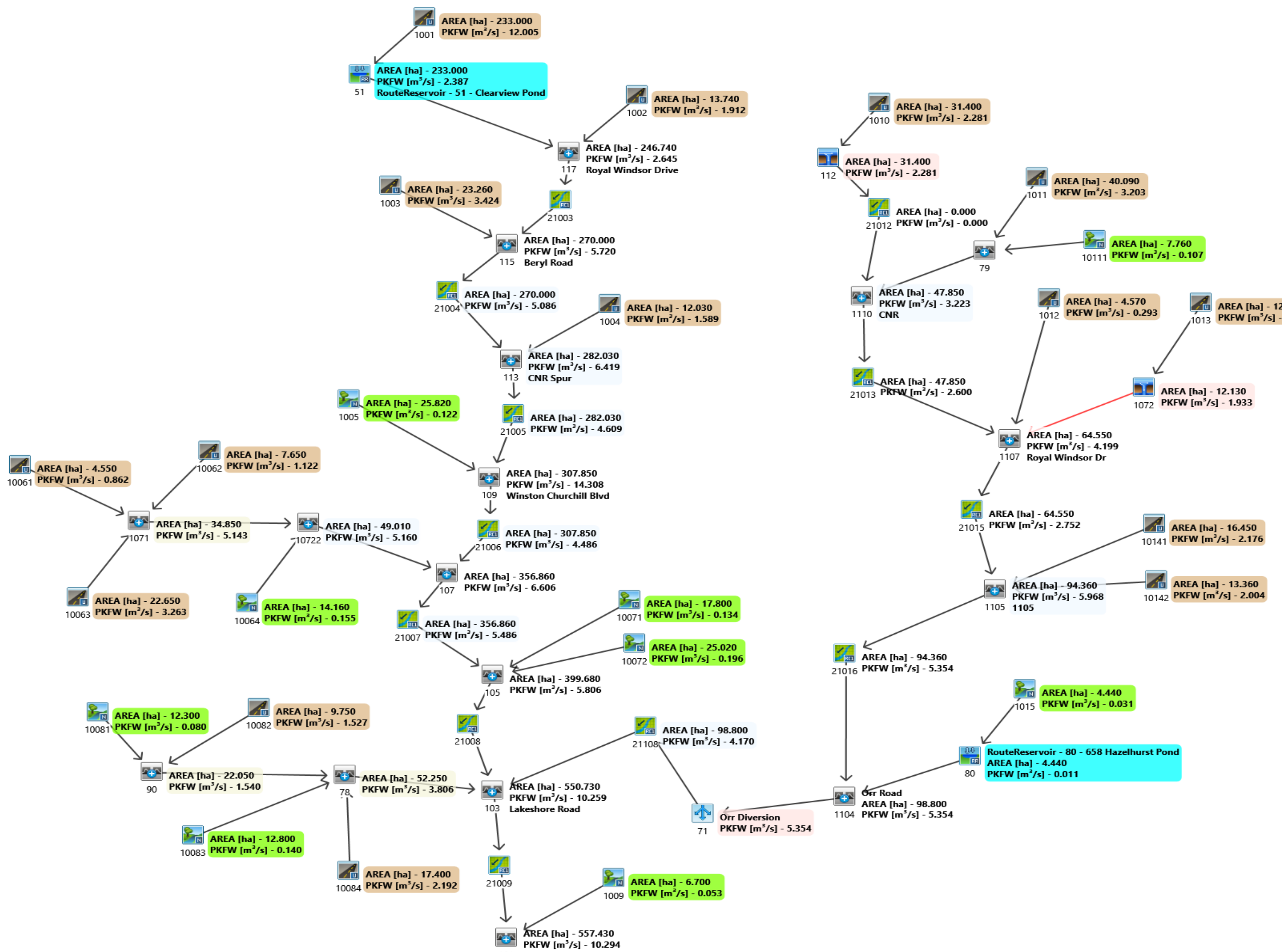
NHYD	Name	CInlet	Notes
112	Major In and Mino	4.845	10 year flow out to Sheridan
1072	Minor In and Majo	3.528	100-10 year flow to Lakeside

Pond Routing routines (Clearview Pond) Nhyd

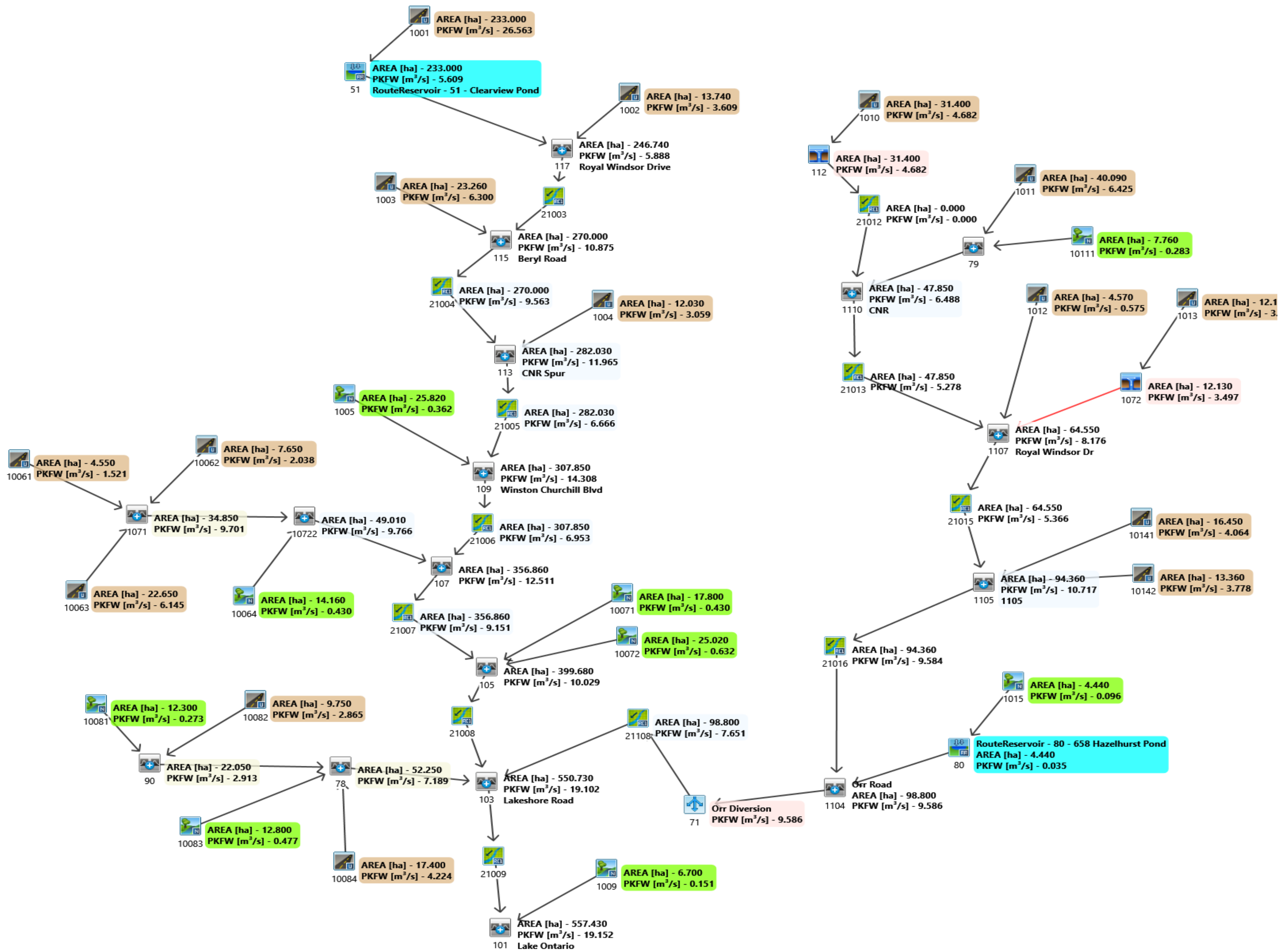
Discharge (m3/s)	Storage (ha.m)
0	0
1.64	1.63
2.54	2.89
3.43	3.54
4.35	4.2
6.28	5.58
14.32	8.02

Clearview Creek Watershed VO Schemantic

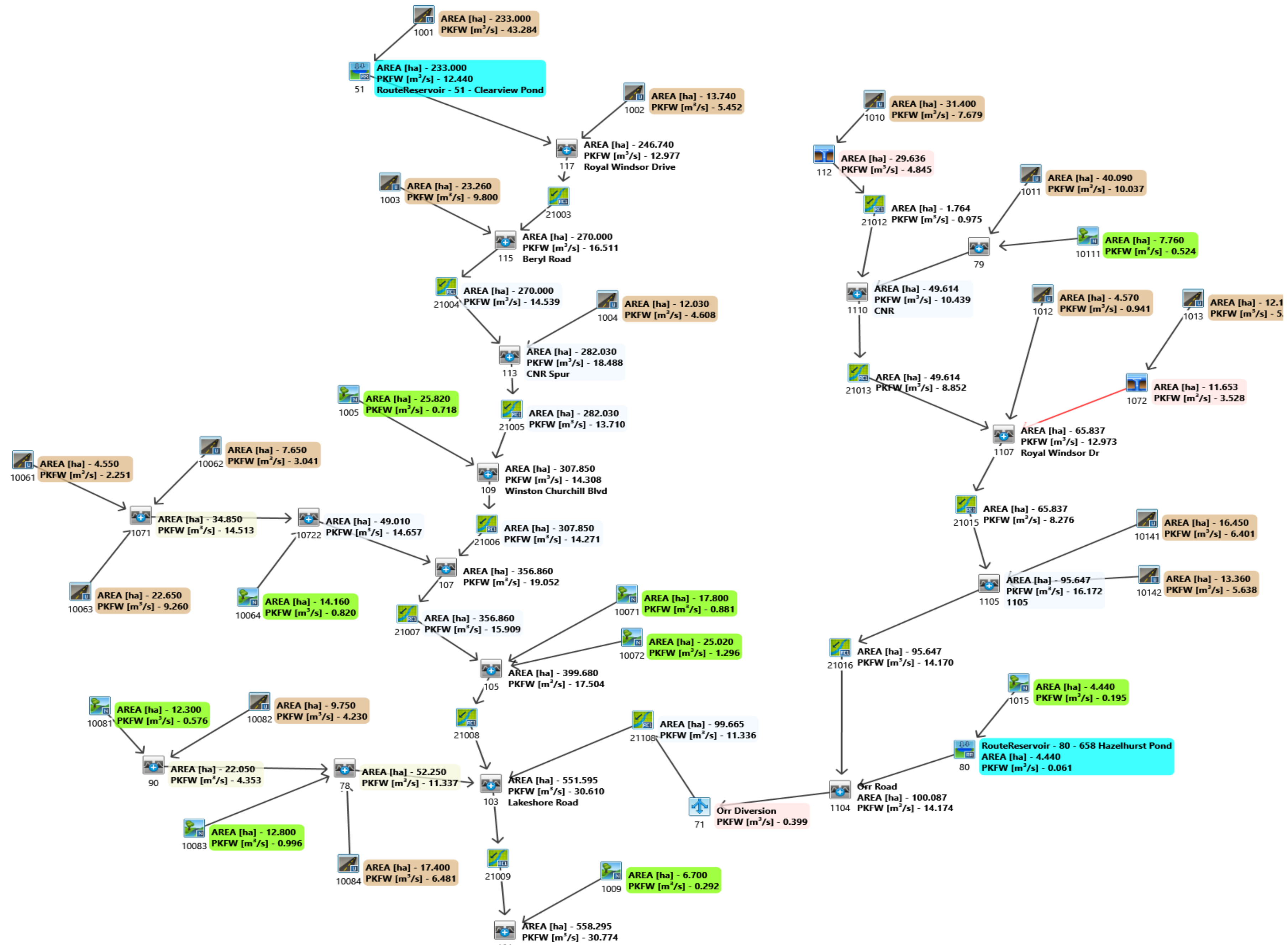
2YR - TMIG MODEL

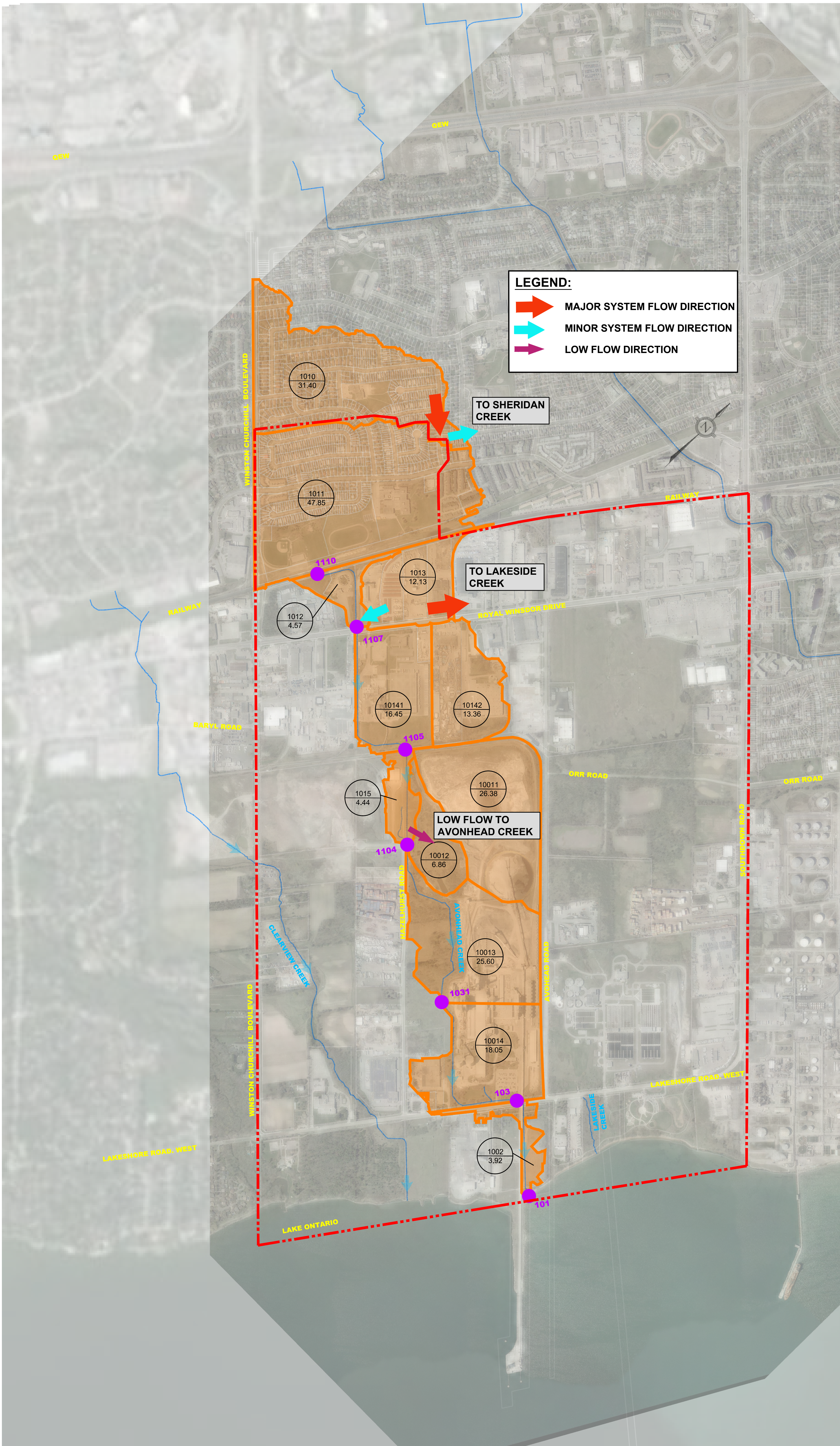


10 YR - TMIG MODEL



100 YR - TMIG MODEL




LEGEND:
MAJOR SYSTEM FLOW DIRECTION
MINOR SYSTEM FLOW DIRECTION
LOW FLOW DIRECTION
TO SHERIDAN CREEK
TO LAKESIDE CREEK
LOW FLOW TO AVONHEAD CREEK
QEW
RAILWAY
ROYAL WINSDOR DRIVE
ORR ROAD
WINSTON CHURCHILL BOULEVARD
HAZELHURST ROAD
AVONHEAD CREEK
AVONHEAD ROAD
CLEARVIEW CREEK
LAKESIDE CREEK
SOUTHDOWN ROAD
LAKESHORE ROAD WEST
LAKE ONTARIO
1010 31.40
1011 47.85
1012 4.57
1013 12.13
10141 16.45
10142 13.36
1015 4.44
10011 26.38
10012 6.86
10013 25.60
10014 18.05
1002 3.92
1110
1107
1105
1104
1031
103
101

TMIG Project Number 18137
Date : September 2018

VO5 Model Input Parameters (based on the CVC existing model, scenario 2-100yr storm)
Avonhead Creek

Project name: Avonhead_Hydrology_Existing _TMIG Updated-2018-July-updated

Scenario: Clearview Existing 2-100yr Storm

Hydrologic Model Parameter Values (DT = 2)

ID	AREA [ha]	TIMP [%]	XIMP [%]	Pervious Area					Impervious Area				Tp	OUTLET / OUTFLOW NODE
				CN	Depression Storage / Ia [mm]	Length (m)	Slope [%]	Manning n	Depression Storage / Ia [mm]	Slope [%]	Impervious Length [m]	Manning n		
STANDHYD														
1010	31.40	42%	35%	74.0	4.6	40	2	0.25	2	2.50	457.53	0.013	NA	112
1011	39.99	45%	45%	71.0	5.2	40	2	0.25	2	1.30	516.33	0.013	NA	83
1012	4.57	29%	29%	71	5.2	40	2	0.25	2	0.80	174.55	0.013	NA	1107
1013	12.13	80%	80%	71	5.2	40	2	0.25	2	1.00	284.37	0.013	NA	1072
10141*	16.45	77%	77%	70	5.6	40	2	0.25	2	0.60	331.16	0.013	NA	1105
10142*	13.36	84%	84%	70	5.6	40	2	0.25	2	0.60	298.44	0.013	NA	1105
10011*	26.38	35%	35%	59	9.2	40	2	0.25	2	1.50	419.36	0.013	NA	87
10013*	25.60	43%	43%	59	9.2	40	2	0.25	2	1.50	413.12	0.013	NA	88
10014*	18.05	78%	78%	59	9.2	40	2	0.25	2	1.50	258.20	0.013	NA	84
NASHYD														
1015	4.44	NA	NA	60	8.3	NA	NA	NA	NA	NA	NA	NA	0.58	1104
1002	3.92	NA	NA	76	4.0	NA	NA	NA	NA	NA	NA	NA	0.84	101
10111	7.86	NA	NA	71	5.2	NA	NA	NA	NA	NA	NA	NA	1.04	83
10012*	6.86	NA	NA	51	12.5	NA	NA	NA	NA	NA	NA	NA	0.29	87

TOT AREA *211.01* ha

*Note: * Indicates TMIG changes*

Avonhead Creek Routing Values (DT = 1)

NHYD/ NODE ID	Name	Outlet	ChLgth	ChSlope
21012	Road Channel	1110	1200	0.5
21014	RouteChannel	1107	374	0.46
21015	RouteChannel	1105	680	0.56
21016	RouteChannel	1104	372	0.96
21001	RouteChannel	103	1500	0.78
21002	Road Channel from pipe	101	399	0.5

ORR diversion (Diversion ROUTINE) Outflow / Inflow Relationship

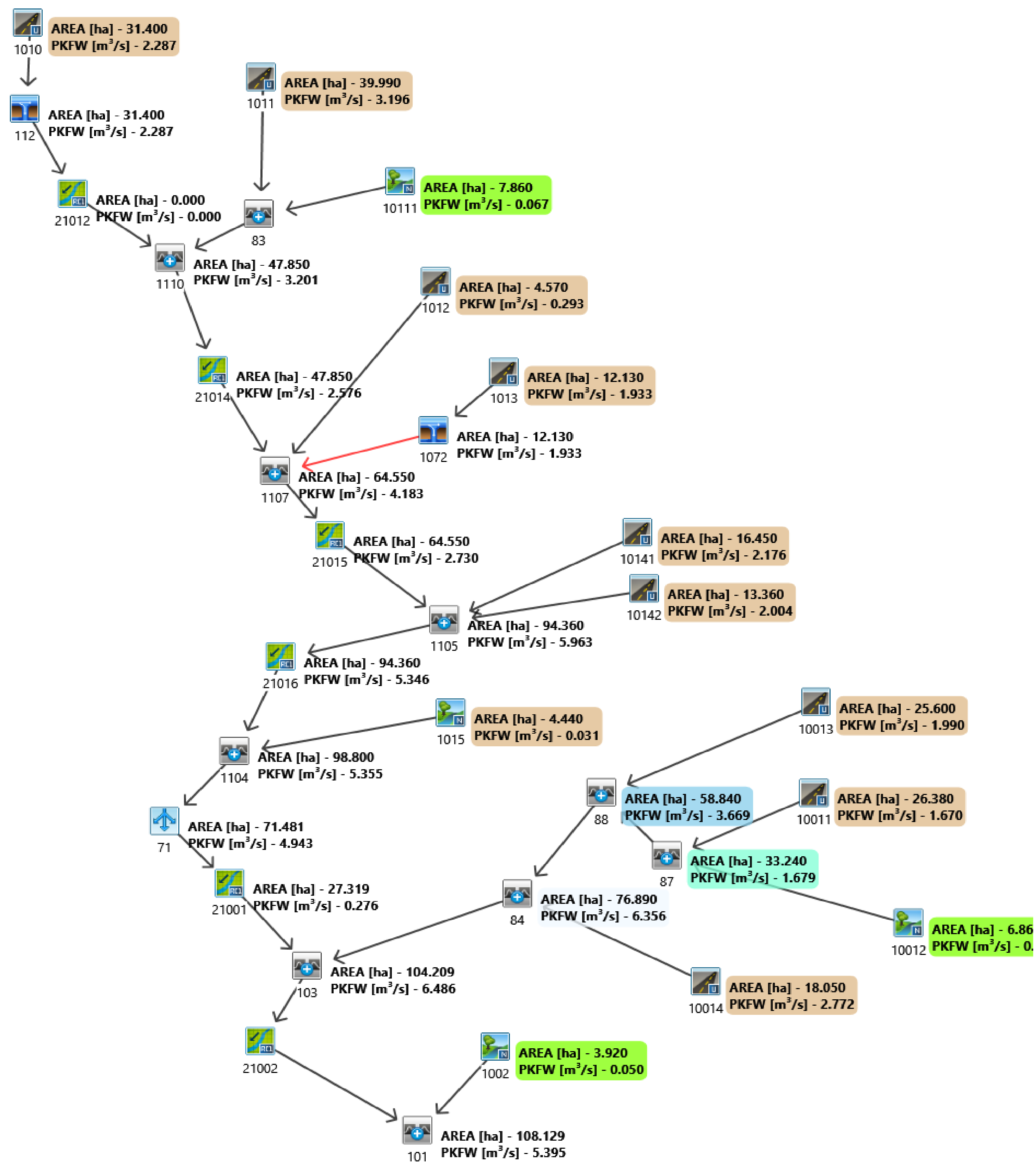
Flow 1 (cms)	Flow 2 (cms)	Flow 3 (cms)	Flow 4 (cms)	Flow 5 (cms)	Total (cms)
0.07	0	0	0	0	0.07
0.81	10.69	0	0	0	11.5
1.37	13.48	0.39	0	0	15.24

DuHyd Routines

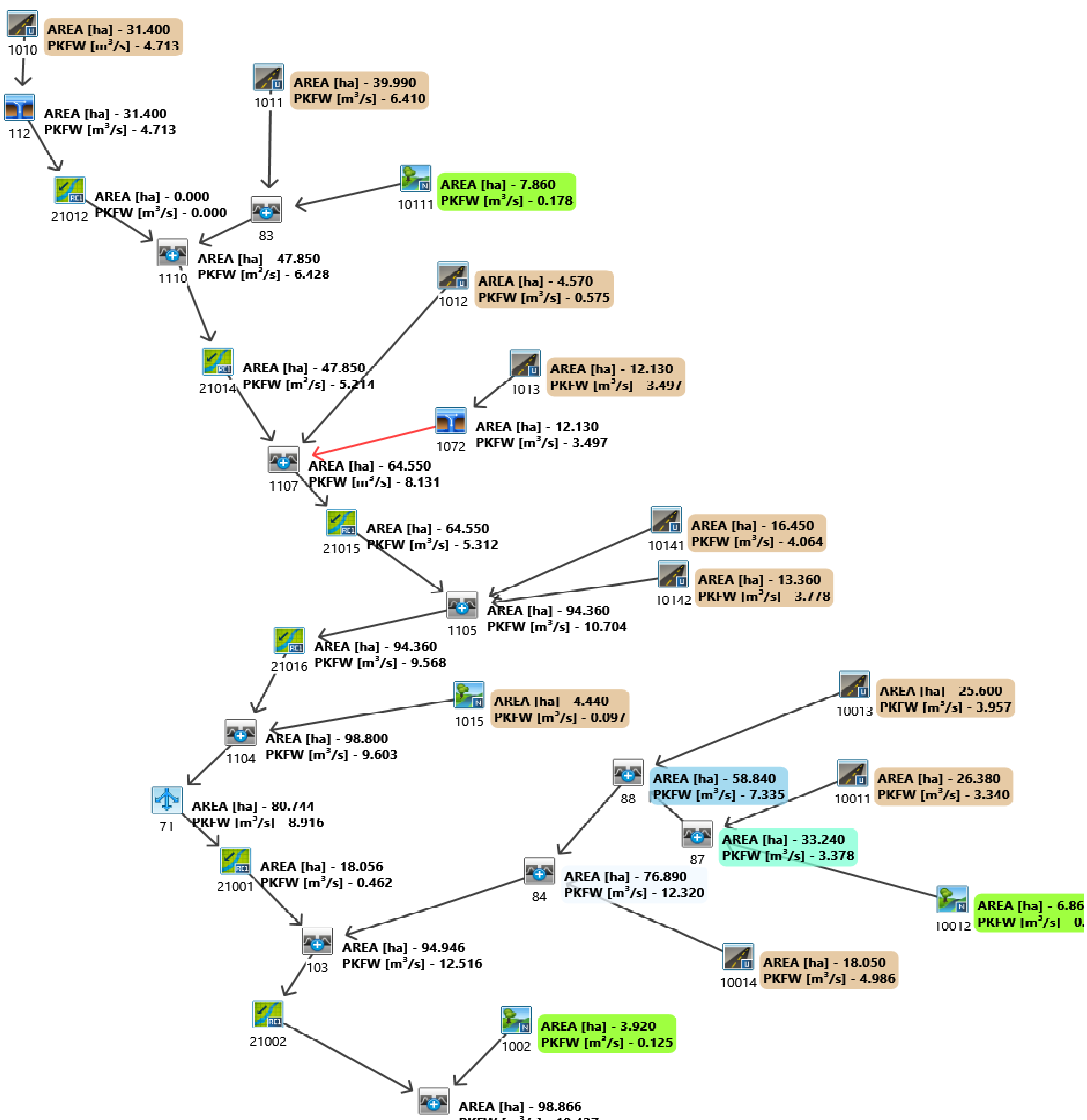
NHYD	Name	CInlet	Notes
112	Major in and Minor Out	4.845	10 year flow out to Sheridan
1072	Minor in and Major out	3.528	100-10 year flow to Lakeside

Avonhead Watershed VO Schemantic

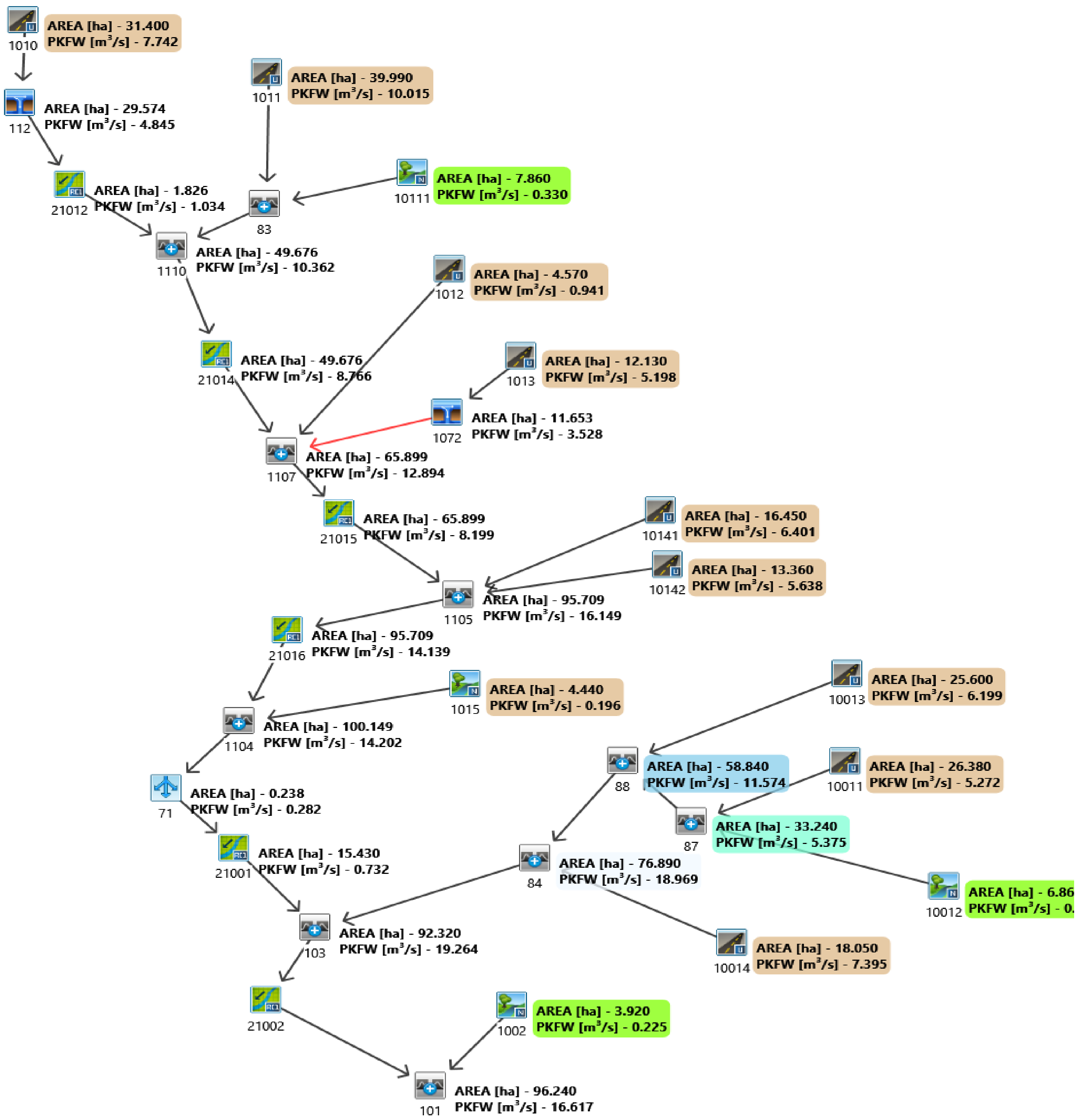
2 YR - TMIG MODEL

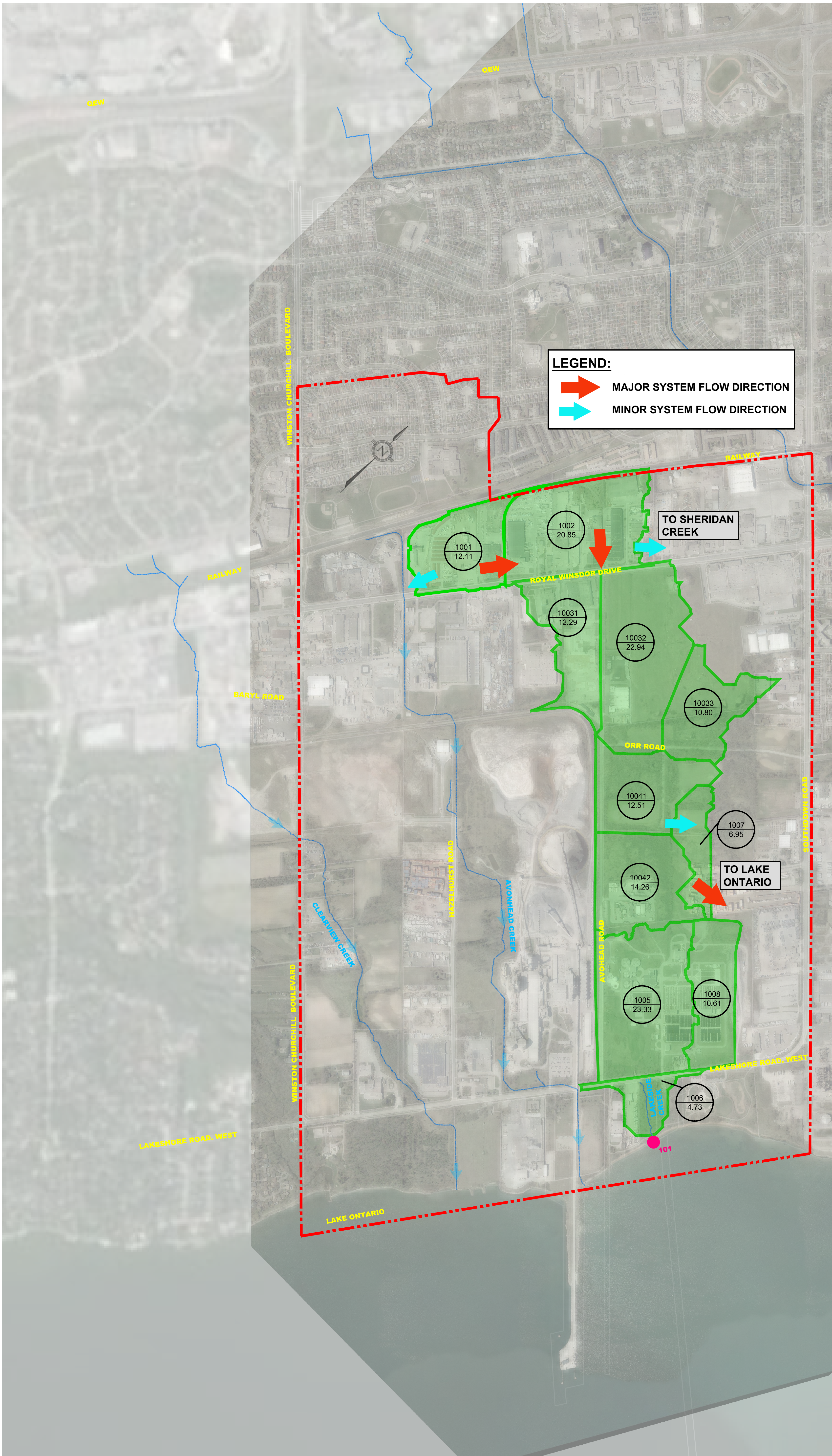


10 YR - TMIG MODEL



100 YR - TMIG MODEL





LEGEND:
MAJOR SYSTEM FLOW DIRECTION
MINOR SYSTEM FLOW DIRECTION
QEW
QEW
RAILWAY
RAILWAY
WINSTON CHURCHILL BOULEVARD
ROYAL WINDSOR DRIVE
BARYL ROAD
ORR ROAD
HAZELHURST ROAD
AVONHEAD CREEK
CLEARVIEW CREEK
AVONHEAD ROAD
SOUTHDOWN ROAD
LAKESHORE ROAD WEST
LAKE ONTARIO
TO SHERIDAN CREEK
TO LAKE ONTARIO
1001 12.11
1002 20.85
10031 12.29
10032 22.94
10033 10.80
10041 12.51
1007 6.95
10042 14.26
1005 23.33
1008 10.61
1006 4.73
101

TMIG Project Number 18137
Date : September 2018

VO5 Model Input Parameters (based on the TMIG existing model, scenario 2-100yr storm)
LAKESIDE Creek

Project name: Lakeside_Hydrology_Existing _CVC Updated-2018-03-updated

Scenario: Lakeside Existing 2-100yr Storm

Hydrologic Model Parameter Values (DT = 2)

ID	AREA [ha]	TIMP [%]	XIMP [%]	Pervious Area					Impervious Area				Tp	OUTLET / OUTFLOW NODE
				CN	Depression Storage / Ia [mm]	Length (m)	Slope [%]	Manning n	Depression Storage / Ia [mm]	Slope [%]	Impervious Length [m]	Manning n		
STANDHYD														
1001	12.11	85%	85%	71.0	5.2	40	2	0.25	2	0.70	284.14	0.013	NA	109
1002	20.85	86%	86%	71.0	5.2	40	2	0.25	2	0.60	372.83	0.013	NA	108
10031	12.29	90%	90%	68	6.0	40	2	0.25	2	0.70	286.24	0.013	NA	45
10042	14.26	38%	38%	61	8.1	40	2	0.25	2	1.00	308.33	0.013	NA	105
1005	18.32	50%	50%	57	9.5	40	2	0.25	2	1.70	349.48	0.013	NA	38
1006	4.73	46%	46%	56	9.9	40	2	0.25	2	1.80	177.58	0.013	NA	101
1008	10.61	40%	40%	57	9.5	40	2	0.25	2	0.70	265.96	0.013	NA	103
NASHYD														
1007	6.95	NA	NA	61	8.0	NA	NA	NA	NA	NA	NA	NA	0.46	104
10032	22.94	NA	NA	68	6.0	NA	NA	NA	NA	NA	NA	NA	0.54	45
10033	10.80	NA	NA	68	6.0	NA	NA	NA	NA	NA	NA	NA	0.32	39
10041	12.51	NA	NA	61	8.1	NA	NA	NA	NA	NA	NA	NA	0.41	105
10051	5.01	NA	NA	61	8.0	NA	NA	NA	NA	NA	NA	NA	0.56	38

TOT AREA ***151.38*** ha

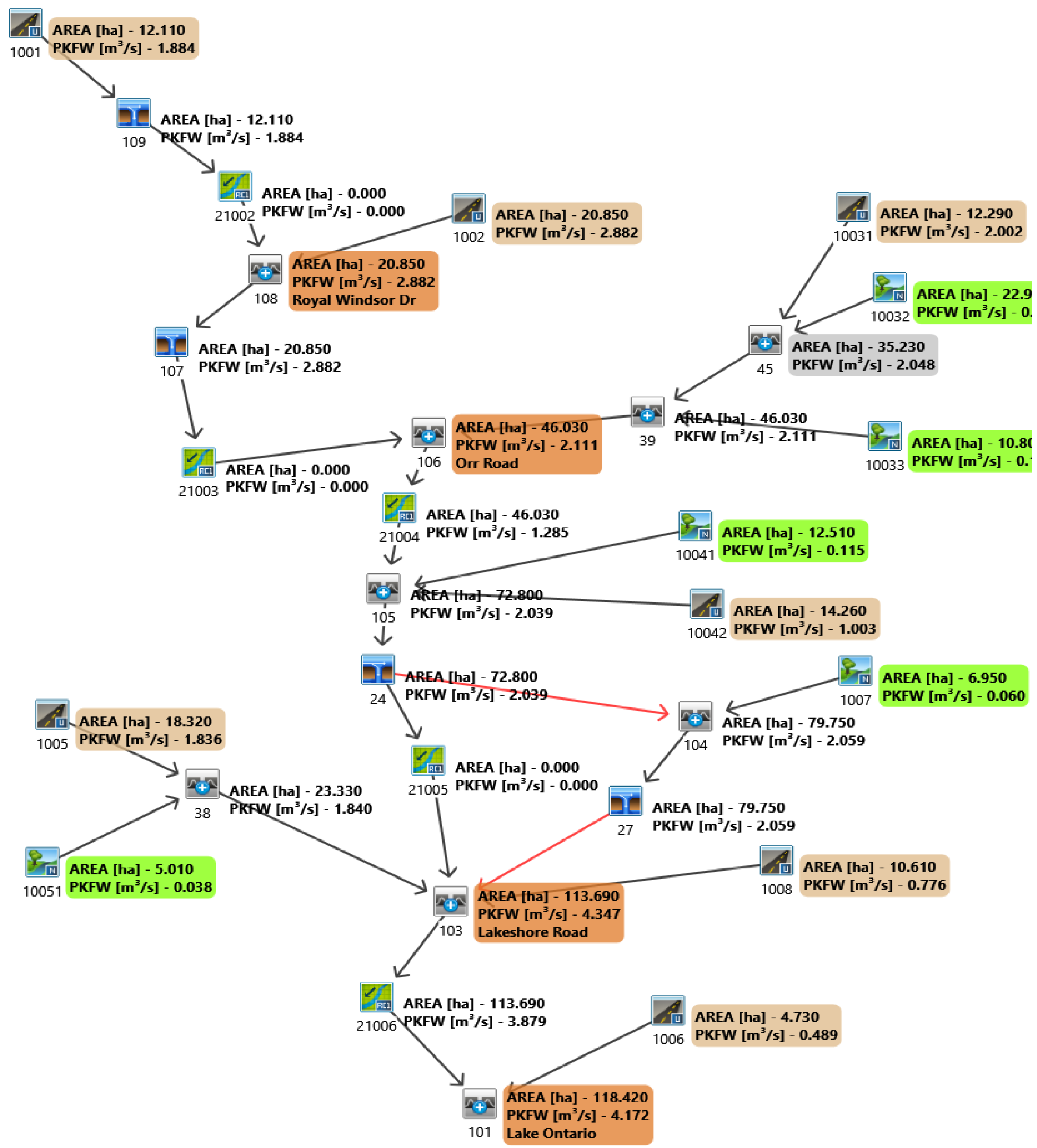
Lakeside Creek Routing Values (DT = 1)

NHYD/ NODE ID	Name	Outlet	ChLgth	ChSlope
21002	Road - 21002	108	385	0.5
21003	Road - 21003 (Avonhead Rc	106	902	0.5
21004	CreekChannel - 21004	105	768	0.85
21005	CreekChannel - 21005	103	650	0.85
21006	CreekChannel - 21006	101	255	0.91

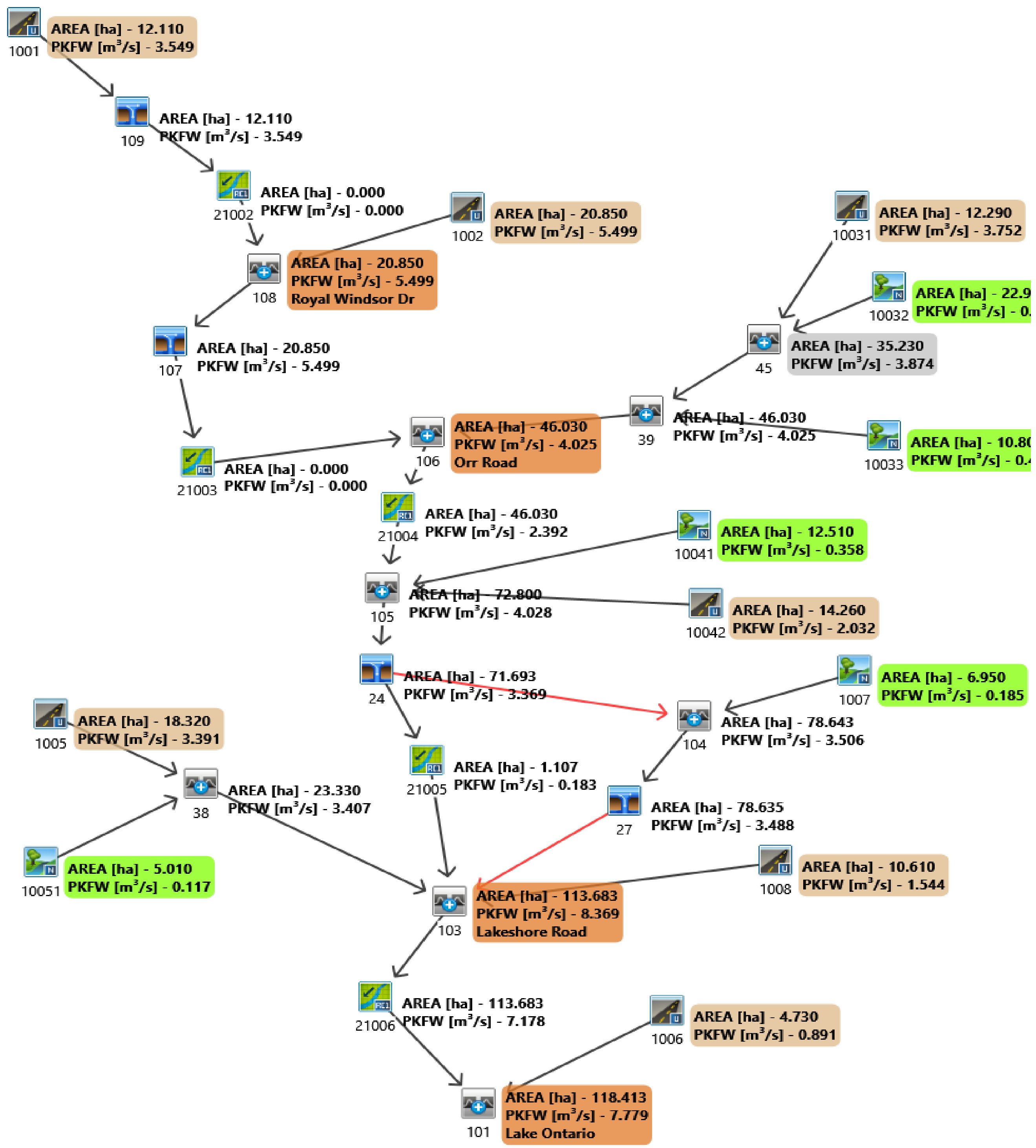
DuHyd Routines

NHYD	Name	CInlet	Notes
109	Major in and Minor to Avonhead	3.578	
107	Major in and Minor out	5.543	
24	DuHyd - 24	3.369	
27	Minor in Major Out	3.488	

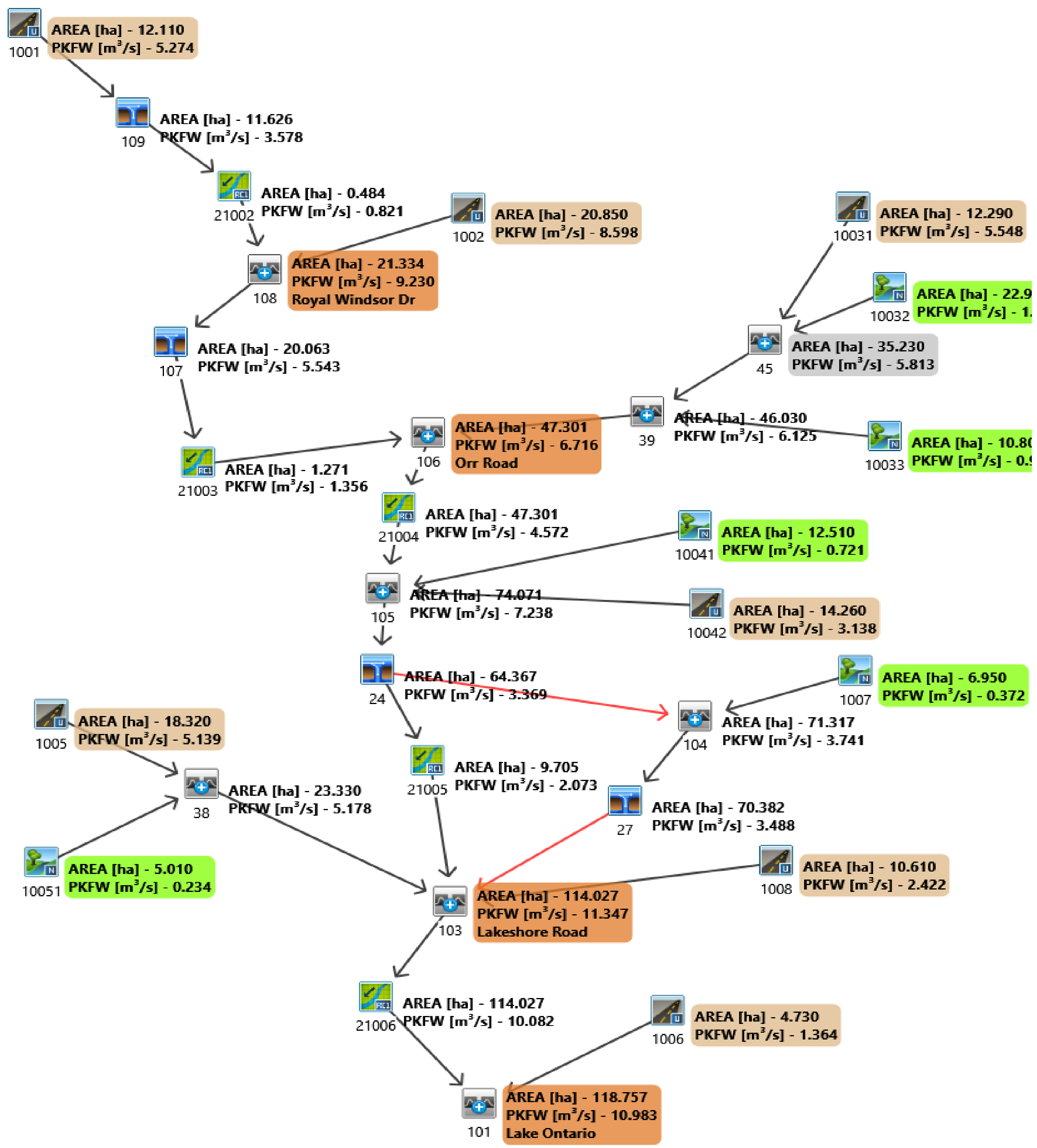
lAKESIDE Watershed TMIG VO Schemantic - 2 yr



lAKESIDE Watershed TMIG VO Schemantic - 5 yr

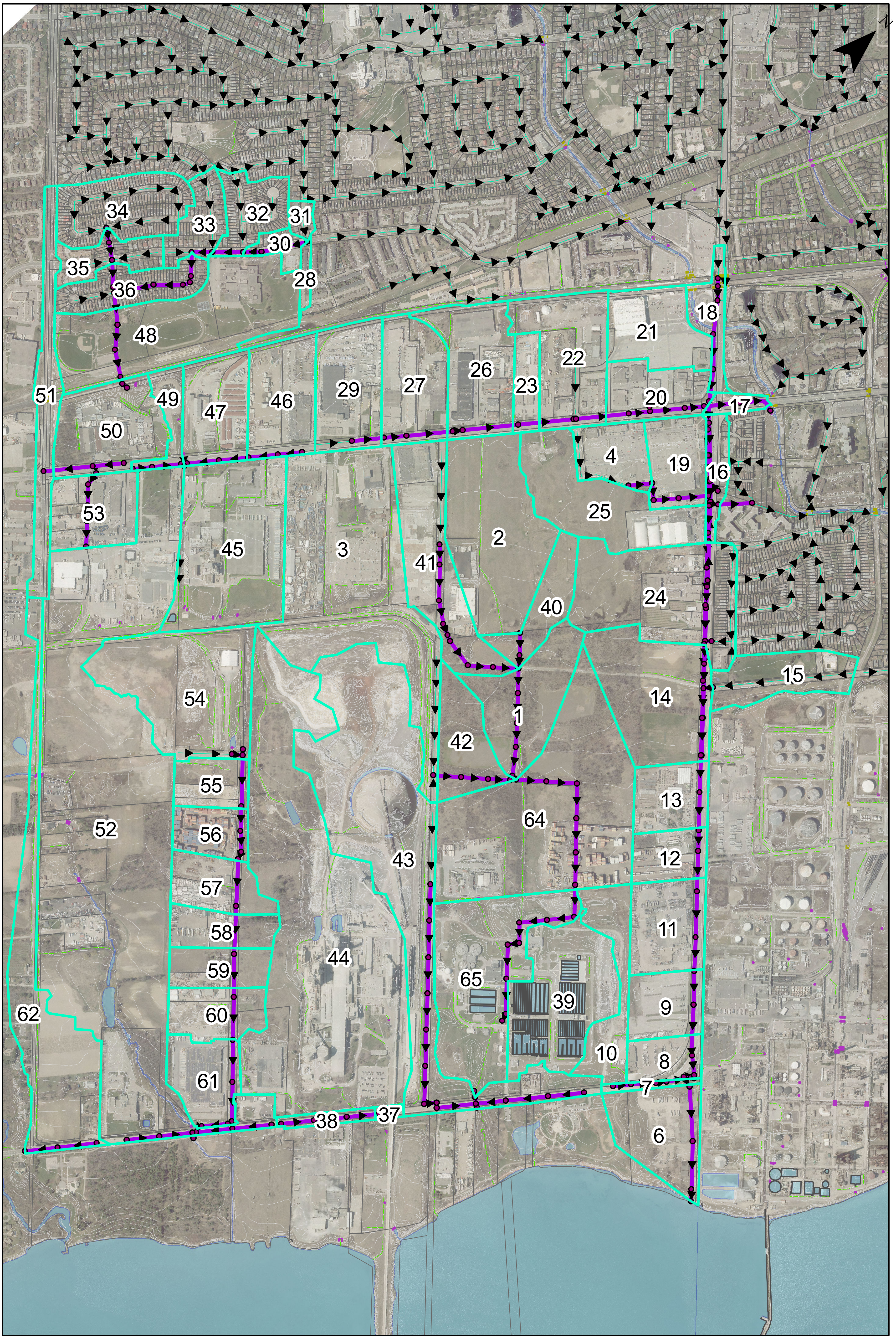


lAKESIDE Watershed TMIG VO Schemantic - 100 yr



APPENDIX E

PCSWMM Existing Conditions Model Output



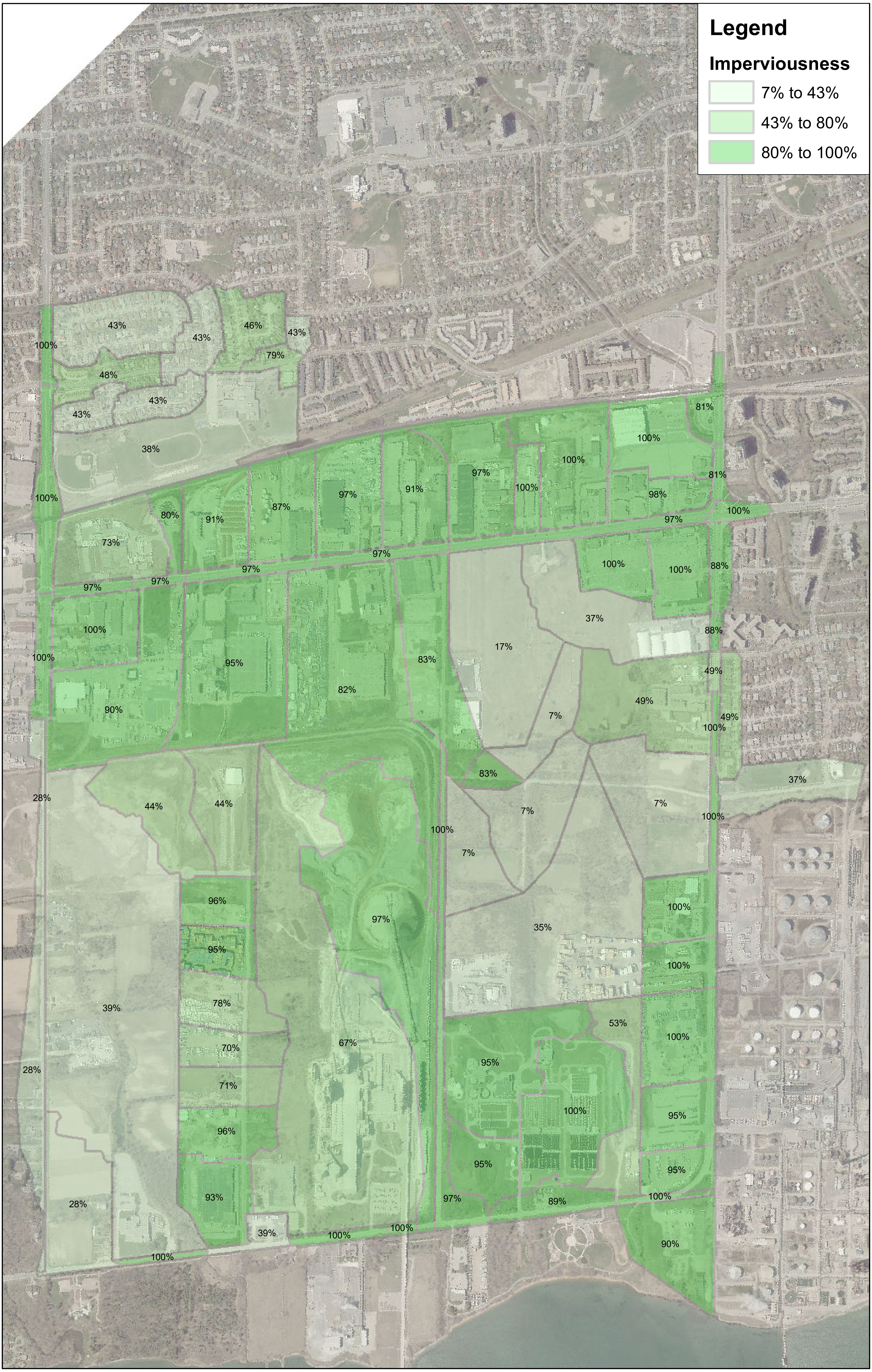
TMIG

MISSISSAUGA SOUTHDOWN DISTRICT SERVICING
AND ENVIRONMENTAL MANAGEMENT PLAN

EXISTING CONDITIONS - DRAINAGE AREA FOR PCSWMM

SCALE	PROJECT NO.
1 :11,000	18137
DATE	FIGURE NO.
APRIL 2018	1

Document Path: G:\Projects\2018\18137 - Mississauga - Southdown SWM Servicing and EMP\DRAWINGS\GIS\For PCSWMM model drainage area delineation.mxd


Legend
Imperviousness
7% to 43%
43% to 80%
80% to 100%
43%
46%
43%
43%
100%
79%
48%
43%
43%
81%
100%
38%
100%
97%
100%
81%
100%
97%
91%
98%
87%
100%
80%
91%
97%
73%
97%
100%
100%
88%
97%
97%
97%
37%
100%
88%
100%
17%
95%
83%
49%
100%
82%
49%
90%
49%
7%
100%
83%
37%
28%
44%
44%
7%
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97%
35%
95%
100%
78%
39%
53%
67%
100%
70%
28%
95%
71%
100%
95%
96%
95%
95%
97%
89%
100%
93%
28%
39%
100%
100%
90%
100%

AreaID	Area	FlowPathLength	CatchmentWidth	Timp	Ximp	PerviousInitialAbstraction	ImperviousInitialAbstraction	Suction	K	InitialMoisture
1	8.47	237.63	356.44	0.07	0.07	11.14	0.25	110.10	21.80	0.25
2	15.02	316.46	474.69	0.17	0.17	9.98	0.32	191.53	5.46	0.16
3	27.46	427.89	641.83	0.82	0.82	2.16	0.77	174.37	8.91	0.18
4	4.12	165.73	248.60	1.00	1.00	0.00	0.90	148.52	14.09	0.21
6	7.31	220.76	331.13	1.00	1.00	0.00	0.90	110.10	21.80	0.25
7	0.67	66.83	100.25	1.00	1.00	0.00	0.90	110.10	21.80	0.25
8	2.98	141.05	211.57	1.00	1.00	0.00	0.90	110.10	21.80	0.25
9	4.56	174.42	261.63	1.00	1.00	0.00	0.90	110.10	21.80	0.25
10	5.56	192.55	288.82	0.53	0.53	5.69	0.57	110.10	21.80	0.25
11	6.35	205.81	308.71	1.00	1.00	0.00	0.90	110.10	21.80	0.25
12	3.48	152.40	228.59	1.00	1.00	0.00	0.90	110.10	21.80	0.25
13	4.56	174.43	261.65	1.00	1.00	0.00	0.90	110.10	21.80	0.25
14	12.24	285.69	428.53	0.16	0.16	10.09	0.31	110.10	21.80	0.25
15	5.56	192.56	288.84	0.37	0.37	7.62	0.46	110.10	21.80	0.25
16	2.25	122.38	183.57	0.88	0.85	1.44	0.82	110.10	21.80	0.25
17	1.00	81.65	122.47	1.00	1.00	0.00	0.90	110.10	21.80	0.25
18	2.85	137.84	206.76	0.81	0.81	2.23	0.77	152.00	13.39	0.20
19	4.82	179.26	268.89	1.00	1.00	0.00	0.90	112.35	21.35	0.24
20	5.14	185.16	277.73	0.98	0.98	0.21	0.89	202.27	3.31	0.15
21	6.52	208.41	312.62	1.00	1.00	0.00	0.90	208.80	2.00	0.15
22	9.41	250.41	375.61	1.00	1.00	0.00	0.90	208.80	2.00	0.15
23	2.35	125.24	187.86	1.00	1.00	0.00	0.90	208.80	2.00	0.15
24	14.52	311.10	466.65	0.49	0.46	6.14	0.54	131.31	17.55	0.22
25	10.64	266.28	399.42	0.37	0.37	7.60	0.46	172.16	9.35	0.18
26	8.66	240.34	360.51	0.97	0.97	0.30	0.88	208.80	2.00	0.15
27	7.43	222.61	333.92	0.91	0.91	1.07	0.84	208.80	2.00	0.15
28	0.64	65.32	97.98	0.43	0.27	6.86	0.50	208.80	2.00	0.15
29	7.74	227.10	340.65	0.97	0.97	0.33	0.88	208.80	2.00	0.15
30	1.35	94.80	142.20	0.79	0.71	2.56	0.75	208.80	2.00	0.15
31	0.81	73.48	110.23	0.43	0.21	6.86	0.50	208.80	2.00	0.15
32	4.09	165.15	247.73	0.46	0.32	6.44	0.52	208.80	2.00	0.15
33	3.42	151.01	226.52	0.43	0.23	6.86	0.50	208.80	2.00	0.15

AreaID	Area	FlowPathLength	CatchmentWidth	Timp	Ximp	PerviousInitialAbstraction	ImperviousInitialAbstraction	Suction	K	InitialMoisture
34	7.43	222.56	333.84	0.43	0.27	6.86	0.50	208.80	2.00	0.15
35	3.24	146.97	220.45	0.48	0.31	6.29	0.53	208.80	2.00	0.15
36	4.99	182.39	273.59	0.43	0.27	6.86	0.50	208.80	2.00	0.15
37	0.32	46.19	69.28	1.00	1.00	0.00	0.90	208.80	2.00	0.15
38	1.09	85.24	127.87	1.00	1.00	0.00	0.90	208.80	2.00	0.15
39	12.05	283.45	425.17	1.00	1.00	0.00	0.90	110.10	21.80	0.25
40	4.20	167.33	251.00	0.07	0.07	11.14	0.25	140.89	15.62	0.21
41	10.96	270.36	405.54	0.83	0.83	2.03	0.78	177.61	8.26	0.18
42	5.46	190.79	286.18	0.07	0.07	11.14	0.25	110.10	21.80	0.25
43	32.14	462.87	694.30	0.97	0.97	0.40	0.88	117.51	20.31	0.24
44	45.72	552.10	828.16	0.67	0.67	3.99	0.67	120.29	19.76	0.24
45	16.57	332.39	498.59	0.95	0.95	0.55	0.87	179.71	7.84	0.18
46	7.29	220.38	330.57	0.87	0.87	1.57	0.81	208.80	2.00	0.15
47	6.50	208.10	312.15	0.91	0.91	1.10	0.84	208.80	2.00	0.15
48	17.15	338.13	507.20	0.38	0.38	7.48	0.46	208.80	2.00	0.15
49	2.28	123.32	184.98	0.80	0.80	2.39	0.76	208.80	2.00	0.15
50	8.56	238.87	358.31	0.73	0.73	3.19	0.71	208.80	2.00	0.15
51	6.42	206.88	310.32	1.00	1.00	0.00	0.90	196.35	4.50	0.16
52	65.51	660.86	991.28	0.39	0.38	7.34	0.47	126.95	18.42	0.23
53	5.80	196.65	294.98	1.00	1.00	0.00	0.90	208.80	2.00	0.15
54	15.19	318.18	477.27	0.44	0.44	6.70	0.51	110.10	21.80	0.25
55	3.35	149.45	224.18	0.96	0.96	0.52	0.87	110.10	21.80	0.25
56	3.39	150.43	225.64	0.95	0.95	0.65	0.86	110.10	21.80	0.25
57	4.55	174.26	261.38	0.78	0.78	2.62	0.75	110.10	21.80	0.25
58	3.68	156.57	234.86	0.70	0.70	3.65	0.69	110.10	21.80	0.25
59	3.73	157.71	236.56	0.71	0.71	3.45	0.70	110.10	21.80	0.25
60	4.49	173.03	259.55	0.96	0.95	0.46	0.87	110.10	21.80	0.25
61	5.19	186.04	279.06	0.93	0.93	0.89	0.85	145.85	14.63	0.21
62	15.31	319.44	479.16	0.28	0.28	8.67	0.39	110.10	21.80	0.25
64	27.05	424.65	636.98	1.00	1.00	0.00	0.90	110.10	21.80	0.25
65	15.45	320.93	481.39	0.95	0.95	0.59	0.87	122.06	19.40	0.23

APPENDIX F

Alternative Solution Details

PREFERRED SOLUTIONS

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Table F-1 Evaluation of Alternative Solutions

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Financial Environment	Overall Evaluation
	Impacts	Benefits	Impacts	Benefits	Challenges	Effectiveness		
Do Nothing	◑ Increased erosion and degraded water quality due to uncontrolled runoff from future development	○ No benefits, as no works are proposed	● No impacts, as no works are proposed	○ No benefits, as no works are proposed	● No challenges, as no works are proposed	○ Increased flow rates resulting in increased flooding and erosion in the watercourses	No capital costs, as no works are proposed Potentially increased maintenance costs to repair infrastructure damaged by flooding and erosion	**NOT RECOMMENDED** Uncontrolled flows from future development will have unacceptable impacts on flooding, erosion and water quality
Current Standard Stormwater and Environmental Management Approach	● No impacts, as all stormwater controls would be implemented within the future development sites	○ No benefit to the natural environment	● No impacts, as all stormwater controls would be implemented within the future development sites	○ No benefit to social or cultural environments	● Few challenges anticipated for implementation of on-site controls to achieve applicable SWM criteria for future development sites	◕ Will mitigate impacts of future development on flooding, erosion and water quality, but will not improve existing degraded watercourses	Capital costs are dependent on the form of development and suite of on-site controls implemented The on-site controls will be constructed and maintained by the developer / property owner	**RECOMMENDED** Adequately mitigates impacts of future anticipated development with no significant impacts or challenges for implementation
Centralized SWM Facilities for Future Development	● No impacts, as all SWM facilities would be constructed outside of the NHS limits	◔ The SWM facilities could be designed and landscaped to complement and enhance the adjacent NHS areas	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction	◔ Potential benefits to employees in the study area if recreational facilities (trails, lookouts) are integrated into the design of the SWM facilities	○ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners and developers for land and construction costs	◕ Will mitigate impacts of future development on flooding, erosion and water quality, but will not improve existing degraded watercourses	Estimated land and construction costs of **$29.2 Million** would be borne by the contributing development sites Increased long term operation and maintenance costs when the SWM facilities are assumed by the City	**NOT RECOMMENDED** Prohibitive challenges to implement centralized SWM facilities for multiple development sites with different timelines, but should be considered if multiple development applications are advanced with similar timelines
Retrofit SWM Facilities	◑ Vegetation and mature tree removals for implementation of the Clearview Creek facility	◔ Improved water quality in the watercourses south of Lakeshore Road	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction Potential impacts to heritage property	◑ Potential benefits to the public if recreational facilities (trails, lookouts) are integrated into the design of the SWM facilities	○ Challenges to secure land from private property owners and Peel Region, challenges to capture storm flows for treatment while preserving baseflows and fish passage in the watercourses	◑ Will improve water quality in the relatively short length of watercourse between Lakeshore Road and Lake Ontario	Estimated land and construction costs of **$29.2 Million** (City) Increased long term operation and maintenance costs	**NOT RECOMMENDED** Significant challenges to secure land for the SWM facilities, challenges to construct on-line water quality facilities on Clearview and Avonhead Creeks, does not improve water quality in watercourses north of Lakeshore Road

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Financial Environment	Overall Evaluation
	Impacts	Benefits	Impacts	Benefits	Challenges	Effectiveness		
Watercourse Improvements: **Clearview Creek**	◑ Vegetation and mature tree removals for Clearview Creek south of Lakeshore Road, temporary impacts to watercourse during construction	● Significant improvement in the quality and quantity of aquatic and terrestrial habitat	◕ Limited potential impacts to residents and businesses during construction Potential impacts to heritage properties	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	◔ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners north of Lakeshore Road, challenges to stage construction across multiple properties	◕ Erosion and flooding hazards would be fully confined to the channel corridor. The reduced flood plain and re-aligned corridor facilitates more functional land parcels for future development	Capital cost of **$19.1 Million** ($1.9 Million City) ($17.2 Million Developer) Negligible increase in long term costs for maintenance of the channel corridors	**RECOMMENDED** While there are significant challenges for implementation, there will be significant benefits to the natural environment, recreation and future developments with the realigned and protected channel corridor
Watercourse Improvements: **Avonhead Creek South of Orr Road**	◕ Limited vegetation and mature tree removals, temporary impacts to watercourse during construction	● Improved fish passage from Lake Ontario and improvement in the quality and quantity of aquatic and terrestrial habitat	◑ Property required for the realignment of Avonhead Creek south of Lakeshore Road, potential impacts to residents and businesses during construction Potential impacts to heritage property	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	◑ Moderate challenges to secure property south of Lakeshore Road, limited challenges to co-ordinate with the design of Clearview Creek south of Lakeshore Road	◕ Erosion and flooding hazards would be fully confined to the channel corridor. The reduced flood plain and re-aligned corridor facilitates more functional land parcels for future development	Capital cost of **$31.9 Million** ($6.6 Million City) ($25.3 Million Developer) Negligible increase in long term costs for maintenance of the channel corridors	**RECOMMENDED** While there are moderate challenges for implementation, there will be significant benefits to the natural environment, recreation and future developments with the realigned and protected channel corridor
Watercourse Improvements: **Avonhead Creek North of Orr Road**	◕ Negligible vegetation removals, temporary impacts to watercourse during construction	◔ Limited opportunities for ecological restoration or enhancements	◕ Limited potential impacts to residents and businesses during construction	◔ No benefits, as the works would be implemented on private properties	◕ Few technical challenges for implementation, but there are no mechanisms to compel the works to occur outside of a development application	◑ Flooding would be significantly reduced but the Regional flood would not be confined to the channel	Capital cost of **$0.6 Million** (Developer) Potential reduction in long term maintenance costs for larger culvert and channel	**RECOMMENDED** The works are relatively inexpensive and can be implemented relatively easily to achieve a significant reduction in the extent of flooding

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Financial Environment	Overall Evaluation
	Impacts	Benefits	Impacts	Benefits	Challenges	Effectiveness		
Watercourse Improvements: Lakeside Creek	◕ Moderate vegetation and mature tree removals required east of Avonhead Road	◕ Significant increase in the quality and quantity of aquatic and terrestrial habitat, but the system would remain piped through the WWTP and disconnected from the existing Lakeside Creek at Lakeshore Road	◕ Limited potential impacts to residents and businesses during construction	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	○ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners, significant challenges to implement if not constructed in a single phase	◑ Erosion and flooding hazards would be fully confined within the new channel corridor, but there are currently no erosion and flood hazards on the impacted properties	Capital cost of **$17.8 Million** (Developer) Negligible increase in long term costs for maintenance of the channel corridors	**NOT RECOMMENDED** The predicted improvements to the natural heritage system cannot justify the significant challenges to implement this solution. The Avonhead Road storm sewer upgrade would provide similar flood protection to the Clarkson WWTP
Storm Sewer Upgrades	● No impacts, as works would be contained within existing developed road rights-of-way	◔ Removal or abandonment of the storm sewers east of Avonhead Road could facilitate future restoration and enhancement of the existing wooded area	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction	○ No benefits, as works would be contained within existing developed road rights-of-way	● Few challenges anticipated with design, approvals and construction of storm sewer upgrades	◕ Storm sewers will meet current City storm drainage criteria, but will not improve existing degraded watercourses	Capital cost of **$19.3 Million** if implemented as standalone projects. Costs can be reduced if coordinated with future road reconstruction projects Costs for upsizing Avonhead Road storm sewer to be shared with developers on east side of Avonhead Road No additional long term operation and maintenance costs	**RECOMMENDED** Recommended to be implemented to facilitate future urban development north of the Clarkson WWTP (Avonhead Road system) or as part of future planned road reconstruction projects (Southdown, Bromsgrove and Widemarr Road systems)

○ → ◔ → ◑ → ◕ → ●

Greatest Impact / Least Benefit → → → Least Impact / Greatest Benefit

Table F2 Implementation Strategy: City of Mississauga Works

Project	Criteria and Objectives	Key Future Study Requirements	Phasing Considerations	Key Required Approvals	Additional Considerations
Current Standard Stormwater and Environmental Management Approach	The City is not responsible for implementation of stormwater and environmental controls, but has a role in reviewing and approving development applications and ensuring that all criteria and guidelines are satisfied				
Clearview Creek Naturalization South of Lakeshore Road	Fully contain the Regulatory flood plain and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology and Coastal Assessment Geotechnical and Hydrogeology Investigations Utility Investigation Heritage Assessment Project File Report	The realignment and naturalization south of Lakeshore Road should be coordinated with the realignment of Avonhead Creek south of Lakeshore Road	CVC MECP – SAR (if required) MECP – PTTW (if required) DFO City (Heritage)	The realignment and naturalization south of Lakeshore Road should be integrated with the proposed City park at the Harding Waterfront Estate property
Avonhead Creek South of Lakeshore Road	Fully contain the Regulatory flood plain and all erosion hazards (ignoring the current flow diversion at Orr Road) Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation Heritage Assessment Project File Report	The realignment and naturalization south of Lakeshore Road should be coordinated with the realignment of Clearview Creek south of Lakeshore Road Interim works will be needed to tie into the existing Avonhead Creek if the realignment proceeds in advance of the realignment on the private property to the north	CVC MECP – SAR (if required) MECP – PTTW (if required) DFO City (Heritage)	Property is required from two different parcels south of Lakeshore Road. A longer and more expensive culvert could potentially eliminate the need to secure land from the eastern property The location of the new culvert at Lakeshore Road should be co-ordinated with the property owners on the north side of the road
Avonhead Road Storm Sewer System Modifications	Convey the runoff from a 10 year storm from the Avonhead Road right-of-way and the greater of existing flows or proposed controlled 100 year storm flows from external properties without surcharging	Geotechnical Investigation Utility Investigation Cost Sharing Agreement (for extension and oversizing to accommodate controlled flows from future development east of Avonhead Road)	The storm sewer upgrades should be implemented prior to development of the lands east of Avonhead Road The storm sewer upgrades could be implemented by developers east of Avonhead Road if development occurs ahead of the City's schedule for Avonhead Road improvements	MECP – ECA MECP – PTTW (if required) Region (sign-off for potential impacts to storm sewers through the Clarkson WWTP)	A small area immediately north of the Clarkson WWTP may need to continue to discharge to the storm sewer leading through the WWTP. Future development flows should be controlled to or below the available capacity in the storm sewer within the WWTP site
Southdown, Bromsgrove and Widemarr Road Storm Sewer Upgrades	Convey the runoff from a 10 year storm without surcharging (< 100 ha drainage area)) Convey the runoff from a 25 year storm without surcharging (> 100 ha drainage area) Contain the 100 year storm flow within the road right-of-way	Geotechnical Investigation Utility Investigation	The storm sewer upgrades should be coordinated with planned road reconstruction and/or infrastructure renewal projects	CVC (if a new outlet from the Southdown Road storm sewer to Lake Ontario is required) MECP – ECA MECP – PTTW (if required)	The upgraded storm sewers for Bromsgrove and Widemarr Road may need to convey more than the 10 year storm flow in order to contain the 100 year storm flows within the road rights-of-way

Table F3 Implementation Strategy: Landowner and Private Developer Works

Project	Criteria and Objectives	Key Future Study Requirements	Phasing Considerations	Key Required Approvals	Additional Considerations
Current Standard Stormwater and Environmental Management Approach	Achieve current standards for water quality, erosion mitigation, flood control, water balance and environmental protection	Design, approval and construction of stormwater management infrastructure for future development and redevelopment in the study area is the responsibility of the developer as part of the normal development process for each property. The developer or property owner will also be responsible for long term operation and maintenance of all on-site stormwater management controls.			Low Impact Development strategies for water balance should be prioritized for areas associated with coarse grained soils, high infiltration capacity and adequate depth to the water table. They must also comply with Source Protection Plan policies associated with Highly Vulnerable Aquifers
Clearview Creek Realignment East of Winston Churchill Boulevard	Fully contain the Regulatory flood plain and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation Heritage Assessment Project File Report	The works span multiple properties and should be coordinated to constructed as much of the channel as possible in a single phase. Interim works will be needed to transition to the existing channel upstream and downstream of realigned reaches where not all properties are participating	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga (planning, grading, servicing and heritage) Region of Peel (for construction access) DFO	The recommended alignment is centred on the property line of the lots fronting Winston Churchill Boulevard If an agreement cannot be reached with the owner to the east, the channel may need to be implemented fully on the property to the west
Clearview Creek Dam Removal north of Lakeshore Road	Achieve a net benefit to the natural heritage system Ensure fish passage Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Heritage Assessment Project File Report	The works are located on a single property and can be completed in a single phase	CVC MECP – SAR (if required) MECP – PTTW (if required) MNRF (to remove fish and wildlife from the pond prior to construction) City of Mississauga (planning, grading, servicing and heritage) Region of Peel (for construction access) DFO	It is expected that the property owner would implement these works to mitigate risks and liability associated with failure of the dam and potential impacts to downstream property and infrastructure There could be cost savings if the works were implemented as part of a larger contract associated with the upstream channel realignment
Avonhead Creek Channel Improvements North of CNR Tracks	Prevent any increase in the frequency or extent of flooding on adjacent properties	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation	The works can proceed independently but should ideally be coordinated with the flood containment project to the south	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga (planning, grading, servicing) DFO	It is expected that these works would occur during any future expansion or redevelopment of 2500 Royal Windsor Drive

Project	Criteria and Objectives	Key Future Study Requirements	Phasing Considerations	Key Required Approvals	Additional Considerations
Avonhead Creek Flood Containment South of CNR Tracks	Contain the spill flow over the railway tracks and safely convey it to Orr Road Prevent any increase in the frequency or extent of flooding on adjacent properties Provide a freeboard of at least 0.3 m from the regulatory flood level to the proposed grades on the remainder of the site	Geotechnical and Hydrogeology Investigations	The works can proceed independently but should ideally be coordinated with the culvert and channel improvements to the north	CVC City of Mississauga Region of Peel (for construction access)	It is expected that these works would occur during development of 701 - 805 Winston
Avonhead Creek Realignment West of Hazelhurst Road	Fully contain the Regulatory flood plain and all erosion hazards (ignoring the current flow diversion at Orr Road) Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation Project File Report	The existing and realigned channel are contained within a single property Interim works may be required to connect to the existing culvert under Lakeshore Road if the realignment occurs in advance of the realignment of Avonhead Creek south of Lakeshore Road	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga (planning, grading, servicing) DFO	It is expected that these works would occur during future significant redevelopment of the existing concrete plant property (i.e. change of use / form of development) As the works would take place in a single property, there is considerable flexibility for the alignment and configuration of the channel.

APPENDIX F1

Centralized Stormwater Management Facilities

Enhanced Water Quality Control Requirements

Southdown District Servicing and Environmental Management Plan
City of Mississauga
Project # : 18137
Date: August 2019

CLEARVIEW CREEK

Pond ID	Contributing Area (ha)	Imp
185	20.07	90%
197	8.84	90%

(MOE SWM Planning & Design Manual - March 2003)

Impervious Level	35%	55%	70%	85%
Enhanced Storage Volume (m^3/ha)	80	105	120	140
Normal Storage Volume (m^3/ha)	60	70	80	90
Basic Storage Volume (m^3/ha)	60	60	60	60

Enhanced Water Quality Control Requirements

Pond ID 185

Water Quality Control Unit Volume Required=	146.7	m^3/ha
Permanent Pool Unit Volume Requirement =	106.7	m^3/ha
Total Permanent Pool Storage Volume Required =	2,141	m^3
Extended Detention Storage Unit Volume Requirement =	40	m^3/ha
Total Extended Detention Storage Volume Required =	803	m^3
Total Water Quality Storage Requirement =	2,944	m^3

Pond ID 197

Water Quality Control Unit Volume Required=	146.7	m^3/ha
Permanent Pool Unit Volume Requirement =	106.7	m^3/ha
Total Permanent Pool Storage Volume Required =	943	m^3
Extended Detention Storage Unit Volume Requirement =	40	m^3/ha
Total Extended Detention Storage Volume Required =	354	m^3
Total Water Quality Storage Requirement =	1,297	m^3

SWM Pond ID 185
SWM Pond Storage Calculations

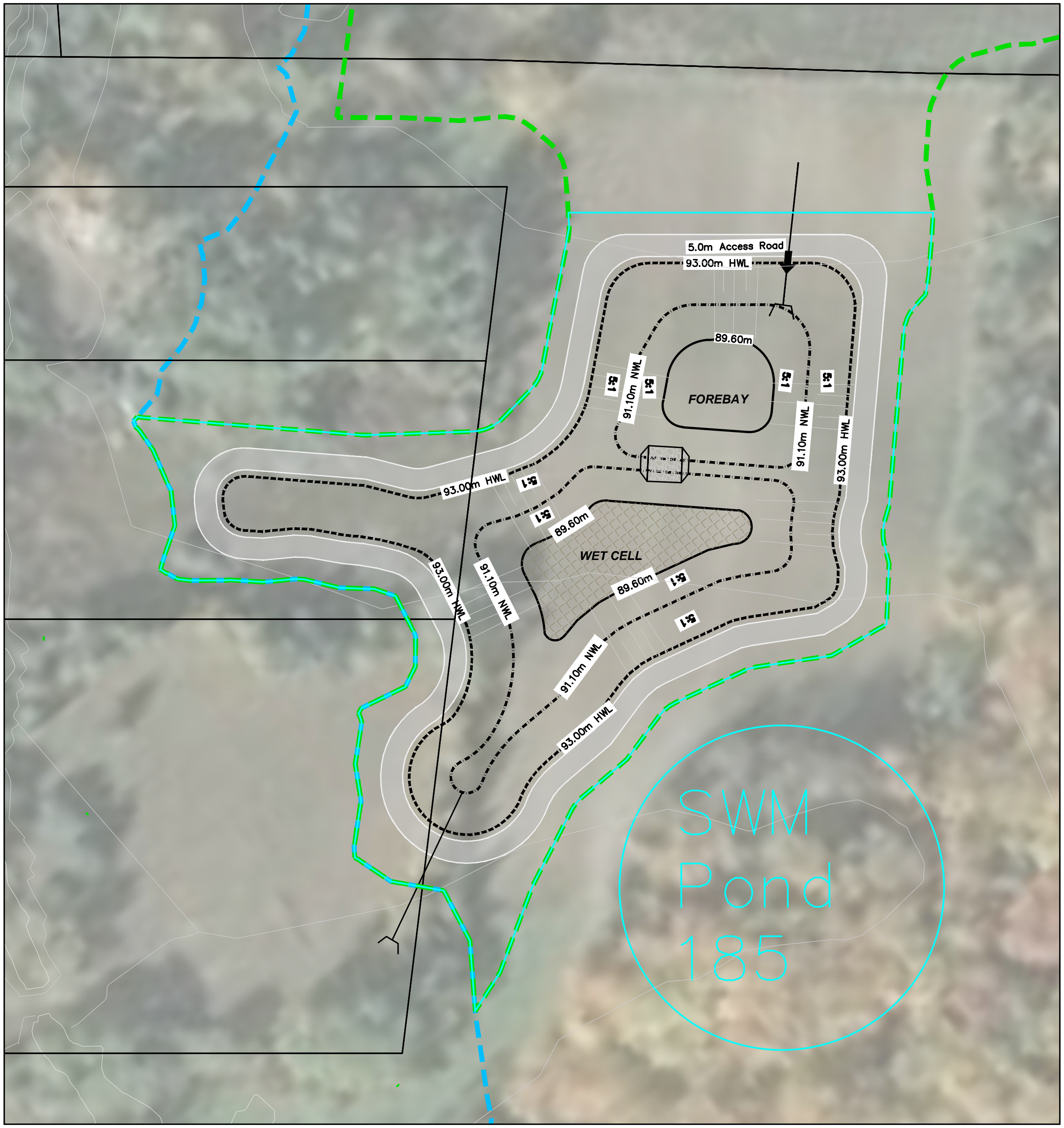
Project#: 18137
Date: Dec 2019

POND CHARACTERISTICS

Base of Pond:	89.60	
N.W.L.:	91.10	masl
Increment for Volume:	0.1	m
Required Permanent Pool Volume:	**2,141**	m^3
Permanent Pool Volume Provided:	**3,767**	m^3

STAGE / STORAGE INFORMATION

	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage (m^3)	Cumulative Storage (m^3)	Cumulative Storage above Permanent Pool (m^3)
Pond Base:	89.60	0.00	455.7	828.3	1,284.0		0.0		
N.W.L.:	91.10	1.50	1,374.8	2,363.6	3,738.4	2,511.2	3,766.7	**3,767**	**0**
HWL:	93.00	3.40	7,995.3		7,995.3	5,866.8	11,146.9	**14,914**	**11,147**
Free Board	93.30	3.70	8,722.7		8,722.7	8,359.0	2,507.7	**17,421**	**13,655**



DESCRIPTION	REQUIRED STORAGE	PROVIDED STORAGE
PERMANENT POOL EL.89.60 – EL.91.10	2,141 m^3	3,465 m^3
ACTIVE POOL EL.91.10 – EL.93.00	10,601 m^3	11,147 m^3

POND GEOMETRIC DATA

ITEM	DATA
DRAINAGE AREA	20.07 HA
POND BLOCK AREA	1.50 HA
PERMANENT POOL ELEV.	91.10m
BOTTOM OF POND ELEV.	98.60m
HWL	93.00m
FREE BOARD ELEV=ACCESS RD ELEV.	93.30m
POND SLOPES	5:1

LEGEND

- POND BLOCK
- FLOODLINE BUFFER
- NHS BUFFER

TMIG
The Municipal Infrastructure Group Ltd
8800 Dufferin Street,
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Vaughan, ON
L4K 0C5
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CLEARIVEW POND 185
SOUTHDOWN DISTRICT STORMWATER SERVICING AND ENVIRONMENTAL MANAGEMENT PLAN

PROJECT No. 18137

DRAWING No.

SWM Pond ID 197

Project#: 18137

SWM Pond Storage Calculations

Date: Dec 2019

POND CHARACTERISTICS

Base of Pond:	86.60	
N.W.L.:	88.10	masl
Increment for Volume:	0.1	m
Required Permanent Pool Volume:	**943**	m^3
Permanent Pool Volume Provided:	**1,384**	m^3

STAGE / STORAGE INFORMATION

	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage (m^3)	Cumulative Storage (m^3)	Cumulative Storage above Permanent Pool (m^3)
Pond Base:	86.60	0.00	42.1	256.0	298.1		0.0		
N.W.L.:	88.10	1.50	549.6	997.7	1,547.4	922.7	1,384.1	**1,384**	**0**
HWL:	90.00	3.40	3,781.2		3,781.2	2,664.3	5,062.2	**6,446**	**5,062**
Free Board	90.30	3.70	4,179.0		4,179.0	3,980.1	1,194.0	**7,640**	**6,256**

DESCRIPTION	REQUIRED STORAGE	PROVIDED STORAGE
PERMANENT POOL EL.86.60 – EL.88.10	943 m^3	1,384 m^3
ACTIVE POOL EL.88.10 – EL.90.00	4,849 m^3	5,062 m^3

POND GEOMETRIC DATA	
ITEM	DATA
DRAINAGE AREA	8.84 HA
POND BLOCK AREA	0.77 HA
PERMANENT POOL ELEV.	88.10m
BOTTOM OF POND ELEV.	86.60m
HWL	90.00m
FREE BOARD ELEV=ACCESS RD ELEV.	90.30m
POND SLOPES	5:1

LEGEND

- POND BLOCK
- FLOODLINE BUFFER
- NHS BUFFER

TMIG
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CLEARIVEW POND 197
SOUTHDOWN DISTRICT STORMWATER SERVICING AND ENVIRONMENTAL MANAGEMENT PLAN

PROJECT No.
18137
DRAWING No.

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Enhanced Water Quality Control Requirements

Southdown District Servicing and Environmental Management Plan
City of Mississauga
Project # : 18137
Date: August 2019

AVONHEAD CREEK

Pond ID	Contributing Area (ha)	Imp
93	69.98	90%
94	10.82	90%

(MOE SWM Planning & Design Manual - March 2003)

Impervious Level	35%	55%	70%	85%
Enhanced Storage Volume (m^3/ha)	80	105	120	140
Normal Storage Volume (m^3/ha)	60	70	80	90
Basic Storage Volume (m^3/ha)	60	60	60	60

Enhanced Water Quality Control Requirements

Pond ID 93

Water Quality Control Unit Volume Required=	146.7	m^3/ha
Permanent Pool Unit Volume Requirement =	106.7	m^3/ha
Total Permanent Pool Storage Volume Required =	7,465	m^3
Extended Detention Storage Unit Volume Requirement =	40	m^3/ha
Total Extended Detention Storage Volume Required =	2,799	m^3
Total Water Quality Storage Requirement =	10,264	m^3

Pond ID 94

Water Quality Control Unit Volume Required=	146.7	m^3/ha
Permanent Pool Unit Volume Requirement =	106.7	m^3/ha
Total Permanent Pool Storage Volume Required =	1,154	m^3
Extended Detention Storage Unit Volume Requirement =	40	m^3/ha
Total Extended Detention Storage Volume Required =	433	m^3
Total Water Quality Storage Requirement =	1,587	m^3

SWM Pond ID 93

SWM Pond Storage Calculations

Project#: 18137

Date: Dec 2019

POND CHARACTERISTICS

Base of Pond:	81.20
N.W.L.:	83.10 masl
Increment for Volume:	0.1 m
Required Permanent Pool Volume:	**7,465** m^3
Permanent Pool Volume Provided:	**11,946** m^3

STAGE / STORAGE INFORMATION

	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage (m^3)	Cumulative Storage (m^3)	Cumulative Storage above Permanent Pool (m^3)
Pond Base:	81.20	0.00	1,114.9	3,123.6	4,238.5		0.0		
N.W.L.:	83.10	1.90	2,736.6	5,600.1	8,336.7	6,287.6	11,946.5	**11,946**	**0**
HWL:	85.00	3.80	12,754.3		12,754.3	10,545.5	20,036.5	**31,983**	**20,036**
Free Board	85.30	4.10	13,447.2		13,447.2	13,100.8	3,930.2	**35,913**	**23,967**

DESCRIPTION	REQUIRED STORAGE	PROVIDED STORAGE
PERMANENT POOL EL.81.20 – EL.83.10	7,465 m^3	11,946 m^3
ACTIVE POOL EL.83.10 – EL.85.00	14,348 m^3	20,036 m^3

POND GEOMETRIC DATA	
ITEM	DATA
DRAINAGE AREA	69.98 HA
POND BLOCK AREA	1.91 HA
PERMANENT POOL ELEV.	83.10m
BOTTOM OF POND ELEV.	81.20m
HWL	85.00m
FREE BOARD ELEV=ACCESS RD ELEV.	85.30m
POND SLOPES	5:1

LEGEND

POND BLOCK

FLOODLINE BUFFER

TMIG
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Vaughan, ON
L4K 0C5

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f: 905.738.0065

AVONHEAD POND 93
SOUTHDOWN DISTRICT STORMWATER SERVICING AND ENVIRONMENTAL MANAGEMENT PLAN

PROJECT No. 18137

DRAWING No.

SWM Pond ID 94
SWM Pond Storage Calculations

Project#: 18137
Date: Dec 2019

POND CHARACTERISTICS

Base of Pond:	85.60	
N.W.L.:	87.10	masl
Increment for Volume:	0.1	m
Required Permanent Pool Volume:	**1,154**	m^3
Permanent Pool Volume Provided:	**2,413**	m^3

STAGE / STORAGE INFORMATION

	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage (m^3)	Cumulative Storage (m^3)	Cumulative Storage above Permanent Pool (m^3)
Pond Base:	85.60	0.00	65.9	768.3	834.3		0.0		
N.W.L.:	87.10	1.50	542.6	1,841.0	2,383.6	1,608.9	2,413.4	**2,413**	**0**
HWL:	89.00	3.40	4,904.9		4,904.9	3,644.2	6,924.1	**9,337**	**6,924**
Free Board	89.30	3.70	5,324.6		5,324.6	5,114.7	1,534.4	**10,872**	**8,458**

DESCRIPTION	REQUIRED STORAGE	PROVIDED STORAGE
PERMANENT POOL EL.85.60 – EL.87.10	1,154 m^3	2,413 m^3
ACTIVE POOL EL.87.10 – EL.89.00	6,869 m^3	6,924 m^3

POND GEOMETRIC DATA	
ITEM	DATA
DRAINAGE AREA	10.82 HA
POND BLOCK AREA	0.88 HA
PERMANENT POOL ELEV.	87.10m
BOTTOM OF POND ELEV.	85.60m
HWL	89.00m
FREE BOARD ELEV=ACCESS RD ELEV.	89.30m
POND SLOPES	5:1

LEGEND

POND BLOCK

FLOODLINE BUFFER

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f: 905.738.0065

AVONHEAD POND 94
SOUTHDOWN DISTRICT STORMWATER SERVICING AND ENVIRONMENTAL MANAGEMENT PLAN

PROJECT No.
18137

DRAWING No.

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Enhanced Water Quality Control Requirements

Southdown District Servicing and Environmental Management Plan
City of Mississauga
Project # : 18137
Date: August 2019

LAKESIDE CREEK

Pond ID	Contributing Area (ha)	Imp
Lakeside Pond	29.087	90%

(MOE SWM Planning & Design Manual - March 2003)

Impervious Level	35%	55%	70%	85%
Enhanced Storage Volume (m^3/ha)	80	105	120	140
Normal Storage Volume (m^3/ha)	60	70	80	90
Basic Storage Volume (m^3/ha)	60	60	60	60

Enhanced Water Quality Control Requirements

Lakeside Pond

Water Quality Control Unit Volume Required=	146.7	m^3/ha
Permanent Pool Unit Volume Requirement =	106.7	m^3/ha
Total Permanent Pool Storage Volume Required =	3,103	m^3
Extended Detention Storage Unit Volume Requirement =	40	m^3/ha
Total Extended Detention Storage Volume Required =	1,163	m^3
Total Water Quality Storage Requirement =	4,266	m^3

SWM Pond ID 94

SWM Pond Storage Calculations

Project#: 18137

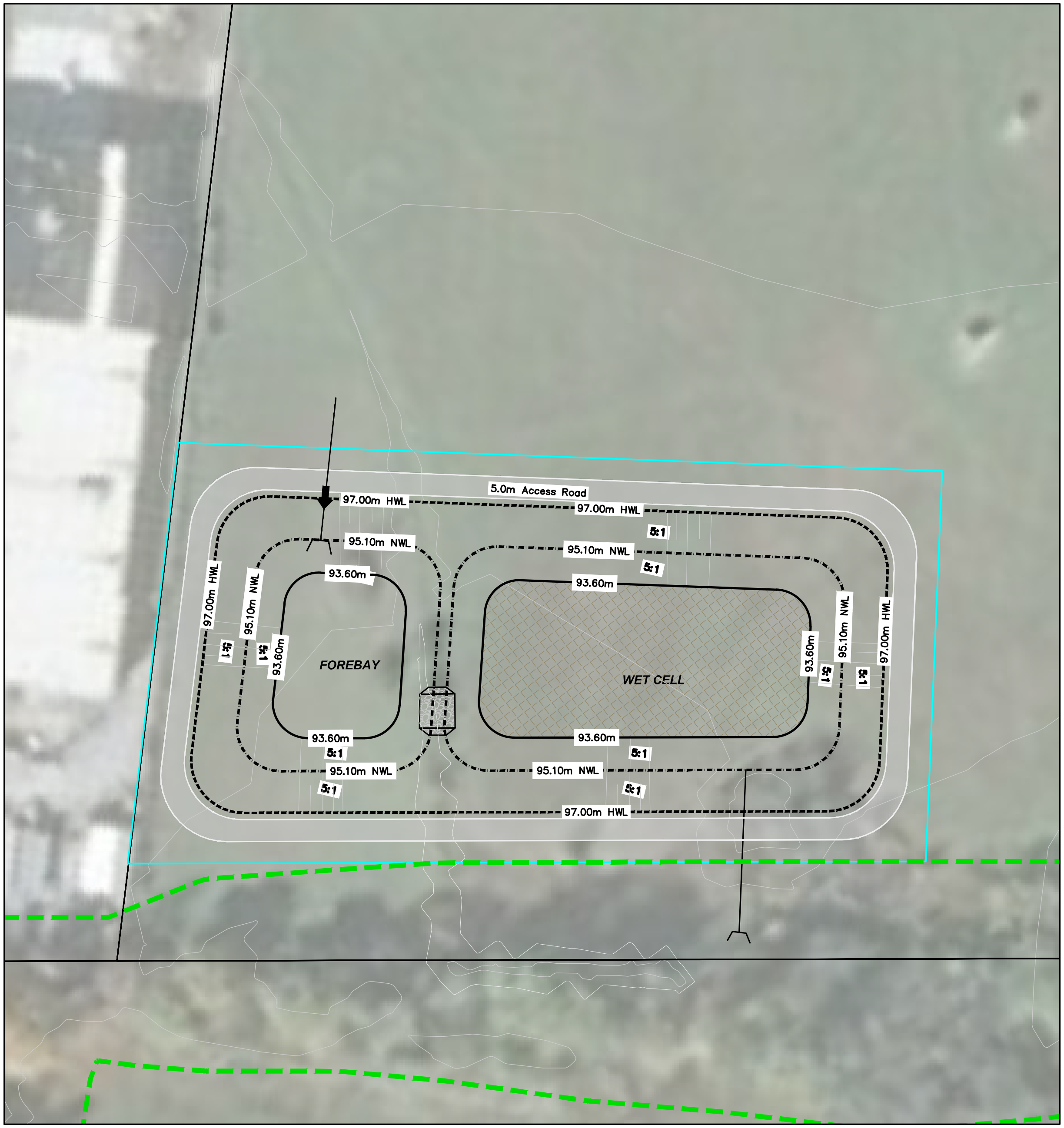
Date: Dec 2019

POND CHARACTERISTICS

Base of Pond:	93.60
N.W.L.:	95.10 masl
Increment for Volume:	0.1 m
Required Permanent Pool Volume:	**3,103** m^3
Permanent Pool Volume Provided:	**7,604** m^3

STAGE / STORAGE INFORMATION

	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage (m^3)	Cumulative Storage (m^3)	Cumulative Storage above Permanent Pool (m^3)
Pond Base:	93.60	0.00	1,012.1	2,545.1	3,557.2		0.0		
N.W.L.:	95.10	1.50	2,198.5	4,382.6	6,581.0	5,069.1	7,603.7	**7,604**	**0**
HWL:	97.00	3.40	10,701.1		10,701.1	8,641.1	16,418.0	**24,022**	**16,418**
Free Board	97.30	3.70	11,364.0		11,364.0	11,032.6	3,309.8	**27,332**	**19,728**



DESCRIPTION	REQUIRED STORAGE	PROVIDED STORAGE
PERMANENT POOL EL.93.60 – EL.95.10	3,103 m^3	7,604 m^3
ACTIVE POOL EL.95.10 – EL.97.00	15,907 m^3	16,418 m^3

POND GEOMETRIC DATA

ITEM	DATA
DRAINAGE AREA	29.09 HA
POND BLOCK AREA	1.65 HA
PERMANENT POOL ELEV.	95.10m
BOTTOM OF POND ELEV.	93.60m
HWL	97.00m
FREE BOARD ELEV=ACCESS RD ELEV.	97.30m
POND SLOPES	5:1

LEGEND

POND BLOCK

NHS BUFFER

TMIG
The Municipal Infrastructure Group Ltd
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LAKESIDE POND
SOUTHDOWN DISTRICT STORMWATER SERVICING AND ENVIRONMENTAL MANAGEMENT PLAN

PROJECT No.
18137

DRAWING No.

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Southdown District Stormwater Servicing and Environmental Management Plan

New Centralized SWM Facilities

Cost Estimate

Facility	Unit	Estimated Quantity	Unit Price	Total Price
Clearview Pond 185 - Construction	m3	14,612	$70	$1,022,840
Clearview Pond 185 - Land	m2	15,000	$200	$3,000,000
Clearview Pond 197 - Construction	m3	6,446	$70	$451,220
Clearview Pond 197 - Land	m2	7,700	$200	$1,540,000
Avonhead Pond 93 - Construction	m3	31,982	$70	$2,238,740
Avonhead Pond 93 - Land	m2	19,100	$200	$3,820,000
Avonhead Pond 94 - Construction	m3	9,337	$70	$653,590
Avonhead Pond 94 - Land	m2	8,800	$200	$1,760,000
Lakeside Pond - Construction	m3	24,022	$70	$1,681,540
Lakeside Pond - Land	m2	16,500	$200	$3,300,000
Sub-Total				**$19,467,930**
Soft Costs, Contingencies and Escalation (50%)				$9,733,965
Total Cost				**$29,201,895**
Rounded Cost Estimate				*$29,200,000*

Construction costs based on recent bid prices for greenfield developments in the GTA (TMIG)

Land costs based on the City's 2019 Development Charges Study and recent property sales in the Southdown District

Note that these costs would be offset by eliminating the need for quantity and quality controls within future development areas

APPENDIX F2

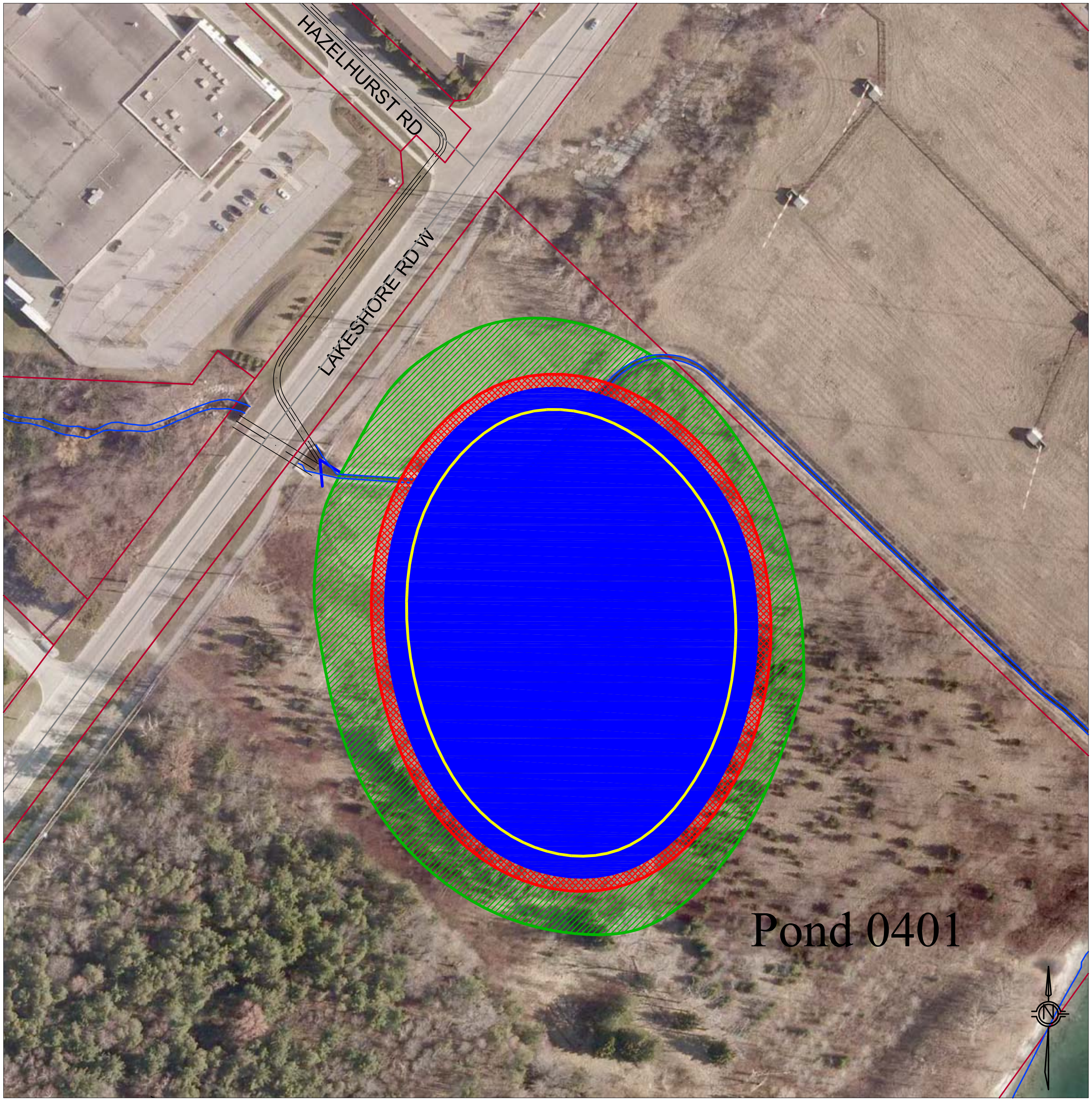
Retrofit Stormwater Management Facilities

Clearview Creek Proposed Facility # 0401 (MSWQCS #24)

- No photo available -

Facility Information
Tributary to: Clearview Creek
Land Ownership: City of Mississauga
Type of Facility: Proposed Off-line quality and quantity control
Drainage Area: 237 ha
Predominant Upstream Landuse: Residential and Commercial
Imperviousness of Upstream Area: 60%

Sizing Information		
Permanent Pool - As illustrated in footprint drawings		
Water Quality Target 38,439 m^3	*Available on Site* 40,578 m^3	*% of target* 100.0 %
Depth of Permanent Pool: 2.5m		
Active Storage (erosion and flood control)		
Target 83,048 m^3	*Site* 70,828 m^3	*% of target* 85.0 %
Active storage estimated as available volume above permanent pool		
Notes: *1.Water quality target assumes level 1 fisheries habitat* *2.Active storage targets estimated as 350m^3/ha for residential and 500m^3/ha for commercial*		



SCALE: 1:2,000

LEGEND:

- Grading
- Permanent Pool
- Access Road
- Pond Bottom
- Property Parcels

Note: Refer to Waterfront Park Redevelopment Concept Master Plan.

Approx: Bottom of Pond Elvn: 75.5m

Approx: Permanent Pool Elvn: 78m

Approx: Maintenance Road Elvn: 78.5m

Approx: Max. Active Storage Elvn: 81m

Aquafor Beech Limited

MISSISSAUGA Transportation and Works

Project

City of MISSISSAUGA

STORMWATER MASTER PLAN

Figure

Pond 0401

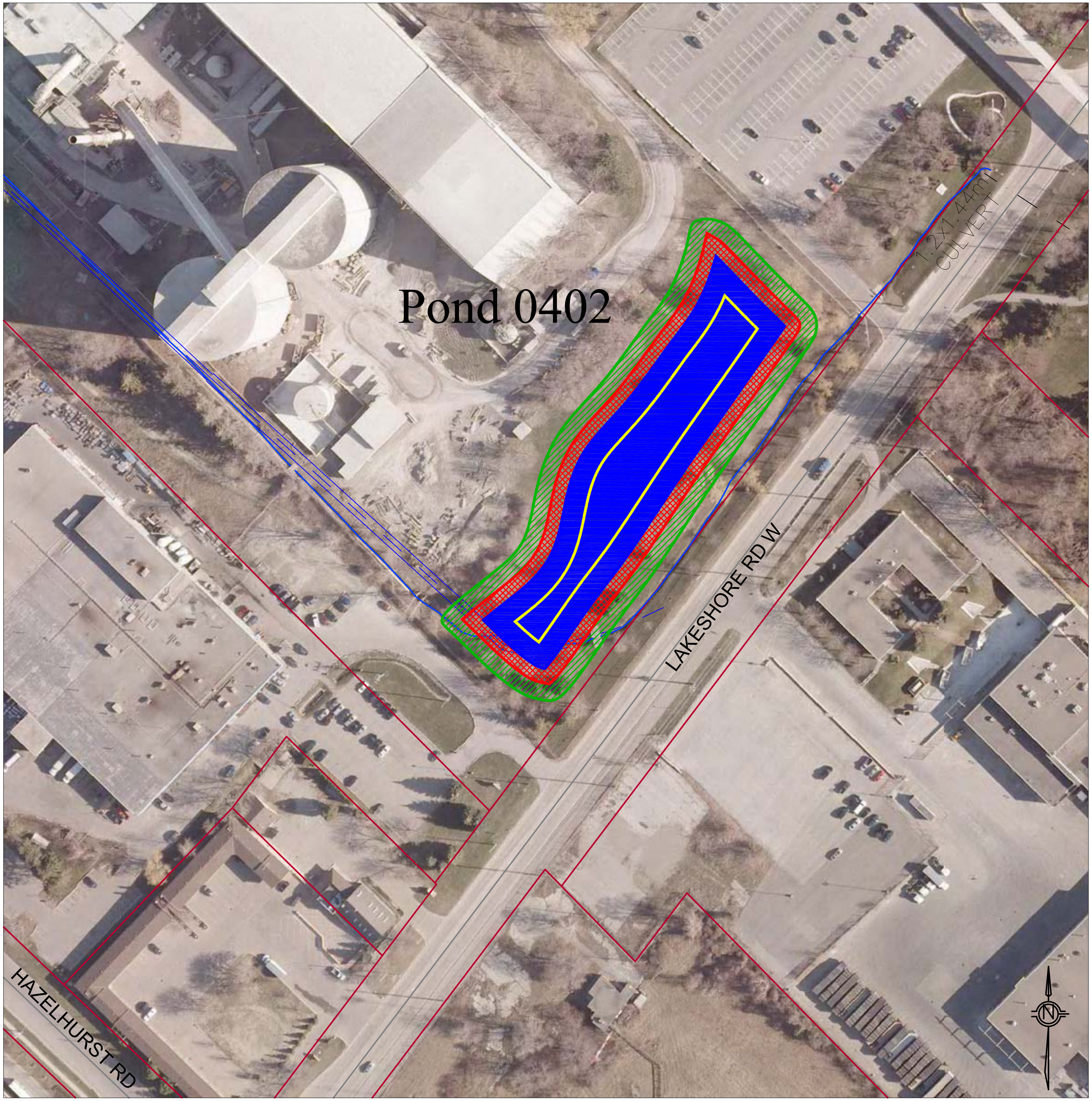
Aquafor Project No. 64785

Avonhead Creek Proposed Facility # 0402 (MSWQCS #25)

- No photo available -

Facility Information
Tributary to: Avonhead Creek
Land Ownership: Saint Lawrence Cement
Type of Facility: Proposed On-line quality and quantity control
Drainage Area: 42 ha
Predominant Upstream Landuse: Commercial
Imperviousness of Upstream Area: 75%

Sizing Information		
Permanent Pool - As illustrated in footprint drawings		
Water Quality Target 8,010 m^3	*Available on Site* 7,753 m^3	*% of target* 97.0 %
Depth of Permanent Pool: 2.5m		
Active Storage (erosion and flood control)		
Target 14,525 m^3	*Site* 15,263 m^3	*% of target* 100.0 %
Active storage estimated as available volume above permanent pool		
Notes: *1.Water quality target assumes level 1 fisheries habitat* *2.Active storage targets estimated as 350m^3/ha for residential and 500m^3/ha for commercial*		



SCALE: 1:2,000

LEGEND:

- Grading
- Permanent Pool
- Access Road
- Pond Bottom
- Property Parcels

Approx: Bottom of Pond Elvn: 78.5m

Approx: Permanent Pool Elvn: 81m

Approx: Maintenance Road Elvn: 81.5m

Approx: Max. Active Storage Elvn: 83m

Aquafor Beech Limited

MISSISSAUGA Transportation and Works

Project
City of MISSISSAUGA

STORMWATER MASTER PLAN

Figure
Pond 0402

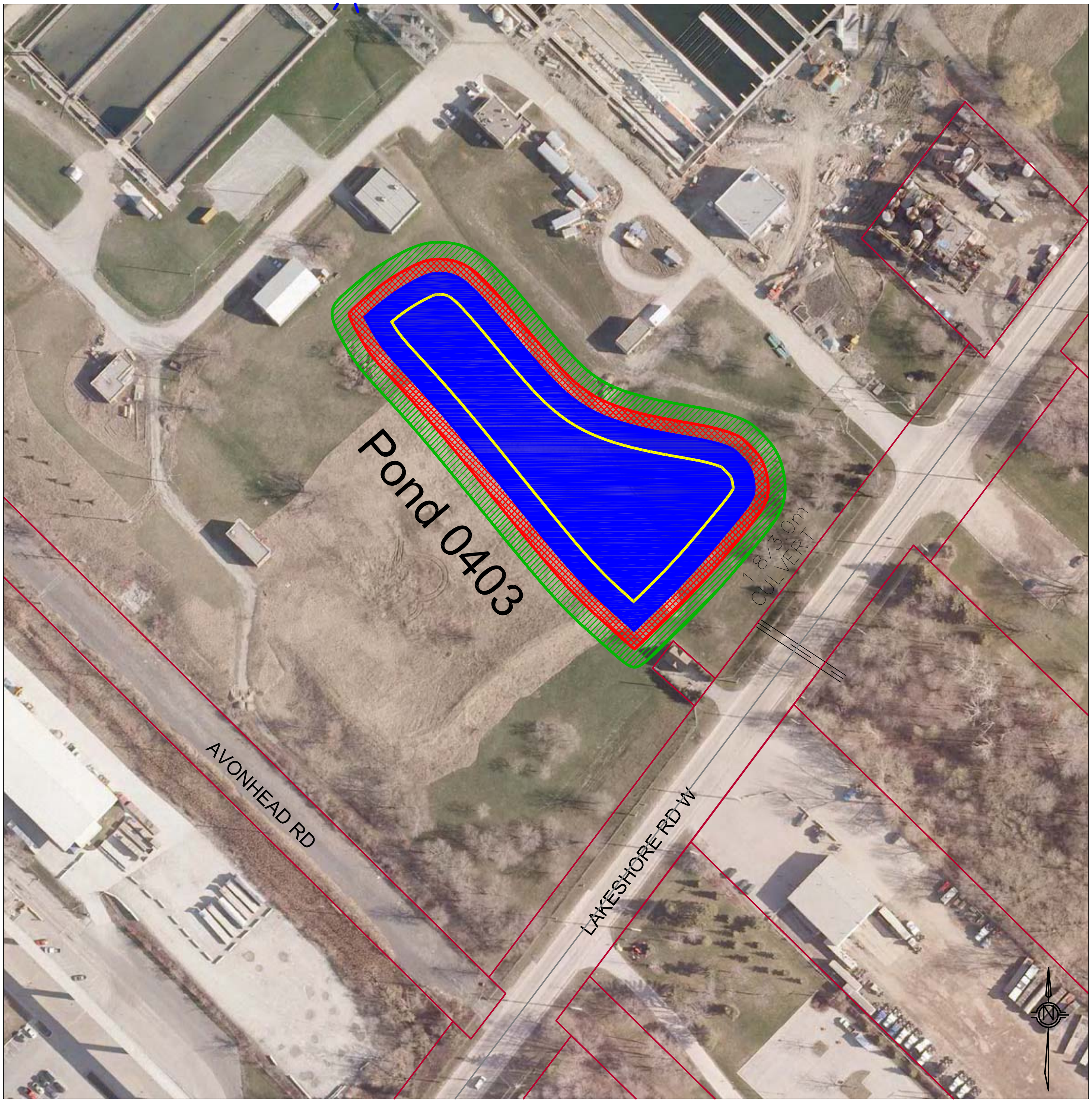
Aquafor Project No. 64785

Lakeside Creek Proposed Facility # 0403 (MSWQCS #26)

- No photo available -

Facility Information
Tributary to: Lakeside Creek
Land Ownership: Region of Peel (WWTP facility lands)
Type of Facility: Proposed On-line quality and quantity control
Drainage Area: 155 ha
Predominant Upstream Landuse: Residential
Imperviousness of Upstream Area: 50%

Sizing Information		
Permanent Pool - As illustrated in footprint drawings		
Water Quality Target 21,390 m^3	*Available on Site* 13,693 m^3	*% of target* 64.0 %
Depth of Permanent Pool: 2.5m		
Active Storage (erosion and flood control)		
Target 54,250 m^3	*Site* 18,338 m^3	*% of target* 34.0 %
Active storage estimated as available volume above permanent pool		
Notes: *1.Water quality target assumes level 1 fisheries habitat* *2.Active storage targets estimated as 350m^3/ha for residential and 500m^3/ha for commercial*		



SCALE: 1:2,000

LEGEND:

- Grading
- Permanent Pool
- Access Road
- Pond Bottom
- Property Parcels

Approx: Bottom of Pond Elvn: 78.5m

Approx: Permanent Pool Elvn: 81m

Approx: Maintenance Road Elvn: 81.5m

Approx: Max. Active Storage Elvn: 83m

Aquafor Beech Limited

MISSISSAUGA Transportation and Works

Project
City of MISSISSAUGA
STORMWATER MASTER PLAN

Figure
Pond 0403

Aquafor Project No. 64785

Table 7.2: Summary of Previously Planned Storm Water Management Facilities within the City of Mississauga

City of Mississauga SWM Facility ID #	MSWQCS Pond ID#	Recommended in MSWQCS (Facility Management Plan)	Status on Mississauga Transportation and Works Storm Water Management Facilities Map	Background Study	Planning Status (Dates based on 2008 Budget - Otherwise noted)	Dates based on 2012 Budget and 2013 - 2021 Forecast	Subwatershed	Location	Analysis	Location Suitable	In 2004 DC Update	Included in 2009 DC Update	Comments (2009 DC Update)	Percent of Water Quality Volume that Can be Achieved given the Site Constraints		Comments	Planning Status
														1.5m permanent pool depth	2.5m permanent pool depth		
4503	Outside MSWQCS Study Area		Proposed Offline Water Quantity and Quality Facility	Meadowvale District MDP	Design & Construction planned for 2014	Design and constructiuon planned beyond 2021 forecast	Credit River	North of Hwy 401, E of Credit River	Y	Yes	Y	Y	To include Design & Construction (No land cost - floodplain)	100%	na	Private lands - Master drainage plan outdated - Pond will only treat part of proposed lands (23ha), Pond site in Floodplain	Will be constructed likely by developer
5805			Proposed overland (online) Quantity Control Facility	Sawmill Creek SWS &Earthtech Glen Erin Brook/Hwy403 study	Design & Construction in approved **2003** Budget	Design and constructiuon planned to be re-budgeted in 2014	Sawmill Creek –Glen Erin Brook	North of Hwy 403, , west of Winston Churchill Blvd.	Y	Yes	Y	Y	Include Design & Construction & Land Cost in 2009 DC.	na	na	Conceptual Drawings done - Work in tandem with 5804 - both ponds have been identified in previous captial budgets. City received conceptual designs 2 months ago (we need a copy) - Park for now	Will be constructed by developer
5502			Proposed Offline Water Quality Control Facility	North 16 District Scoped SWS (Philips, March 3/2004 Draft)	Design & Land Cost in approved **2006** Budget; Construction in **2010** Budget	Construction of 5503 planned to be re-budgeted in 2017	Sixteen Mile Creek	TBD	N	Yes	Y	Y	Design & Land Cost already in approved budgets; Construction not in approved budget	na	na	Planning Completed	Will be constructed by developer
5503			Proposed Offline Water Quality Control Facility											na	na		
0401	24	Y	Proposed Offline Water Quality Control Facility	Southdown MDP	Design & Construction & Land Cost in **2015**	Design and Construction planned in 2020	Clearview Creek	South of Lakeshore Rd, East of Winston Churchill Blvd.	Y	Yes, but north of Lakeshore ltd options	Y	Y	To include Design & Construction & Land Cost	66%	100%	City deemed facility online.	Will likely be constructed as part of redevelopment
0402	25	Y	Proposed Online Water Quality Control Facility		Design & Construction & Land Cost in **2015**	Design and Construction planned in 2021	Avonhead Creek	North of Lakeshore Rd, East of Hazelhurst Rd.	Y	No or Limited options	Y	Y	To include Design & Construction & Land Cost	67%	97%	Lands owned by St Lawrence Cement Co. Proposed pond location has been developed. Drainage area will be redirected with proposed Hazelhurst sewer diversion to facility 0401 - Facility 0402 location on hold for St. Lawrence redevelopment	On hold - St Lawrence Cement Redevelopment (Will likely be constructed as part of redevelopment)
0403	26	Y	Proposed Online Water Quality Control Facility		Design & Construction & Land Cost in **2016**	Design and Construction planned in 2021	Lakeside Creek	NW corner of Lakeshore Rd W and Southdown Rd.	Y	No or Limited Options	Y	Y	To include Design & Construction & Land Cost	42%	64%	Region of Peel to review. WWTP location identified in Southdown is viable. Southdown Rd location (MSWQCS\T&W Map) has been developed and is no longer viable	Construct not probable (Will likely be constructed as part of redevelopment)
2101	31	Y	Proposed Water Quality Control Facility	MSWQCS	Not budgeted	Design and Construction planned in 2021	Cooksville Creek	City Centre at Mississauga Valley Blvd and Central Pkwy E.	Y	Two possible locations	Y	Y	To include Design & Construction & Land Cost	28%	43%	Lands owned by City of Mississauga. Two potential locations: First has mature trees (NA) and is within floodlines. Second provides only 50% treatment due to space constraints. Downstream of facility #23 - Both facilities required to achieve full water quality treatment	Construction Possible (Likely only pond to be built by the City and not part of redevelopment)

Table 4. Summary of End-of-Pipe Facilities within the City of Mississauga

City of Mississauga SWM Facility ID #	Subwatershed	Total Storage Volume Requirements (m^3)	2009 Costs (DC Estimated Project Costs)	Facility Type	Implementation Priority
		Previously Planned Facilities			
4503	Credit River	14,400	$978,650	Offline Quantity and Quality Control	3
5805	Sawmill Creek	18,600	$3,190,500	Overland (online) Quantity Control	1
5502 & 5503	Sixteen Mile Creek	9,500	$2,410,000	Quality Control	1
5502 & 5503	Sixteen Mile Creek		$1,733,000	Quality Control	1
0401	Clearview Creek	38400	$2,604,750	Online Quality Control	1
0402	Avonhead Creek	7,700	$2,677,100	Online Quality Control	3
0403	Lakeside Creek	13,700	$3,202,200	Online Quality Control	3
2101	Cooksville Creek	18,000	$1,223,600	Quality Control	4
Total			$18,019,800		
		Retrofits Underway			
5901	Loyalist Creek	21,000	$2,713,000	Quality and Quantity Control	n/a
5903	Loyalist Creek	15,900	$2,054,000	Quantity Retrofit for Quality Control	n/a
Total			$4,767,000		
		Retrofits Feasible			
5401	Mullet Creek Upstream	27,800	$4,130,800	Quantity Retrofit for Quality Control	4
5402	Mullet Creek Upstream	58,900	$8,751,500	Quantity Retrofit for Quality Control	4
3701	Cooksville Creek	116,600	$17,324,750	Quantity Retrofit for Quality Control	1
3602	Little Etobicoke Creek	34,900	$5,185,350	Quantity Retrofit for Quality Control	1
Total			$35,392,400		
		New Opportunities			
13	Credit River	29,800	$4,427,500	Quality Control	2
23	Cooksville Creek	24,900	$9,557,550	Quality Control	2
37**	Credit River	30,300	N/A	Quality Control	3
61	Etobicoke Creek	5,400	$802,700	Quality Control	2
70	Etobicoke Creek	10,400	$1,545,600	Quality Control	1
128	Meadowvale North	37,800	$11,486,600	Quality Control	3
129	Mimico Creek	6,300	$936,100	Quality Control	2
Total			$28,756,050		
Grand Total			**$86,935,250**		

Southdown District Stormwater Servicing and Environmental Management Plan

Retrofit SWM Facilities

Cost Estimate

Facility	Unit	Estimated Quantity	Unit Price [1]	Total Price
Clearview Pond 401 (Construction Only)	LS	1	$2,600,000	$2,600,000
Avonhead Pond 402 (Land + Construction)	LS	1	$2,680,000	$2,680,000
Lakeside Pond 403 (Land + Construction)	LS	1	$3,200,000	$3,200,000
Sub-Total				**$8,480,000**
Soft Costs, Contingencies and Escalation (75%)				$6,360,000
Total Cost				**$14,840,000**
Rounded Cost Estimate				*$14,900,000*

[1] Cost estimates are taken from the MSWQUS (2012), which were based on the City's 2009 DC Study

A higher contingency and escalation factor has been applied, given the time since the 2009 DC Study

APPENDIX F3

Watercourse Improvements

GEO Morphix Ltd.

Head Office
PO Box 205, 36 Main St. N.
Campbellville, ON, Canada L0P 1B0

T 416.920.0926

Ottawa Office
PO Box 336, Woodlawn PO
Dunrobin, ON, Canada K0A 1T0

T 613.979.7303

December 9, 2019

The Municipal Infrastructure Group
8800 Dufferin Street
Concord, ON L4K 0C5

Attention: Rosalie Chung, P.Eng.
Water Resources Engineer

Re: Southdown District Stormwater Servicing and Environmental Management Plan
Realigned Corridor Width and Erosion Mitigation Recommendations
City of Mississauga (Revised)
GEO Morphix Project No: 18027

GEO Morphix was retained to provide fluvial geomorphological input for the Southdown District Stormwater Servicing and Environmental Management Plan. The Phase 1 Report provided a summary of existing conditions and constraints from a fluvial geomorphologic perspective through the completion of desktop- and field-based assessments along portions of Clearview Creek, Avonhead Creek, Lakeside Creek and Joshua Creek. This letter, prepared to provide input to Phase 2 of the study, identifies corridor width requirements for the potential realignment of a portion of Clearview Creek east of Winston Churchill Boulevard, construction of a corridor parallel to Lakeshore Road West to redirect flows from Avonhead Creek to Clearview Creek, restoration of Clearview Creek south of Lakeshore Road West (i.e., removal of concrete lining), and daylighting of a portion of Lakeside Creek north of the Clarkson Wastewater Treatment Plant.

Significant lengths of channel to be maintained are also proposed to be restored/rehabilitated. Given the urban setting, a hybrid natural channel design is deemed most appropriate. This approach allows restoration of channel ecological function while addressing infrastructure protection. We envision riffle-pool or cascade sequences with hydraulically sized channel reinforcements along each realigned corridor. There may also be opportunities to provide infiltration potential through stone-cored and floodplain wetlands. Other terrestrial features, such as turtle nesting areas and raptor poles, may also enhance any realigned corridors.

Conceptual bankfull channel dimensions were determined by the bankfull discharge, as this represents what is generally considered the channel-forming discharge, or the dominant discharge. Bankfull capacity in a stable channel generally has a 1- to 2-year return period. The bankfull discharges used to model the realigned channels were assumed to be equivalent to the modelled 2-year flows, which were provided by The Municipal Infrastructure Group (TMIG). This is a conservative approach as at detailed design a shorter event return period with a lower magnitude flow will likely be applied to channel sizing, which is a common practice. A simple Manning's approach was used to iteratively back-calculate the bankfull dimensions summarized in **Table 1**, below.

With regard to the lower portion of Clearview Creek, Credit Valley Conservation (CVC; 2018) completed a feasibility study to remove the existing concrete-lining and restore the channel between Lakeshore Road West and the outlet to Lake Ontario. The study explored three potential channel alignments that considered impacts to flora and fauna, the proposed outlet at the bluff along the Lake Ontario Shoreline, earthworks requirements, existing land ownership constraints, future land uses, and potential costs. As the diversion of flows from Avonhead Creek to Clearview Creek is proposed in the current study, the combined 2-year flows from Clearview Creek and

Avonhead Creek provided by TMIG were used to determine bankfull channel dimensions. In addition, the corridor requirements for the downstream reach of Clearview Creek considered all three channel alignment options proposed by CVC (2018). We note that while the 2-year flow for the downstream reach of Clearview Creek would increase should flows from Avonhead Creek be diverted, the corridor gradient between Lakeshore Road West and Lake Ontario would be substantially higher, resulting in a similar corridor width to that of the upstream section of Clearview Creek east of Winston Churchill Boulevard.

Table 1: Preliminary corridor width recommendations

Watershed	2-Yr Flow	Designed Bankfull Channel		Modelled Belt Width (Williams, 1986)	Corridor Bottom Width (3x Bankfull)	Corridor Bottom Width (4x Bankfull)
		Width (m)	Depth (m)			
Clearview Creek (Upstream)	6.89	7.35	0.74	**57**	22	**30**
Clearview Creek (Downstream)	13.65	7.29-7.40	0.73-0.74	**57**	22	**30**
Avonhead Creek	6.76	6.30	0.63	**48**	19	**25**
Lakeside Creek	2.11	4.13	0.41	**30**	12	**17**

Preliminary meander belt widths were modelled using a modified Williams (1986) approach that considers the average bankfull width of the designed channel and a factor of safety. The equation is as follows:

$$B_w = ([4.3 * W_b^{1.12}] + W_b) * 1.2 \qquad \text{[Eq.1]}$$

where Bw is meander belt width (m), and Wb is bankfull channel width (m).

As noted previously, we anticipate a hybrid natural channel design approach for the realigned channels to ensure that the channels remain stable in the urbanized landscape. Sizing of corridors should consider meander belt widths, although the corridors may not be able to completely accommodate these widths. Where they cannot be fully accommodated, it is recommended that hazards be addressed through appropriate erosion mitigation techniques such as bioengineering, stream training and offset protection. Therefore, we recommend corridor widths ranging from 4 times the designed bankfull width to the modelled meander belt width be used at this stage. It is anticipated that the corridor bottom widths would be further refined during planning for any developments.

Table 2 provides an estimated cost of the constructed channel based on the above assumptions. We note that these estimated costs may vary significantly based on required bioengineering, types of bed grade control, planting type and density, and size of stone. This estimate also does not include any costs associated with cut and fill requirements.

Table 2: Preliminary cost of channel works per linear metre

Watershed	Estimated Cost Per Linear Metre
Clearview Creek (Upstream)	$2,000-$2,500
Clearview Creek (Downstream)	$2,000-$2,500
Avonhead Creek	$2,000-$2,500
Lakeside Creek	$1,500-$2,000

With regard to the stormwater management strategy, the hybrid design approach (bioengineering and river training) will result in channels with substantially higher erosion thresholds. Given the future channels are anticipated to be far more resilient and have higher assimilative capacities, we suggest the Ministry of Environment, Conservation and Parks (MECP) standard erosion criteria will suffice at this time to size preliminary stormwater management ponds. This can be verified through future phases of redevelopment.

We trust this letter satisfies your requirements at this time. Should you have any requirements please contact the undersigned.

Respectfully submitted,

Suzanne St. Onge

Paul Villard, Ph.D., P.Geo., CAN-CISEC, EP, CERP
Director, Principal Geomorphologist

Suzanne St. Onge, M.Sc.
Senior Environmental Scientist

PROPOSED 4.8m x1.2m BOX CULVERT
PROPOSED CHANNEL IMPROVEMENTS (MIN 3m BASE WIDTH)
PROPOSED GRADING TO CONTAIN AND CONVEY SPILL
17.0m
29.0m
49.0m CORRIDOR WIDTH
PROPOSED LAKESIDE CREEK
62.0m CORRIDOR WIDTH
42.0m
30.0m
25.0m
37.0m
57.0m CORRIDOR WIDTH
INTEGRATED STORAGE FACILITY
REMOVE ONLINE POND
CLEARVIEW CREEK
AVONHEAD CREEK
62.0m CORRIDOR WIDTH
42.0m
36.0m
25.0m
37.0m
57.0m CORRIDOR WIDTH
LAKESIDE CREEK
LEGEND
EXISTING CREEK ALIGNMENT
PROPOSED CREEK
Royal Windsor Dr
Bromsgrove Rd
Orr Rd
Lakeshore Rd W
Avonhead Rd
Winston Churchill Blvd
Southdown Rd
Beryl Rd

Southdown District Stormwater Servicing and Environmental Management Plan
Watercourse Improvements
Cost Estimate

Clearview Creek - North of Lakeshore	Unit	Estimated Quantity	Unit Price	Total Price
Clearview Creek North of Lakeshore - Construction	m	715	$3,500	$2,502,035
Clearview Creek North of Lakeshore - Land	m2	44,000	$200	$8,800,000
Clearview Creek - On-Line Pond Removal	LS	1	$100,000	$100,000
Sub-Total				**$11,402,035**
Soft Costs, Contingencies and Escalation (50%)				$5,701,017
Total Cost				**$17,103,052**
Rounded Cost Estimate				*$17,200,000*

Clearview Creek - South of Lakeshore	Unit	Estimated Quantity	Unit Price	Total Price
Clearview Creek South of Lakeshore - Construction	m	359	$3,500	$1,255,461
Sub-Total				**$1,255,461**
Soft Costs, Contingencies and Escalation (50%)				$627,730
Total Cost				**$1,883,191**
Rounded Cost Estimate				*$1,900,000*

All works on City lands

Clearview Creek - Total				$19,100,000

Southdown District Stormwater Servicing and Environmental Management Plan
Watercourse Improvements
Cost Estimate

Avonhead Creek - North of Orr Road	**Unit**	**Estimated Quantity**	**Unit Price**	**Total Price**
Avonhead Creek Culvert Removal	LS	1	$4,000	$4,000
Avonhead Creek Culvert	LS	1	$75,000	$75,000
Avonhead Creek Channel Widening	m	95	$1,800	$171,000
Re-grading property south of CNR to contain spill	m2	3,500	$40	$140,000
Sub-Total				**$390,000**
Soft Costs, Contingencies and Escalation (50%)				$195,000
Total Cost				**$585,000**
Rounded Cost Estimate				*$600,000*

Southdown District Stormwater Servicing and Environmental Management Plan
Watercourse Improvements
Cost Estimate

Avonhead Creek - North of Lakeshore	**Unit**	**Estimated Quantity**	**Unit Price**	**Total Price**
Avonhead Creek North of Lakeshore - Construction	m	1,160	$3,500	$4,061,491
Avonhead Creek North of Lakeshore - Land	m2	64,000	$200	$12,800,000
Sub-Total				**$16,861,491**
Soft Costs, Contingencies and Escalation (50%)				$8,430,746
Total Cost				**$25,292,237**
Rounded Cost Estimate				*$25,300,000*

Avonhead Creek - South of Lakeshore	**Unit**	**Estimated Quantity**	**Unit Price**	**Total Price**
Avonhead Creek South of Lakeshore - Construction	m	310	$3,500	$1,083,502
Avonhead Creek South of Lakeshore - Land	m2	12,000	$200	$2,400,000
Avonhead Creek at Lakeshore - Culvert	LS	1	$900,000	$900,000
Sub-Total				**$4,383,502**
Soft Costs, Contingencies and Escalation (50%)				$2,191,751
Total Cost				**$6,575,253**
Rounded Cost Estimate				*$6,600,000*

Land costs associated with private lands east of City owned Harding Waterfront Estates property

Avonhead Creek South of Orr Road - Total				**$31,900,000**

Southdown District Stormwater Servicing and Environmental Management Plan
Watercourse Improvements
Cost Estimate

Lakeside Creek	Unit	Estimated Quantity	Unit Price	Total Price
Lakeside Creek - Construction	m	810	$3,000	$2,430,252
Lakeside Creek - Land	m2	40,000	$200	$8,000,000
Lakeside Creek - Storage Upstream of Clarkson WWTP	m3	20,300	$70	$1,421,000
Sub-Total				**$11,851,252**
Soft Costs, Contingencies and Escalation (50%)				$5,925,626
Total Cost				**$17,776,878**
Rounded Cost Estimate				*$17,800,000*

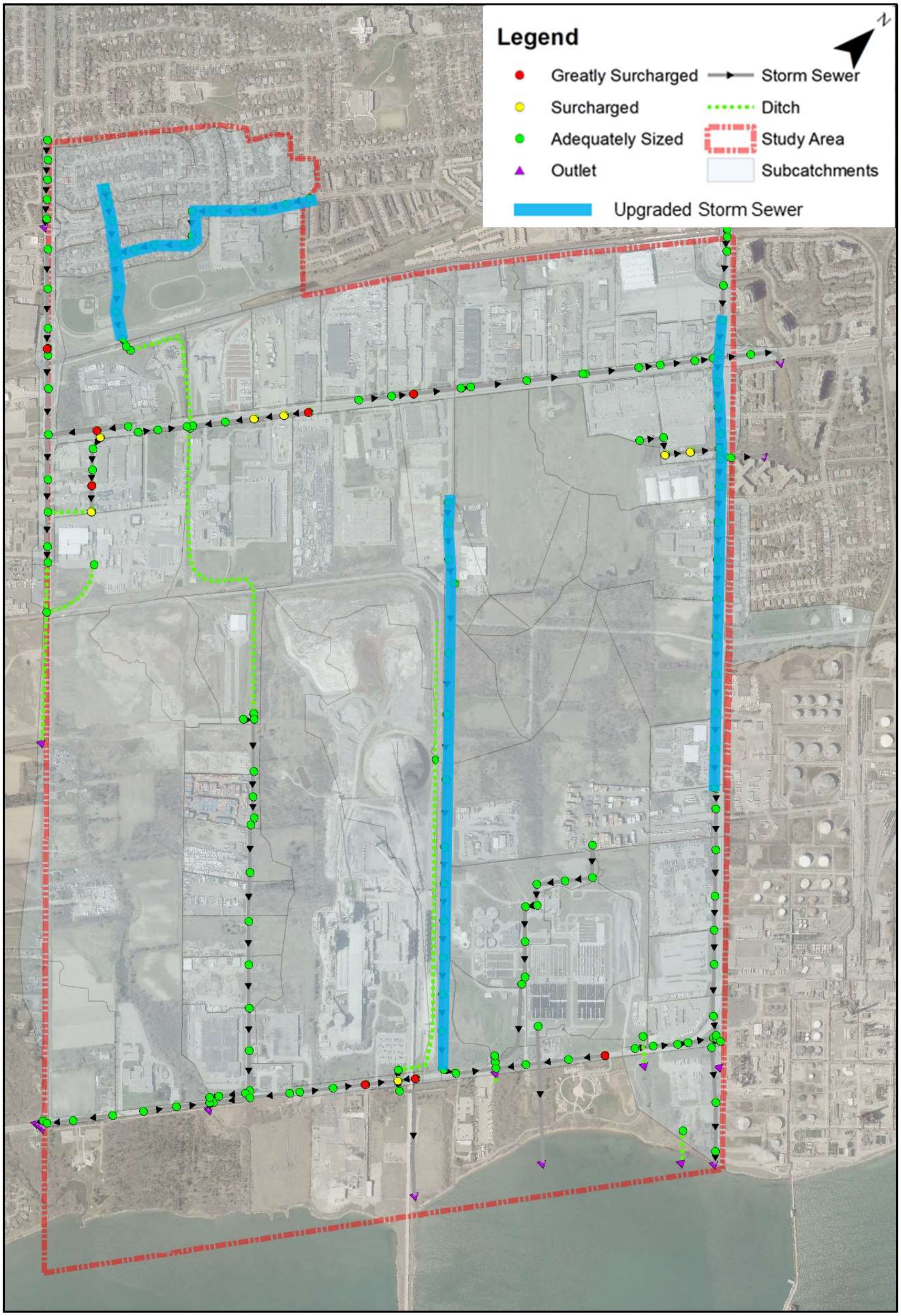
Total Costs - Works to be Implemented by Development	**$60,900,000**
Total Cost - Works to be implemented by City	**$8,500,000**
Total Cost	**$69,400,000**

Construction costs based on recent bid prices for greenfield developments in the GTA (TMIG, Geomorphix)

Land costs based on the City's 2019 Development Charges Study and recent property sales in the Southdown District

APPENDIX F4

Storm Sewer Upgrades


Legend
N
Greatly Surcharged
Surcharged
Adequately Sized
Outlet
Storm Sewer
Ditch
Study Area
Subcatchments
Upgraded Storm Sewer

Southdown District Stormwater Servicing and Environmental Management Plan

Storm Sewer Upgrades

Cost Estimate

Facility	Unit	Estimated Quantity	Unit Price	Total Price
Cramer Street and Easement to CN Rail (900 mm avg. diam.)	m	478	$2,145	$1,025,310
Bromsgrove Road / Widemarr Road (900 mm avg. diam.)	m	687	$2,145	$1,473,615
Southdown Road (1200 mm avg. diam.)	m	837	$3,905	$3,268,485
Avonhead Road (900 mm to 1500 mm diam.)	m	1,871	$3,800	$7,109,800
Sub-Total				**$12,877,210**
Soft Costs, Contingencies and Escalation (50%)				$6,438,605
Total Cost				**$19,315,815**
Rounded Cost Estimate				*$19,400,000*

Costs include removal of existing sewers and maintenance holes, installation of new storm sewer and maintenance holes, reconnection of CB leads and new pavement over excavation limits

Significant cost savings can be realized if the storm sewer replacements are co-ordinated with scheduled road reconstruction projects

APPENDIX G

Public Consultation Records

STAKEHOLDER CONTACT LIST
Southdown District Stormwater and Environmental Management Plan

Last updated: January 2021

Type	Mailing List	Title	First Name	Last Name	Title	Agency	Address Line 1	Address Line 2	City	Prov.	Postal Code	Work Phone	E-mail Address	Notes	Response (Y/N)	Date	Comments
Region of Peel																	
E	N	Mr.	John	Glass	Manager Wastewater Treatment - Capital	Region of Peel	1300 Lakeshore Road East		Mississauga	ON	L5E 3B8		john.glass@peelregion.ca		N		
Conservation Authority																	
E	N	Ms.	Dorothy	DiBerto	Technician, Planning	Credit Valley Conservation	1255 Old Derry Road		Mississauga	ON	L5N 6R4	905.670.1615 ext 304	Dorothy.DiBerto@cvc.ca		Y		Member of Technical Advisory Committee
E	N	Ms.	Heather	Dearlove	Environmental Planner	Conservation Halton	2596 Britannia Road West		Burlington	ON	L7P 0G3	05.336.1158 ext. 2231	hdearlove@hrca.on.ca		Y		Member of Technical Advisory Committee
Provincial																	
E	N	Mr.	Trevor	Bell	Environmental Assessment Coordinator	Ministry of the Environment & Climate Change	chnical Support Section, Central Regi	5775 Yonge St., 8th Floor	Toronto	ON	M2M 4J1	416-326-3577	trevor.bell@ontario.ca		Y		Refer to letter received from MECP
E	N					Ministry of the Environment & Climate Change							eanotification.cregion@ontario.ca				
E	N	Ms.	Jackie	Burkart	District Planner	Ministry of Natural Resources	Bloomington Road WestSouth Tower		Aurora	ON	L4G 3G8	905 713 7368	Jackie.Burkart@ontario.ca		Y		Response received from MNRF regarding potential SAR species
E	N	Mr.	Victor	Doyle	Manager, Community Planning and Development	Ministry of Municipal Affairs & Housing	2nd Floor, 777 Bay Street		Toronto	ON	M5G 2E5	416-585-6109	victor.doyle@ontario.ca		N		
E	N	Mr.	Malcolm	Horne	Archaeology Review Officer - Culture Programs U	Ministry of Tourism, Culture and Sport	401 Bay Street, Suite 1700		Toronto	ON	M7A 0A7	416-314-7146	malcolm.horne@ontario.ca		N		
E	N	Mrs.	Rosi	Zirger	Heritage Planner	Ministry of Tourism, Culture and Sport	401 Bay Street, Suite 1700		Toronto	ON	M7A 0A7	416-314-7159	rosi.zirger@ontario.ca		N		
E	N	Mr.	Drew	Crinklaw	Rural Planner - South Western Ontario	Ministry of Agriculture - OMAFRA	667 Exeter Road		London	ON	N6E 1L3	Tel: 519-873-4085	drew.crinklaw@ontario.ca		N		
E	N	Mr.	Reza	Moridi	Member of Provincial Parliament (MPP)	Richmond Hill	9555 Yonge Street	Suite 311	Richmond Hill	ON	L4C 9M5	905-884-8080	rmoridi.mpp@liberal.ola.org		N		
CN Railway Contacts																	
E	N	Mr.	Derek	Basso	Engineering Technician	CN Railway	Welding Way off Administration Road		Concord	ON	L4K 1B9		Permits.GLD@cn.ca		N		
M	N	Mr.	Stefan	Linder		CN Railway	Welding Way off Administration Road		Concord	ON	L4K 1B9				N		
First Nations Communities																	
E	Y	Chief	Mark	Hill		Six Nations of the Grand River	P.O. BOX 5000		Ohsweken	ON	N0A 1M0		markhill@sixnations.ca		N		
E	Y	Mr.	Lonny	Bomberry	Lands and Resources Director	Six Nations of the Grand River	P.O. BOX 5000		Ohsweken	ON	N0A 1M0	519-753-0665	lonnybomberry@sixnations.ca		N		
E	Y	Ms.	Jen	Mt. Pleasant	Consultation Point Person	Six Nations of the Grand River	2498 Chiefswood Road	P.O. Box 5000	Ohsweken	ON	N0A 1M0		jenmtpleasant@sixnations.ca		N		
E	Y	Mr.	Hohahes	Leroy Hill	Secretary	Haudenosaunee Confederacy Chiefs Council	2634 6th Line Road, RR#2		Ohsweken	ON	N0A 1M0		jocko@sixnationsns.com		N		
E	Y	Chief	Stacey	LaForme		Mississaugas of the New Credit First Nation	2789 Mississauga Road R.R. #6		Hagersville	ON	N0A 1H0	519-768-1133	Stacey.Laforme@mncfn.ca		N		
E	Y				Department of Consultation & Accommodation	Mississaugas of the New Credit First Nation	4065 Highway 6		Hagersville	ON	N0A 1H0	905-768-4260			N		
Utilities																	
E	N					Rogers Communications	Outside Plant Engineering	3573 Wolfdale Road	Mississauga	ON	L5C 3T6		MOB.Permits@rci.rogers.com		Y	2019-05-09	provided information regading existing utilities in study area
E	N				Environmental Assessment Coordinator	Bell Canada Municipal Operations Centre	C/O telecon	7777 Weston Road	Vaughan	ON	L4L 0G9		bell.moc@telecon.ca/ sharmila.kumar@telecon.ca		Y	2019-03-18	provided information regading existing utilities in study area
E	N					Enbridge Gas Distribution Inc	500 Consumers Road	4th Floor - Post A2 - VPC	North York	ON	M2J 1P8		mark-ups@enbridge.com		Y	2018-05-11	provided information regading existing utilities in study area
E	N	Mr.	Greg	Gowan	Real Estate Coordinator	Hydro One Networks Inc.	185 Clegg Road, R32		Markham	ON	L6G 1B7	416-527-3487	greg.gowan@hydroone.com		Y	2018-05-11	provided information regading existing utilities in study area
E	N	Mr.	Enza	Cancilla		Hydro One Networks Inc.							enza.cancilla@hydroone.com		Y		provided information regading existing utilities in study area
E	N	Mr.	Rick	Schatz	Sr. Real Estate Coordinator	Hydro One Networks Inc.						905-946-6233	Rick.Schatz@hydroone.com		N		
E	N	Mr.	Frederic	Sua	TELUS CSD, Engineering Operations & Impleme	Telus	25 York Street	22nd Floor	Toronto	ON	M5J 2V5	(647) 837-9112	com/ Telus.moc@telecon.ca/ Telusutilitymarkups@telecon.ca		Y	2019-03-16	provided information regading existing utilities in study area
E	N				Environmental Assessment Coordinator	Cogeco Data Services Inc	413 Horner Ave		Toronto	ON	M8W 4W3		dass@cogecodata.com/ utility.circulations@cogecopeer1.com/ utility.circulations@cogecodata.com		Y	2019-02-26	Does not have any infrastructure in study area
E	N					Zayo							Utility.Circulations@Zayo.com		Y	2019-03-31	provided information regading existing utilities in study area
E	Y					Hydro One Networks Inc.							secondarylanduse@hydroone.com		N		
Landowners																	
M	Y	Ms.	Nevanka	Gospodnetic	Property Owner	Tim Horton's Plaza and various rental unit properties	2157-2165 Royal Windsor Drive		Mississauga	ON	L5J 1K5				N		
E	Y	Mr.	Michael	Chadsey	Property Representative	Michael Chadsey Management Consulting	6-2400 Dundas Street West	Suite 145	Mississauga	ON	L5K 2R8	647-464-2674	chadsey.michael@gmail.com		N		
E	Y	Mr.	Ted	Fujarczuk		Unifay Fedar Investments (Wimpy's Diner, Davey Tree and misc.	2257A Royal Windsor Drive		Mississauga	ON	L5J 1K5	905-855-1231x225	tedfujarczuk@unifayfedar.com		Y	2019-06-11	Attended landowner meeting prior to PIC#1. Interested in LID practces for Royal Windsor Drive properties
E	Y	Mr.	Glenn	Mackay		Bell Sports Retail Store	2385 Royal Windsor Drive		Mississauga	ON	L5J 1K9	905-855-3763 ext. 22	glennm@bellsports.net		N		
E	Y	Mr.	Dean	Morrison	representative for 595 Winston Churchill	Cushman Wakefield						905-568-9500	Dean.morrison@cushwake.com		N		
E	Y	Mr.	Nicholas	Dell	Representative for Winston Churchill property	Harper Dell & Associates Inc.	1370 Hurontario St.		Mississauga	ON	L5G 3H4	905 615-0614	nickdell8@gmail.com		Y	2019-03-22	Represents owners on Winston Churchill, interested in Clearview Creek realignment
E	Y	Mr.	Mike	Tatarsky	Sales Representative	Avison Young	77 City Centre Drive	Suite 301	Mississauga	ON	L5B 1M5	905.283.2377	michael.tatarsky@avisonyoung.com		N		
E	Y	Mr.	Adam	Carr	Vice President, Sales, Easements & Acquisitions	Infrastructure Ontario	1 Dundas St. West	Suite 2000	Toronto	ON	M5G 1Z3		Adam.Carr@infrastructureontario.ca		N		
E	Y	Mr.	Paul	Patenaude	Facilities Section Head	IESO	2635 Lakeshore Road		Mississauga	ON	L5J 4R9	905-855-6268	Paul.Patenaude@ieso.ca		N		
E	Y	Mr.	Joseph	Milos	Advisor – Station Planning, Planning and Develop	Metrolinx	97 Front Street West		Toronto	ON	M5J 1E6	416.202.7397	Joseph.Milos@metrolinx.com		Y	2019-06-11	Expressed interest in the study
E	Y	Mr.	Ian	Kilgour	Slaight Communications Inc. representative	KILGOUR Planning & Development Inc.	374 Fraser Street		North Bay	ON	P1B 3W7	705-825-0247	ian@iankilgour.ca		N		
M	Y		Owner			1613232 Ontario Inc	663 WINSTON CHURCHILL BLVD,		MISSISSAUGA	ON	L5J 4P9				N		
E	Y	Mr.	CHRISTOPHER ALAN	WILKINSON			655 WINSTON CHURCHILL BLVD,		MISSISSAUGA	ON	L5J 4P9		694eros@live.com		Y	2019-06-11	Attended landowner meeting prior to PIC#1. Interested in realignment of Clearview Creek
M	Y	Mr.	ANTONIO JOSE	RODRIGUES			645 WINSTON CHURCHILL BLVD,		MISSISSAUGA	ON	L5J 4P9				N		
M	Y		Owner			1212308 ONTARIO INC	1407 DUNDAS ST W		TORONTO	ON	M6J 1Y4			621 WINSTON CHURCHILL BLVD	N		
M	Y		Owner			957661 ONTARIO LTD	2135 HIGHWAY 6, RR 3		PUSLINCH	ON	NOB 2JO			595 WINSTON CHURCHILL BLVD	N		
M	Y	Ms.	RITA	CANTALENA			555 WINSTON CHURCHILL BLVD		MISSISSAUGA	ON	L5J 4P8				N		
M	Y		Owner			VERONICA HOLDINGS LTD	3 INGLESIDE DR		Toronto	ON	M3K 1T9			535 WINSTON CHURCHILL BLVD	N		
M	Y	Mr.	Bruno	Morgado	Optimization Manager	Ash Grove, a CRH Company	2300 Steeles Ave W, 4th Floor		Concord	ON	L4K 5X6	) 602-3422/(905) 532-	bruno.morgado@ashgrove.com	2339 Lakeshore Rd W	Y	2022-10-15	Refer to letter recevied October 28, 2021 with concerns regarding Avonhead Creek realignment
E	Y	Mr.	Ashwani	Sinha		REGION OF PEEL	10 PEEL CENTRE DR;		BRAMPTON	ON	L6T4B9	905-791-7800 X 7690	ASHWANI.SINHA@PEELREGION.CA	485 AVONHEAD Rd	N		
E	Y				General	Carttera Private Equities Inc.	20 Adelaide Street East,	Suite 800	Toronto	ON	M5C2T6	Ph:416-687-2776, C:647-400-0451	info@carttera.com		N		
E	Y	Mr.	Kevin	Mitchell	Director Property, Planning & Approvals	CRH Canada Group Inc.						416-788-0015	kevin.mitchell@ca.crh.com		N		
E	Y	Ms.	Jordan	Erasmus	Senior Planner, Porfolio Planning and Developme	Infrastructure Ontario						647-264-3626	jordan.erasmus@infrastructureontario.ca		N		
E	Y				Notice Review	Infrastructure Ontario							noticereview@infrastructureontario.ca		N		
E	Y	Mr.	Mike	Duff	Director, Industrial Development	Beedie	10 Four Seasons Place	Unit 610	Etobicoke	ON	M9B 6H7	647.598.0320	mike.duff@beedie.ca	759 Winston Churchill	N		
Others																	
M	Y	Mr.	R.J.	Fulton			3329 Enniskillen Circle		Mississauga	ON	L5C 2M9	905-277-4572			Y	2019-06-11	Attended PIC1. Concern about maximum hourly/daily rainfall. Concern about sediemtn from roadways. Concern about flow rate to lake Ontario and affect on aquatic habitat

APPENDIX G1

Notice of Commencement

TMIG

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.
8800 Dufferin Street, Suite 200
Vaughan, Ontario L4K 0C5
T 905.738.5700
F 905.738.0065
www.tmig.ca

March 14, 2019 PROJECT NUMBER 18137

«First_Name» «Last_Name»
«Title1»
«Agency»
«Address_Line_1»
«Address_Line_2»
«City», «Prov» «Postal_Code»

Dear «Title» «Last_Name»:

Re: Southdown District Stormwater Servicing and Environmental Management Plan Class Environmental Assessment
City of Mississauga
Notice of Study Commencement

The City of Mississauga is developing a stormwater servicing plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place. The study area is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

The purpose of this letter is to inform you of the commencement of this Study and to solicit your comments. To this end, your assistance in ensuring that this letter is circulated to the appropriate personnel within your organization or agency is greatly appreciated. A copy of the Notice of Study Commencement as it appeared in the Mississauga News on Thursday, March 14, 2019 and Thursday, March 21, 2019 is attached to this letter showing the location of the Study Area.

The Study is being carried out in accordance with the planning and design process following a Master Plan approach, as outlined in the Municipal Class Environmental Assessment Document (October 2000, amended 2007, 2011 & 2015). The Study will describe the site's existing conditions, alternative management strategies, and the evaluation criteria to provide recommendations with respect to stormwater management, ecological restoration or enhancement opportunities within Southdown District. The findings from the study will be documented in a Project File Report.

The first of two Public Information Centres (PICs) is tentatively scheduled for Spring of 2019 to present information on the study area and initial alternative solutions. The PIC will provide an opportunity for agencies and the public to review and comment on the information to date. Notices providing the date, time and location of the PICs will be published in the Mississauga News and issued to interested agencies and stakeholders prior to the meeting. Upon completion of the Study, the Project File Report will be prepared and made available for public review.

We would appreciate receiving any information your agency may have which is relevant to this Study. If your organization or agency has any concerns and/or comments regarding this Study and you wish to provide input, please contact the undersigned using the Reply Form provided. Should the Study have no effect on your organization or agency's program mandate and/or policies, please advise the undersigned of this fact by returning the Reply Form provided. Your response would be appreciated by March 22, 2019 so that we can meet the Project schedule, and ensure your issues/concerns are addressed in a timely manner.

Should you have any questions or require additional information, please contact the undersigned at (905) 738-5700 ext. 359. Thank you for your assistance with this Study and we look forward to working with you.

Sincerely,

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.

Steve Hollingworth, P.Eng.
Consultant Project Manager
shollingworth@tmig.ca

cc:

MISSISSAUGA

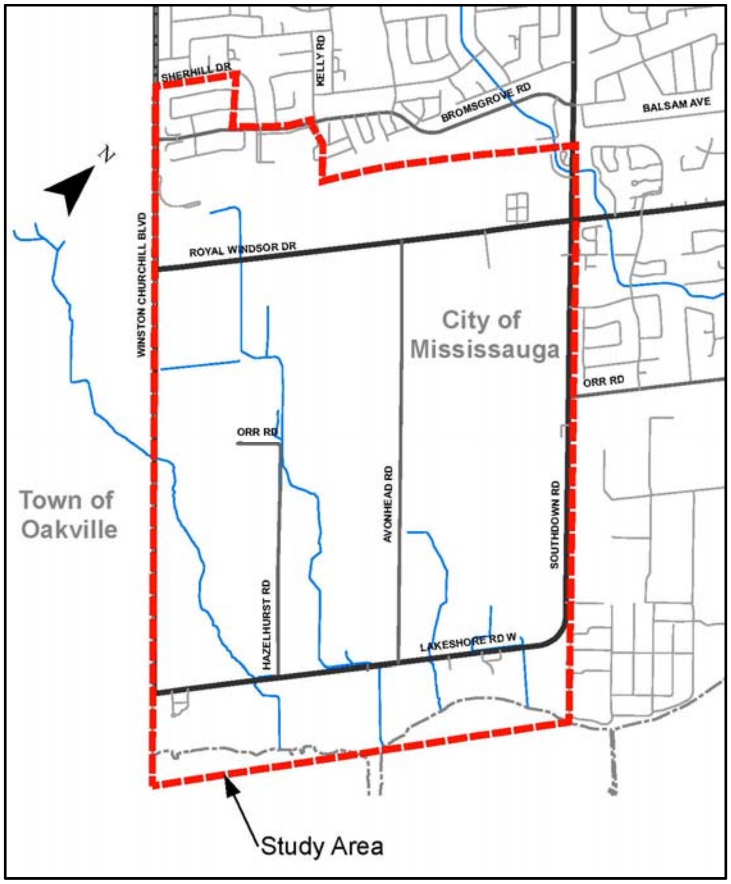
CITY OF MISSISSAUGA – NOTICE OF STUDY COMMENCEMENT:

Southdown District Stormwater Servicing and Environmental Management Plan

WHAT?

The City of Mississauga is developing a stormwater servicing and environmental management plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place.

The study is being conducted in accordance with the Municipal Class Environmental Assessment (EA) process, following a Master Plan approach.



WHY?

The stormwater drainage system in the Southdown area was last investigated in 2000 as part of the "Southdown Master Drainage Plan". Since that time, stormwater management criteria and standard practices have evolved, and there have been considerable changes to the local, regional and provincial policies.

For that reason, the City is conducting a new study to establish updated stormwater management requirements to minimize flooding, erosion, water quality degradation and water balance impacts from urban development, and to identify stream restoration opportunities within the existing drainage system.

HOW?

The study will:

- examine the stormwater drainage system within the study area, including the existing creeks, storm sewers, bridges, and culverts;
- identify drainage deficiencies and provide direction on future infrastructure needs to meet City of Mississauga standards under the current and future conditions;
- Identify stormwater management facility requirements and associated targets/criteria to treat stormwater runoff from future urban development areas;
- Provide recommendations with respect to stormwater management, ecological restoration/enhancement opportunities within the study area watersheds;

Through the Municipal Class EA process, multiple alternative solutions will be developed and evaluated by the Study Team and refined through public and agency consultation (see below). The Study Team will then select a Preferred Alternative to identify future recommended works.

At the end of the study, a Project File, documenting the study process will be available for public review.

GET INVOLVED!

Consultation is an important part of the EA process. Public input and comment are invited for incorporation into the planning and design of this project.

Two Public Information Centres (PICs) will be held to present the study findings, the alternative solutions being considered, and to answer any questions you may have. Details regarding these upcoming PICs will be advertised publicly as the study progresses.

If you have any questions or comments regarding the study, wish to provide input on the proposed solutions, or wish to be added or removed from the study mailing list, please contact:

Greg Frew, P.Eng.
Project Manager
City of Mississauga
201 City Centre Dr., Suite 800
Mississauga, ON L5B 2T4
(905) 615-3200, ext. 3362
greg.frew@mississauga.ca

Steve Hollingworth, P.Eng.
Consultant Project Manager
The Municipal Infrastructure Group
8800 Dufferin St., Suite 200
Vaughan, ON L4K 0C5
(905) 738-5700, ext. 359
shollingworth@tmig.ca

This notice signals the commencement of the Class EA, a study which will define the problem, identify/evaluate alternative solutions, and determine a preferred solution in consultation with regulatory agencies and the public. The study is being undertaken as a Master Plan, as outlined in the "*Municipal Class Environmental Assessment*" document (October 2000, amended in 2007, 2011, and 2015), which is approved under the Ontario *Environmental Assessment Act*.

Personal information is collected under the authority of the Environmental Assessment Act and will be used in the assessment process. With exception of personal information, all comments shall become part of the public records. Questions about this collection should be directed to the Project Manager listed above.

MISSISSAUGA

mississauga.ca
@citymississauga
facebook.com/citymississauga

CITY OF MISSISSAUGA – NOTICE OF STUDY COMMENCEMENT:

Southdown District Stormwater Servicing and Environmental Management Plan

WHAT?

The City of Mississauga is developing a stormwater servicing and environmental management plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place.

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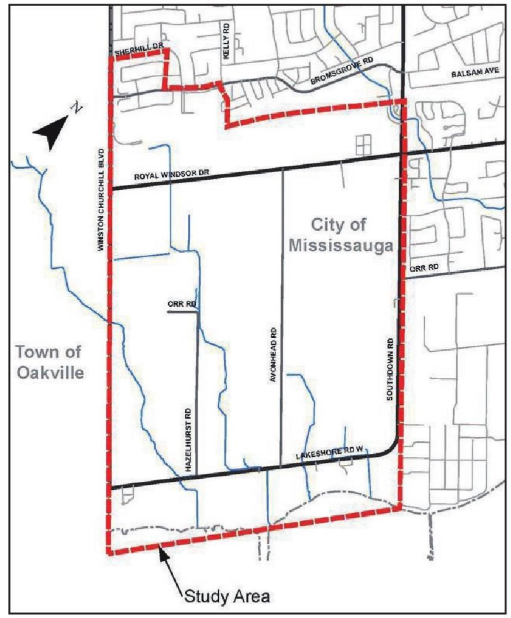

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Through the Municipal Class EA process, multiple alternative solutions will be developed and evaluated by the Study Team and refined through public and agency consultation (see below). The Study Team will then select a Preferred Alternative to identify future recommended works.
At the end of the study, a Project File, documenting the study process will be available for public review.

GET INVOLVED!

- Consultation is an important part of the EA process. Public input and comment are invited for incorporation into the planning and design of this project.
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- If you have any questions or comments regarding the study, wish to provide input on the proposed solutions, or wish to be added or removed from the study mailing list, please contact:

Greg Frew, P.Eng.
Project Manager
City of Mississauga
201 City Centre Dr., Suite 800. Mississauga, ON L5B 2T4
(905) 615-3200, ext. 3362 • greg.frew@mississauga.ca

Steve Hollingworth, P.Eng.
Consultant Project Manager
The Municipal Infrastructure Group
8800 Dufferin St., Suite 200, Vaughan, ON L4K 0C5
(905) 738-5700, ext. 359 • shollingworth@tmig.ca

This notice signals the commencement of the Class EA, a study which will define the problem, identify/evaluate alternative solutions, and determine a preferred solution in consultation with regulatory agencies and the public. The study is being undertaken as a Master Plan, as outlined in the *“Municipal Class Environmental Assessment”* document (October 2000, amended in 2007, 2011, and 2015), which is approved under the Ontario *Environmental Assessment Act*.

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Ministry of the Environment, Conservation and Parks
Central Region
5775 Yonge Street, 8th Floor
North York ON M2M 4J1
Phone: 416.326.6700
Fax: 416.325.6345

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région du Centre
8e étage, 5775, rue Yonge
North York ON M2M 4J1
Tél : 416 326-6700
Téléc : 416 325-6345

April 9, 2019 File No.: EA 01-06-11

Greg Frew
Project Manager
City of Mississauga
201 City Centre Drive, Suite 800
Mississauga, ON L5B 2T4
greg.frew@mississauga.ca
BY EMAIL ONLY

Re: **Southdown District Stormwater Servicing and Environmental Management Plan**
City of Mississauga
Municipal Class EA – Master Plan, Approach #1
Response to Notice of Commencement

Dear Mr. Frew

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the City of Mississauga has indicated that the study is following the approved environmental planning process for a Master Plan project under the Municipal Class Environmental Assessment (Class EA), and that the study is being undertaken in accordance with Approach #1 for Master Plans, which will fulfill the requirements for Schedule A and A+ projects, and become the basis for future investigations for specific Schedule B and C projects.

The **updated** attached “Areas of Interest” document provides guidance regarding the ministry’s interests with respect to the Class EA process. Please identify the areas of interest which are applicable to the project and ensure they are addressed. Proponents who address all of the applicable areas of interest can minimize potential delays to the project schedule.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada’s *Constitution Act* 1982. Where the Crown’s duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- Six Nations of the Grand River;
- Mississaugas of the Credit First Nation;
- Haudenosaunee Confederacy Chiefs Council; and
- Huron-Wendat Nation (if there is potential to impact archaeological resources).

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process" which can be found at the following link: https://www.ontario.ca/document/consultation-ontarios-environmental-assessment-process
Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information.

The proponent must contact the Director of Environmental Approvals Branch under the following circumstances after initial discussions with the communities identified by MECP:
- Aboriginal or treaty rights impacts are identified to the proponent by the communities
- The proponent has reason to believe that the proposed project may adversely affect an Aboriginal or treaty right
- Consultation has reached an impasse
- A Part II Order request or elevation request is expected

The Director of the Environmental Approvals Branch can be notified either by email with the subject line "Potential Duty to Consult" to enviropermissions@ontario.ca or by mail or fax at the address provided below:

Email:	enviropermissions@ontario.ca Subject: Potential Duty to Consult
Fax:	416-314-8452
Address:	Environmental Assessment and Permissions Branch 135 St. Clair Avenue West, 1st Floor Toronto, ON, M4V 1P5

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role the proponent will be asked to play in them.

A draft copy of the Master Plan Report (MPR) should be sent to this office prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments. Please also forward the Notice of Completion and final MPR to me when completed.

Should you or any members of your project team have any questions regarding the material above, please contact me at trevor.bell@ontario.ca or 416-326-3577.

Yours truly,

Trevor Bell
Regional Environmental Assessment Coordinator
Air, Pesticides and Environmental Planning

cc: Paul Martin, Supervisor, Technical Support Section, MECP
Tina Dufresne, Manager, Halton Peel District Office, MECP
Steve Hollingworth, Consultant Project Manager, TMIG

Central Region EA File
A & P File

Attach: Areas of Interest
A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities

AREAS OF INTEREST

It is suggested that you check off each applicable area after you have considered / addressed it.

☐ **Source Water Protection (all projects)**

The Clean Water Act, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or near other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- As you may be aware, in October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the MPR on source water protection.**
    - o The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether the project is located in a vulnerable area and provide applicable details about the area. If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the MPR how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php.The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. The contact for this project is Jennifer Stephens at 416-661-6600 ext. 5568 or jstephens@trca.on.ca. Please document the results of that consultation within the MPR and include all communication documents/correspondence.**

More Information
For more information on the Clean Water Act, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the Clean Water Act. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

☐ **Climate Change**

Ontario is leading the fight against climate change through the Climate Change Action Plan. Recently released, the plan lays out the specific actions Ontario will take in the next five years to meet its 2020 greenhouse gas reduction targets and establishes the framework necessary to meet its long-term targets. As a commitment of the action plan, **the province has now finalized a guide, "Considering Climate Change in the Environmental Assessment Process" (2017) (Guide).**

The Guide is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. **Proponents should review this Guide in detail.**

- The MECP expects proponent to:

1. Consider during the assessment of alternative solutions and alternative designs, the following:
   a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
   b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
2. Include a discrete section in the MPR detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered. Please ensure climate change is considered in the report.

☐ **Planning and Policy**

- Parts of the study area may be subject to the Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan, Greenbelt Plan, Lake Simcoe Protection Plan, or Growth Plan for the Greater Golden Horseshoe. Applicable policies should be referenced in the MPR, and the proponent should describe how the proposed study adheres to the relevant policies in these plans. **The new 2017 provincial plans are now in effect.**

- The Provincial Policy Statement (2014) contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the MPR, and the proponent should describe how this proposed project is consistent with these policies.

Air Quality, Dust and Noise

- If there are sensitive receptors in the surrounding area of this project, an air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- **If a full Air Quality Impact Assessment is not required for the project, the MPR should still contain:**
    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- Please note that the ministry recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities.* Report prepared for Environment Canada. March 2005.

- The MPR should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The MPR should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- All natural heritage features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:

    - Areas of Natural and Scientific Interest (ANSIs)
    - Rare Species of flora or fauna
    - Watercourses
    - Wetlands
    - Woodlots

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, you may consider the provisions of the Rouge Park Management Plan if applicable.

Surface Water

- The MPR must include a sufficient level of information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the MPR and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the Ontario Water Resources Act (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the MPR should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the MPR. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day. It should be noted that certain water taking activities have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the MPR.

- If the potential construction or decommissioning of water wells is identified as an issue, the MPR should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the MPR. A PTTW under the OWRA will be required for any water takings that exceed 50,000 L/day. It should be noted that certain water taking activities have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW.

Contaminated Soils

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the ministry's District Offices for further consultation if contaminated sites are present.

- Any current or historical waste disposal sites should be identified in the MPR. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites.

- The location of any underground storage tanks should be investigated in the MPR. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- The MPR should identify any underground transmission lines in the study area. The owners should be consulted to avoid impacts to this infrastructure, including potential spills.

Excess Materials Management

- Activities involving the management of excess soil should be completed in accordance with the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements.

Servicing and Facilities

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with the Environmental Approvals Access and Service Integration Branch (EAASIB) to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's "D-Series" guidelines – Land Use Compatibility to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Mitigation and Monitoring

Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the MPR and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the MPR, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

Consultation

- The MPR must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the MPR that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The Class EA also directs proponents to include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments.

Class EA Process

- The MPR should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. The Master Plan should clearly indicate the selected approach for conducting the plan, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Part II Order Requests under the *Environmental Assessment Act* (EAA), although the plan itself would not be.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment. The MPR should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the MPR.

- Please include in the MPR a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, and approval under the *Canadian Environmental Assessment Act 2012* (CEAA 2012)

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the MPR.

DEFINITIONS

The following definitions are specific to this document and may not apply in other contexts:

Aboriginal communities – the First Nation or Métis communities identified by the Crown for the purpose of consultation.

Consultation – the Crown's legal obligation to consult when the Crown has knowledge of an established or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. This is the type of consultation required pursuant to s. 35 of the *Constitution Act, 1982*. Note that this definition does not include consultation with Aboriginal communities for other reasons, such as regulatory requirements.

Crown – the Ontario Crown, acting through a particular ministry or ministries.

Procedural aspects of consultation – those portions of consultation related to the process of consultation, such as notifying an Aboriginal community about a project, providing information about the potential impacts of a project, responding to concerns raised by an Aboriginal community and proposing changes to the project to avoid negative impacts.

Proponent – the person or entity that wants to undertake a project and requires an Ontario Crown decision or approval for the project.

I. PURPOSE

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that may adversely impact that right. In outlining a framework for the duty to consult, the Supreme Court of Canada has stated that the Crown may delegate procedural aspects of consultation to third parties. This document provides general information about the Ontario Crown's approach to delegation of the procedural aspects of consultation to proponents.

This document is not intended to instruct a proponent about an individual project, and it does not constitute legal advice.

II. WHY IS IT NECESSARY TO CONSULT WITH ABORIGINAL COMMUNITIES?

The objective of the modern law of Aboriginal and treaty rights is the *reconciliation* of Aboriginal peoples and non-Aboriginal peoples and their respective rights, claims and interests. Consultation is an important component of the reconciliation process.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. For example, the Crown's duty to consult is triggered when it considers issuing a permit, authorization or approval for a project which has the potential to adversely impact an Aboriginal right, such as the right to hunt, fish, or trap in a particular area.

The scope of consultation required in particular circumstances ranges across a spectrum depending on both the nature of the asserted or established right and the seriousness of the potential adverse impacts on that right.

Depending on the particular circumstances, the Crown may also need to take steps to accommodate the potentially impacted Aboriginal or treaty right. For example, the Crown may be required to avoid or minimize the potential adverse impacts of the project.

III. THE CROWN'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

The Crown has the responsibility for ensuring that the duty to consult, and accommodate where appropriate, is met. However, the Crown may delegate the procedural aspects of consultation to a proponent.

There are different ways in which the Crown may delegate the procedural aspects of consultation to a proponent, including through a letter, a memorandum of understanding, legislation, regulation, policy and codes of practice.

If the Crown decides to delegate procedural aspects of consultation, the Crown will generally:

- Ensure that the delegation of procedural aspects of consultation and the responsibilities of the proponent are clearly communicated to the proponent;
- Identify which Aboriginal communities must be consulted;
- Provide contact information for the Aboriginal communities;
- Revise, as necessary, the list of Aboriginal communities to be consulted as new information becomes available and is assessed by the Crown;
- Assess the scope of consultation owed to the Aboriginal communities;
- Maintain appropriate oversight of the actions taken by the proponent in fulfilling the procedural aspects of consultation;
- Assess the adequacy of consultation that is undertaken and any accommodation that may be required;
- Provide a contact within any responsible ministry in case issues arise that require direction from the Crown; and
- Participate in the consultation process as necessary and as determined by the Crown.

IV. THE PROPONENT'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

Where aspects of the consultation process have been delegated to a proponent, the Crown, in meeting its duty to consult, will rely on the proponent's consultation activities and documentation of those activities. The consultation process informs the Crown's decision of whether or not to approve a proposed project or activity.

A proponent's role and responsibilities will vary depending on a variety of factors including the extent of consultation required in the circumstance and the procedural aspects of consultation the Crown has delegated to it. Proponents are often in a better position than the Crown to discuss a project and its potential impacts with Aboriginal communities and to determine ways to avoid or minimize the adverse impacts of a project.

A proponent can raise issues or questions with the Crown at any time during the consultation process. If issues or concerns arise during the consultation that cannot be addressed by the proponent, the proponent should contact the Crown.

a) What might a proponent be required to do in carrying out the procedural aspects of

consultation?

Where the Crown delegates procedural aspects of consultation, it is often the proponent's responsibility to provide notice of the proposed project to the identified Aboriginal communities. The notice should indicate that the Crown has delegated the procedural aspects of consultation to the proponent and should include the following information:

- a description of the proposed project or activity;
- mapping;
- proposed timelines;
- details regarding anticipated environmental and other impacts;
- details regarding opportunities to comment; and
- any changes to the proposed project that have been made for seasonal conditions or other factors, where relevant.

Proponents should provide enough information and time to allow Aboriginal communities to provide meaningful feedback regarding the potential impacts of the project. Depending on the nature of consultation required for a project, a proponent also may be required to:

- provide the Crown with copies of any consultation plans prepared and an opportunity to review and comment;
- ensure that any necessary follow-up discussions with Aboriginal communities take place in a timely manner, including to confirm receipt of information, share and update information and to address questions or concerns that may arise;
- as appropriate, discuss with Aboriginal communities potential mitigation measures and/or changes to the project in response to concerns raised by Aboriginal communities;
- use language that is accessible and not overly technical, and translate material into Aboriginal languages where requested or appropriate;
- bear the reasonable costs associated with the consultation process such as, but not limited to, meeting hall rental, meal costs, document translation(s), or to address technical & capacity issues;
- provide the Crown with all the details about potential impacts on established or asserted Aboriginal or treaty rights, how these concerns have been considered and addressed by the proponent and the Aboriginal communities and any steps taken to mitigate the potential impacts;
- provide the Crown with complete and accurate documentation from these meetings and communications; and
- notify the Crown immediately if an Aboriginal community not identified by the Crown approaches the proponent seeking consultation opportunities.

b) What documentation and reporting does the Crown need from the proponent?

Proponents should keep records of all communications with the Aboriginal communities involved in the consultation process and any information provided to these Aboriginal communities.

As the Crown is required to assess the adequacy of consultation, it needs documentation to satisfy itself that the proponent has fulfilled the procedural aspects of consultation delegated to it. The documentation required would typically include:

- the date of meetings, the agendas, any materials distributed, those in attendance and copies of any minutes prepared;
- the description of the proposed project that was shared at the meeting;
- any and all concerns or other feedback provided by the communities;
- any information that was shared by a community in relation to its asserted or established

Aboriginal or treaty rights and any potential adverse impacts of the proposed activity, approval or disposition on such rights;

- any proposed project changes or mitigation measures that were discussed, and feedback from Aboriginal communities about the proposed changes and measures;
- any commitments made by the proponent in response to any concerns raised, and feedback from Aboriginal communities on those commitments;
- copies of correspondence to or from Aboriginal communities, and any materials distributed electronically or by mail;
- information regarding any financial assistance provided by the proponent to enable participation by Aboriginal communities in the consultation;
- periodic consultation progress reports or copies of meeting notes if requested by the Crown;
- a summary of how the delegated aspects of consultation were carried out and the results; and
- a summary of issues raised by the Aboriginal communities, how the issues were addressed and any outstanding issues.

In certain circumstances, the Crown may share and discuss the proponent's consultation record with an Aboriginal community to ensure that it is an accurate reflection of the consultation process.

c) Will the Crown require a proponent to provide information about its commercial arrangements with Aboriginal communities?

The Crown may require a proponent to share information about aspects of commercial arrangements between the proponent and Aboriginal communities where the arrangements:

- include elements that are directed at mitigating or otherwise addressing impacts of the project;
- include securing an Aboriginal community's support for the project; or
- may potentially affect the obligations of the Crown to the Aboriginal communities.

The proponent should make every reasonable effort to exempt the Crown from confidentiality provisions in commercial arrangements with Aboriginal communities to the extent necessary to allow this information to be shared with the Crown.

The Crown cannot guarantee that information shared with the Crown will remain confidential. Confidential commercial information should not be provided to the Crown as part of the consultation record if it is not relevant to the duty to consult or otherwise required to be submitted to the Crown as part of the regulatory process.

V. WHAT ARE THE ROLES AND RESPONSIBILITIES OF ABORIGINAL COMMUNITIES' IN THE CONSULTATION PROCESS?

Like the Crown, Aboriginal communities are expected to engage in consultation in good faith. This includes:

- responding to the consultation notice;
- engaging in the proposed consultation process;
- providing relevant documentation;
- clearly articulating the potential impacts of the proposed project on Aboriginal or treaty rights; and
- discussing ways to mitigate any adverse impacts.

Some Aboriginal communities have developed tools, such as consultation protocols, policies or processes that provide guidance on how they would prefer to be consulted. Although not legally binding, proponents are encouraged to respect these community processes where it is reasonable to do so. Please note that there is no obligation for a proponent to pay a fee to an Aboriginal community in order to enter into a consultation process.

To ensure that the Crown is aware of existing community consultation protocols, proponents should contact the relevant Crown ministry when presented with a consultation protocol by an Aboriginal community or anyone purporting to be a representative of an Aboriginal community.

VI. WHAT IF MORE THAN ONE PROVINCIAL CROWN MINISTRY IS INVOLVED IN APPROVING A PROPONENT'S PROJECT?

Depending on the project and the required permits or approvals, one or more ministries may delegate procedural aspects of the Crown's duty to consult to the proponent. The proponent may contact individual ministries for guidance related to the delegation of procedural aspects of consultation for ministry-specific permits/approvals required for the project in question. Proponents are encouraged to seek input from all involved Crown ministries sooner rather than later.

From: Kowalyk, Bohdan (MNRF) <bohdan.kowalyk@ontario.ca>
Sent: March 19, 2019 10:05 AM
To: Steve Hollingworth; greg.frew@mississauga.ca
Subject: Southdown District Stormwater Servicing and Environmental Management Plan Class EA, Mississauga

Categories: Orange Category

Hello,

We have received your Notice of Study Commencement for this project.

In addition to the watercourses, natural features in the area include significant woodlands. Known species at risk in the vicinity include Butternut (endangered), endangered bats, Common Nighthawk (special concern) and Peregrine Falcon (special concern).

We will be interested in related findings of your study.

Regards,

Bohdan Kowalyk, R.P.F.
District Planner, Aurora District, Ontario Ministry of Natural Resources and Forestry
50 Bloomington Road, Aurora, Ontario L4G 0L8
Phone: 905-713-7387; Email: Bohdan.Kowalyk@Ontario.ca

From: Matt Howatt <mhowatt@hrca.on.ca>
Sent: March 27, 2019 12:54 PM
To: Steve Hollingworth
Cc: Greg Frew (Greg.Frew@mississauga.ca)
Subject: Southdown District Stormwater Servicing and Environmental Management Plan Class EA - Notice of Study Commencement

Hi Steve,

Thank you for sending CH the Notice of Study Commencement letter regarding the above-noted study and my apologies for the delay in following up.

At this stage, CH staff do not have any comments or concerns to submit regarding the study. As discussed at our introductory meeting on May 31, 2018, CH staff wish to continue to receive notices and information as the study progresses but do not expect to play a significant role in the future PICs or stakeholder meetings given the small portion of the Study Area within our watershed jurisdiction.

We're happy to continue to provide any information, input or support to the study team from our watershed perspective, as needed.

Please contact me should you have any questions or wish to discuss further.

Regards,
Matt

Matt Howatt
Coordinator, Regional Infrastructure Team

Conservation Halton
2596 Britannia Road West, Burlington, ON L7P 0G3
905.336.1158 ext. 2311 | Fax 905.336.6684 | mhowatt@hrca.on.ca
conservationhalton.ca

Hydro One Networks Inc
483 Bay St
Toronto, ON

August 26, 2019

Re: Southdown District Stormwater Servicing and Environmental Management Plan

Attention:
Greg Frew, P.Eng.
Project Manager
City of Mississauga

In our preliminary assessment, we have confirmed that Hydro One has existing high voltage Transmission facilities within your study area. At this point in time we do not have enough information about your project to provide you with meaningful input with respect to the impacts that your project may have on our infrastructure. As such, this response does not constitute any sort of approval for your plans and is being sent to you as a courtesy to inform you that we must be consulted on your project.

In addition to the existing infrastructure mentioned above, the affected transmission corridor may have provisions for future lines or already contain secondary land uses (i.e. pipelines, watermains, parking, etc). Please take this into consideration in your planning.

Also, we would like to bring to your attention that should (Southdown District Stormwater Servicing and Environmental Management Plan) result in a Hydro One station expansion or transmission line replacement and/or relocation, an environmental assessment (EA) will be required as described under the Class Environmental Assessment for Minor Transmission Facilities (Hydro One, 2016). This EA process would require a minimum of 6 months to be completed and associated costs will be allocated and recovered in accordance with the Transmission System Code. Furthermore, to complete an EA it can take from 6 months (to complete a Class EA Screening Process) to 18 months (to complete a Full Class EA Process) based on the level of assessment required for the EA. In order to achieve speedy completion of the EA, Hydro One will need to rely on studies and/or reports completed as part of the EA for your project.

Please allow the appropriate lead-time in your project schedule in the event that your proposed development impacts Hydro One infrastructure to the extent that it would require modifications to our infrastructure.

In planning, please note that developments should not reduce line clearances or limit access to our facilities at any time in the study area of your Proposal. Any construction activities must maintain the electrical clearance from the transmission line conductors as specified in the Ontario Health and Safety Act for the respective line voltage.

Please note that the proponent will be held responsible for all costs associated with modification or relocation of Hydro One facilities, as well as any added costs that may be incurred due to increase efforts to maintain our facilities.

We reiterate that this message does not constitute any form of approval for your project. Hydro One must be consulted during all stages of your project. Please ensure that all future communications about your project are sent to us electronically to secondarylanduse@hydroone.com.

Sent on behalf of,

Secondary Land Use
Asset Optimization
Strategy & Integrated Planning
Hydro One Networks Inc.

From: Nick Dell <nickdell8@gmail.com>
Sent: March 22, 2019 3:24 PM
To: Steve Hollingworth
Subject: Project 18137 - Notice of Interested Party: 595 Winston Churchill Blvd.

Categories: Orange Category

Hi Steve,

Southdown District Stormwater Servicing and Environmental Management Plan Class Environmental Assessment.

Re: Notice of Study Commencement

I would like to be kept posted on all PIC notices and look forward to sharing information related to the EA throughout this process.

The previous 1980's Master Plan presented and was of significant interest to my client, and has been the topic of much discussion amongst landowners within the Southdown Local Area.

Best regards,

--
Nicholas Dell BA. H
Harper Dell & Associates Inc.
Planning, Traffic and Land Development Consultants
1370 Hurontario St.
Mississauga, ON. L5G 3H4

Phone 905 615-0614 Fax 905 270 1936
Email nickdell8@gmail.com
Website www.gregdell.ca

APPENDIX G2

Public Information Centre # 1

ISSUED TO ALL INDIGENOUS COMMUNITIES AND STAKEHOLDERS WHO INDICATED AN INTEREST IN THE STUDY IN RESPONSE TO THE NOTICE OF COMMENCEMENT

From:	Steve Hollingworth
Sent:	May 30, 2019 2:51 PM
To:	Greg Frew
Subject:	Southdown District Stormwater Servicing and Environmental Management Plan - Public Information Centre # 1
Attachments:	2019 02 22 - 18137 - Notice of Commencement Southdown.pdf; Notice of PIC1_Southdown_Miss.News ad.pdf

The City of Mississauga is developing a stormwater servicing plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place. The study area is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

The Study is being carried out in accordance with the planning and design process and will be undertaken as a Master Plan and will follow Approach 1, as outlined in the Municipal Class Environmental Assessment Document (October 2000, amended 2007, 2011 & 2015).

In March 2019, we mailed a hard copy of the Notice of Study Commencement for the study. To date, we have not received a response from your community.

This message is intended to solicit feedback from your community regarding the study, and to inform you of the first Public Information Centre (PIC) for the project, to be held on Tuesday, June 11, 2019 from 6 to 8 pm at the Clarkson Community Centre, Lower Lobby (2475 Truscott Dr., Mississauga, ON). We will be introducing the project, goals and objectives of the study and the problems and opportunities to be address. Potential alternative solutions and the next steps will also be presented.

Please find attached a copy of the Notice of Commencement and a copy of the Notice of Public Information Centre # 1

We look forward to receiving your feedback on this study.

Regards

Steve Hollingworth
Director of Stormwater Management

TMIG | The Municipal Infrastructure Group Ltd.
8800 Dufferin Street, Suite 200 | Vaughan, Ontario L4K 0C5
p: 905.738.5700 x 359 | c: 416.300.0415 | f: 905.738.0065 | tmig.ca

ISSUED TO ALL LANDOWNERS IN THE STUDY AREA

From: Steve Hollingworth
Sent: May 30, 2019 2:20 PM
To: 'Greg Frew'
Subject: Southdown District Stormwater Servicing and Environmental Management Plan - Public Information Centre # 1
Attachments: Notice of PIC1_Southdown_Miss.News ad.pdf

You are receiving this message because you have been identified as a landowner or landowner representative within the Southdown District in the City of Mississauga.

The City of Mississauga is developing a stormwater servicing plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place. The study area is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

Please find attached a notice for the first of two Public Information Centres (PIC) for the project, to be held on Tuesday, June 11, 2019 from 6 to 8 pm at the Clarkson Community Centre, Lower Lobby (2475 Truscott Dr., Mississauga, ON). The notice contains more information regarding the study scope, process and timing. **In addition, the City is hosting a separate meeting for landowners in the study area** in the afternoon, prior to the PIC.

As a landowner (or representative) in the study area, you are invited to this meeting where we will be introducing the project, goals and objectives of the study and the problems and opportunities to be address. Potential alternative solutions and the next steps will also be presented.

- **Meeting Date and Time**: Tuesday, June 11, 2019 from **3 pm** to **5 pm**
- **Meeting Location:** Clarkson Community Centre, Lower Lobby (2475 Truscott Dr., Mississauga, ON).

We look forward to seeing you at the landowner meeting and/or PIC on June 11th. If you are not able to attend, the display materials should be available on the City's website (www.mississauga.ca) shortly after the PIC. Should you have any questions or require additional information, please contact the undersigned at (905) 738-5700 ext. 359, or Greg Frew at the City of Mississauga (905-615-3200 ext. 3362).

If you are planning to attend the landowner meeting in the afternoon of June 11th, we would appreciate it if you could RSVP by replying to this message

Thank you for your assistance with this Study and we look forward to working with you.

Steve Hollingworth
Director of Stormwater Management

TMIG | The Municipal Infrastructure Group Ltd.
8800 Dufferin Street, Suite 200 | Vaughan, Ontario L4K 0C5
p: 905.738.5700 x 359 | c: 416.300.0415 | f: 905.738.0065 | tmig.ca

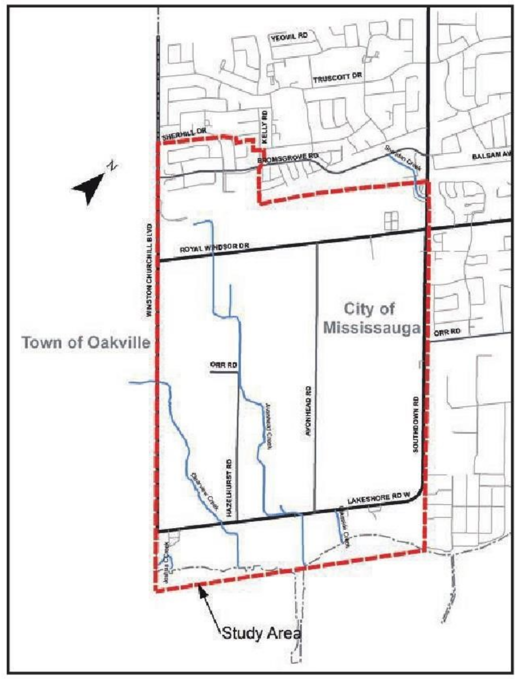
CITY OF MISSISSAUGA – PUBLIC INFORMATION CENTRE:

Southdown District Stormwater Servicing and Environmental Management Plan

WHAT?

The City of Mississauga is developing a stormwater servicing and environmental management plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place.

The study is being conducted in accordance with the Municipal Class Environmental Assessment (EA) process, following a Master Plan approach.



WHY?

The stormwater drainage system in the Southdown area was last investigated in 2000 as part of the "Southdown Master Drainage Plan". Since that time, stormwater management criteria and standard practices have evolved, and there have been considerable changes to the local, regional and provincial policies.

For that reason, the City is conducting a new study to establish updated stormwater management requirements to minimize flooding, erosion, water quality degradation and water balance impacts from urban development, and to identify stream restoration opportunities within the existing drainage system.

HOW?

The study will:

- Examine the stormwater drainage system within the study area, including the existing creeks, storm sewers, bridges, and culverts;
- Identify drainage deficiencies and provide direction on future infrastructure needs to meet City of Mississauga standards under the current and future conditions;
- Identify stormwater management facility requirements and associated targets/criteria to treat stormwater runoff from future urban development areas;
- Provide recommendations with respect to stormwater management, ecological restoration/ enhancement opportunities within the study area watersheds;

Through the Municipal Class EA process, multiple alternative solutions will be developed and evaluated by the Study Team and refined through public and agency consultation (see below). The Study Team will then select a Preferred Alternative to identify future recommended works.

At the end of the study, a Project File, documenting the study process will be available for public review.

Public Consultation

Consultation is an important part of the EA process. Public input and comment are invited for incorporation into the planning and design of this project.

Two Public Information Centres (PICs) will be held to present the study findings, the alternative solutions being considered, and to answer any questions you may have. The first PIC is scheduled for **Tuesday June 11, 2019** to provide members of the public with an opportunity to meet the project team, review the study background, existing conditions, problems and opportunities, alternative solutions, and next steps in the study. The PIC will be held as follows:

DATE: **11 June, 2019**

TIME: **6:00 pm to 8:00 pm**

LOCATION: **Clarkson Community Centre, Lower Lobby**
2475 Truscott Dr.

The PIC will be an "open house" drop-in format with poster board displays illustrating the existing conditions of the study area, the problems, and optional solutions that are being considered. City staff and the study consultant will be available to discuss the project and answer questions.

If you have any questions or comments regarding the study, require additional information, or wish to be added or removed from the study mailing list, please contact:

Greg Frew, P.Eng.	Steve Hollingworth, P.Eng.
Project Manager	*Consultant Project Manager*
City of Mississauga	The Municipal Infrastructure Group
201 City Centre Dr., Suite 800	8800 Dufferin St., Suite 200
Mississauga, ON L5B 2T4	Vaughan, ON L4K 0C5
(905) 615-3200, ext. 3362	(905) 738-5700, ext. 359
greg.frew@mississauga.ca	shollingworth@tmig.ca

Personal information is collected under the authority of the Environmental Assessment Act and will be used in the assessment process. With exception of personal information, all comments shall become part of the public records. Questions about this collection should be directed to the Project Manager listed above.

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

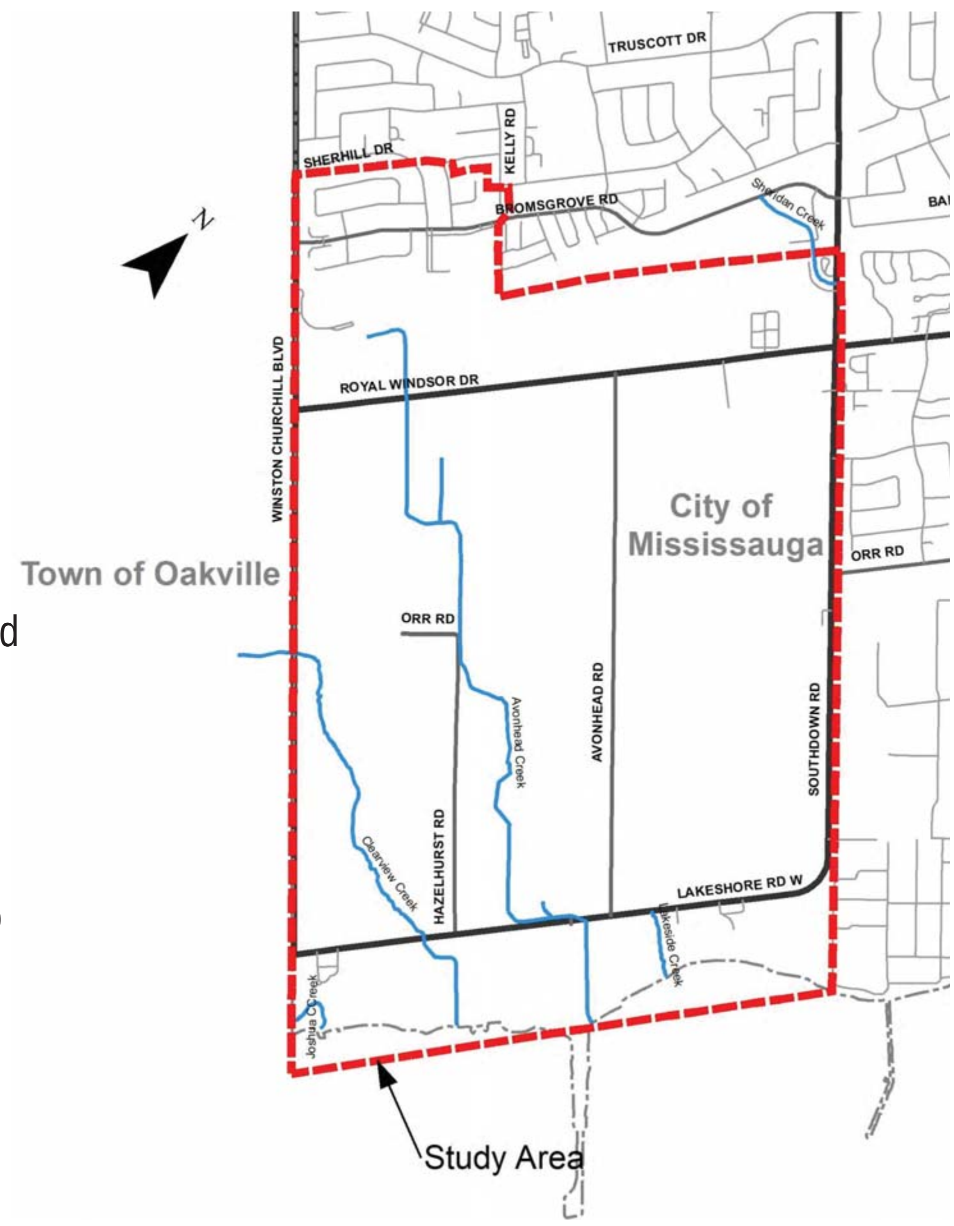
Public Information Centre #1
June 11, 2019
6 to 8 p.m.

Please sign in on the sheet provided. Then feel free to walk around, view the displays and fill out a comment sheet.

The purpose of this Public Information Centre (PIC) is to introduce you to this project, inform you of our progress to date, and obtain your comments.

If you have any questions, our representatives will be pleased to discuss the project with you.

We are interested in receiving any comments that you may have about the project. Should you have any questions, comments, require further information or wish to be added to the project mailing list, please contact either Steve or Greg.



Mr. Steve Hollingworth
Consultant Project Manager
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Tel: (905) 738-5700 Ext. 359
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City Project Manager
City of Mississauga
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Mississauga, ON L5B 2T4
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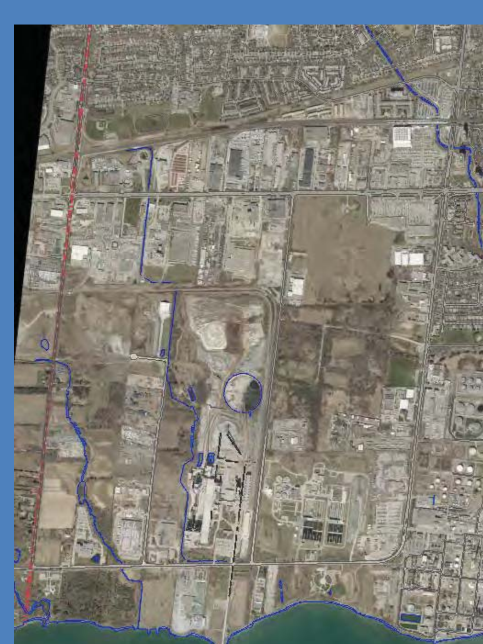
Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Study Purpose

The stormwater drainage system in the Southdown area was last investigated in 2000 as part of the "Southdown Master Drainage Plan". Since that time, stormwater management criteria and standard practices have evolved, and there have been considerable changes to the local, regional and provincial policies related to the protection and enhancement of watercourses and other natural heritage features. For that reason, a new Stormwater Servicing and Environmental Management Plan is needed *to establish updated stormwater management requirements and watercourse improvements required to support long term growth and intensification*, as defined by the urban structure framework and policy of the Southdown Local Area Plan.

2000



2019

Future Growth & Intensification

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Municipal Class Environmental Assessment (EA) Process

The study is being conducted as a Master Plan and is intended to satisfy Phases 1&2 of the Municipal Class EA process. Stakeholder input is an important component of the process.

Class EA Phase 1		Class EA Phase 2			Implementation
Identify Problem or Opportunity	Background Review	Site Inventory / Investigation	Evaluation of Alternatives	Preliminary Design / Project File Report	Detailed Design / Implementation
• Identify Need • Initiate Consultation with the public and agencies • Notice of Commencement	• Obtain and review background documentation and initiate agency contact • Identify data gaps to be address during the site inventory/ investigation	• Undertake natural heritage investigations • Aquatic habitat assessment • Incidental wildlife survey • Undertake hydrology/hydraulics investigation • Archeological Investigations • Identify opportunities and constraints • PIC #1	• Identify alternatives • Complete impact assessments • Evaluate alternatives • Select preferred alternative	• Preliminary design of preferred alternative • Recommendation for further study, if required • PIC# 2 • Develop a staging and implementation plan • Prepare Project File Report • Notice of Completion • 30-day Public Review	• Detailed design of the proposed works • Obtain permits and approvals • Prepare contract drawings and tender documents • Construction and operation of the works • Post-construction monitoring

Project Schedule

Spring 2019

- Liaison committee meeting with key stakeholders to review existing conditions
- Public Information Centre (PIC) #1 (Tonight)
- Development of initial stormwater management and watercourse improvement alternatives

Fall 2019

- Liaison committee meeting to review of alternative solutions and the evaluation process
- PIC #2 to present the alternative solutions and evaluation results
- Selection of the preliminary preferred alternative

Winter 2019

- Notice of Completion
- File project with the Ministry of the Environment, Conservation and Parks

MISSISSAUGA

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Existing Conditions: Study Area Watercourses


Clearview Creek downstream of Winston Churchill Blvd: meandering channel through sparse vegetation on private lots


Clearview Creek: online agricultural pond


Clearview Creek upstream of Lakeshore Rd: meandering natural channel through mature riparian vegetation


Clearview Creek downstream of Lakeshore Rd: concrete engineered channel


Sheridan Creek at CNR: concrete engineered channel


Avonhead Creek downstream of Royal Windsor Drive: narrow straightened channel/swale


Avonhead Creek through concrete plant: CSP and concrete lined channel


Lakeside Creek downstream of Lakeshore Road: natural channel through mature riparian vegetation


Joshua Creek: outlet to Lake Ontario


Avonhead Creek upstream of Lakeshore Road: grass-lined channel

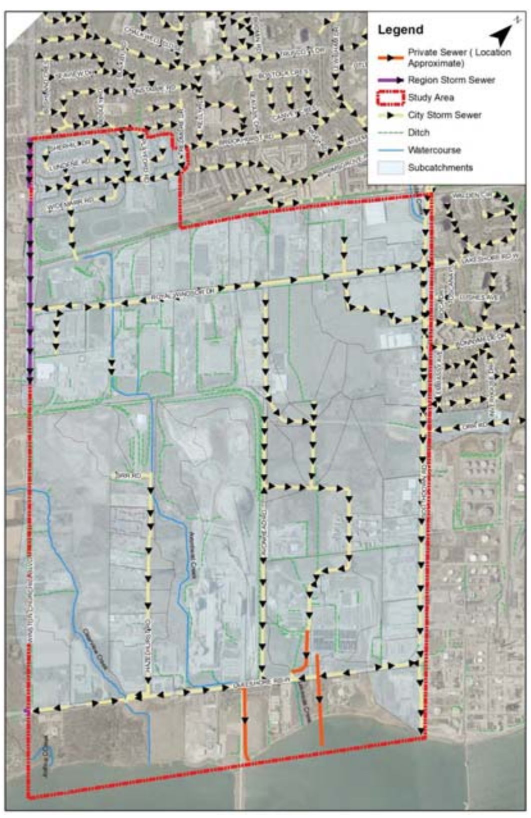

Avonhead Creek downstream of Lakeshore Road: piped to outlet at Lake Ontario

TMIG

MISSISSAUGA

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Existing Conditions: Storm Sewers and Road Drainage



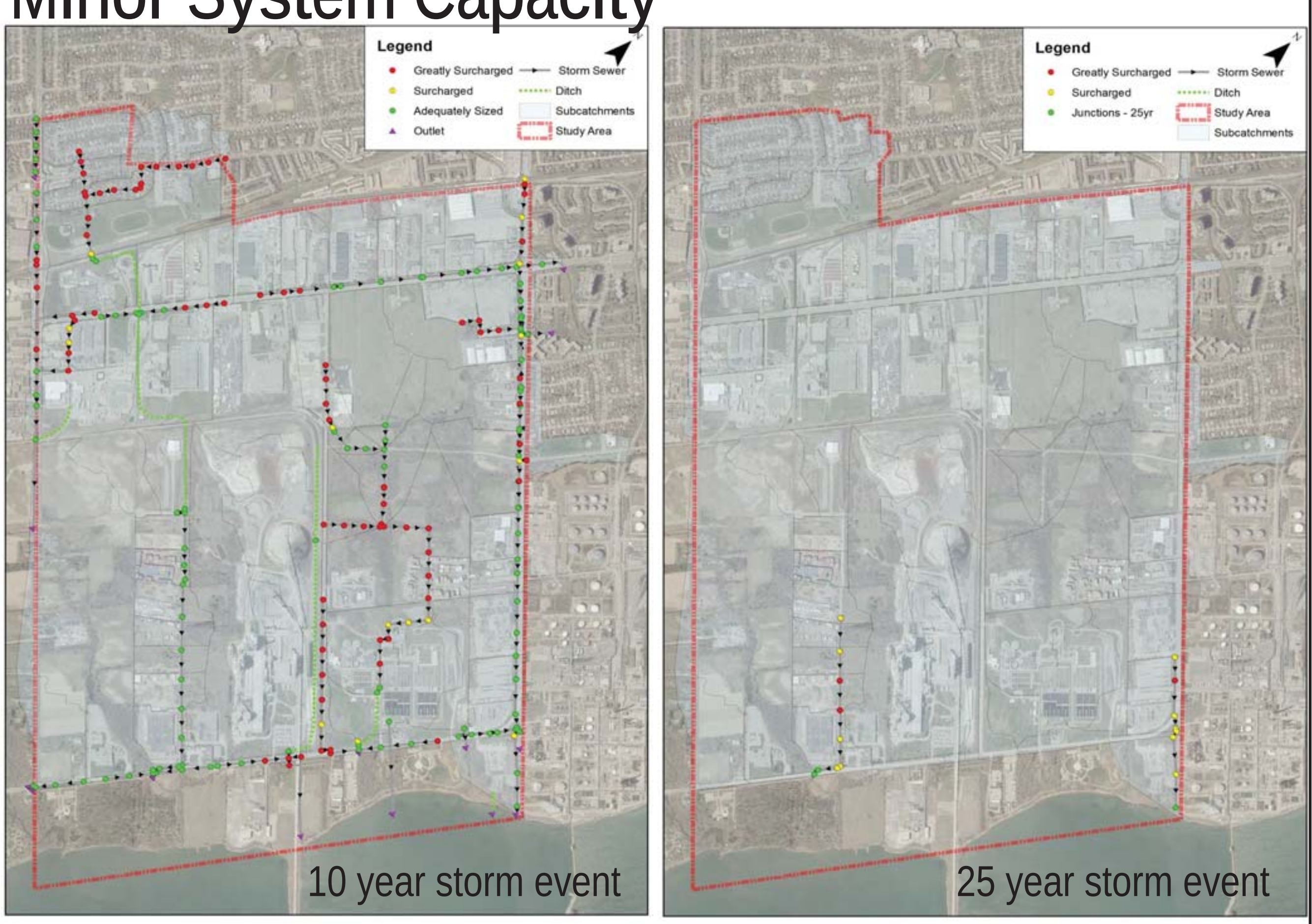
Computer modelling was completed to assess the capacity of the existing storm sewers and road drainage:

City of Mississauga design standards:

Storm sewer and ditch (minor) systems:
- 10-year storm for small sewers (<100 hectares)
- 25-year storm for large trunk sewers (>100 hectares)

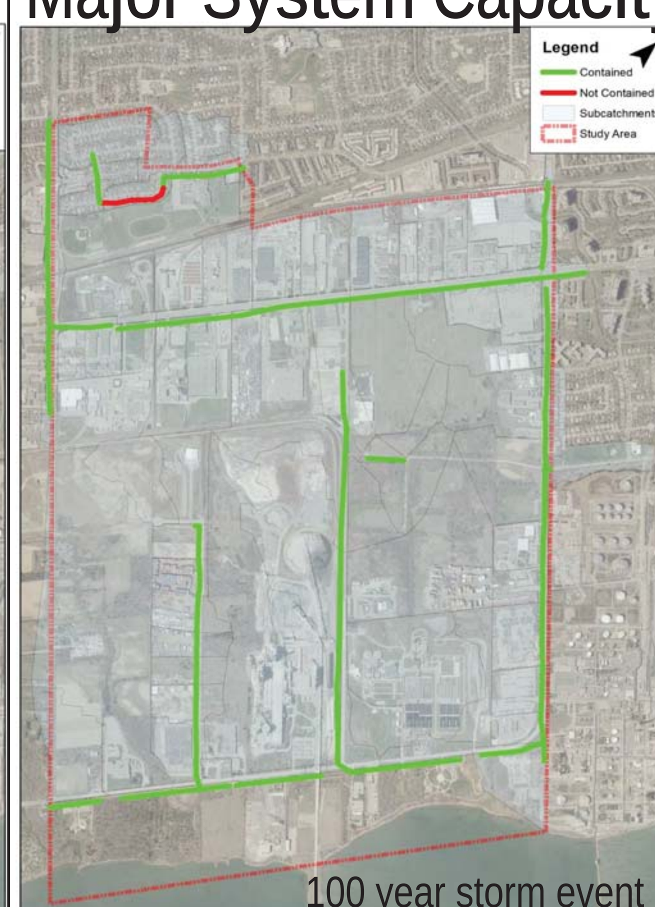
Road drainage (major) system:
- 100-year storm to be contained within the roadway or municipal easements

Minor System Capacity



Storm sewer segments illustrated in green are big enough to meet the City's capacity standards under the current landuses. Sewer segments illustrated in red are undersized which may cause stormwater to "backup" and pond on the road.

Major System Capacity

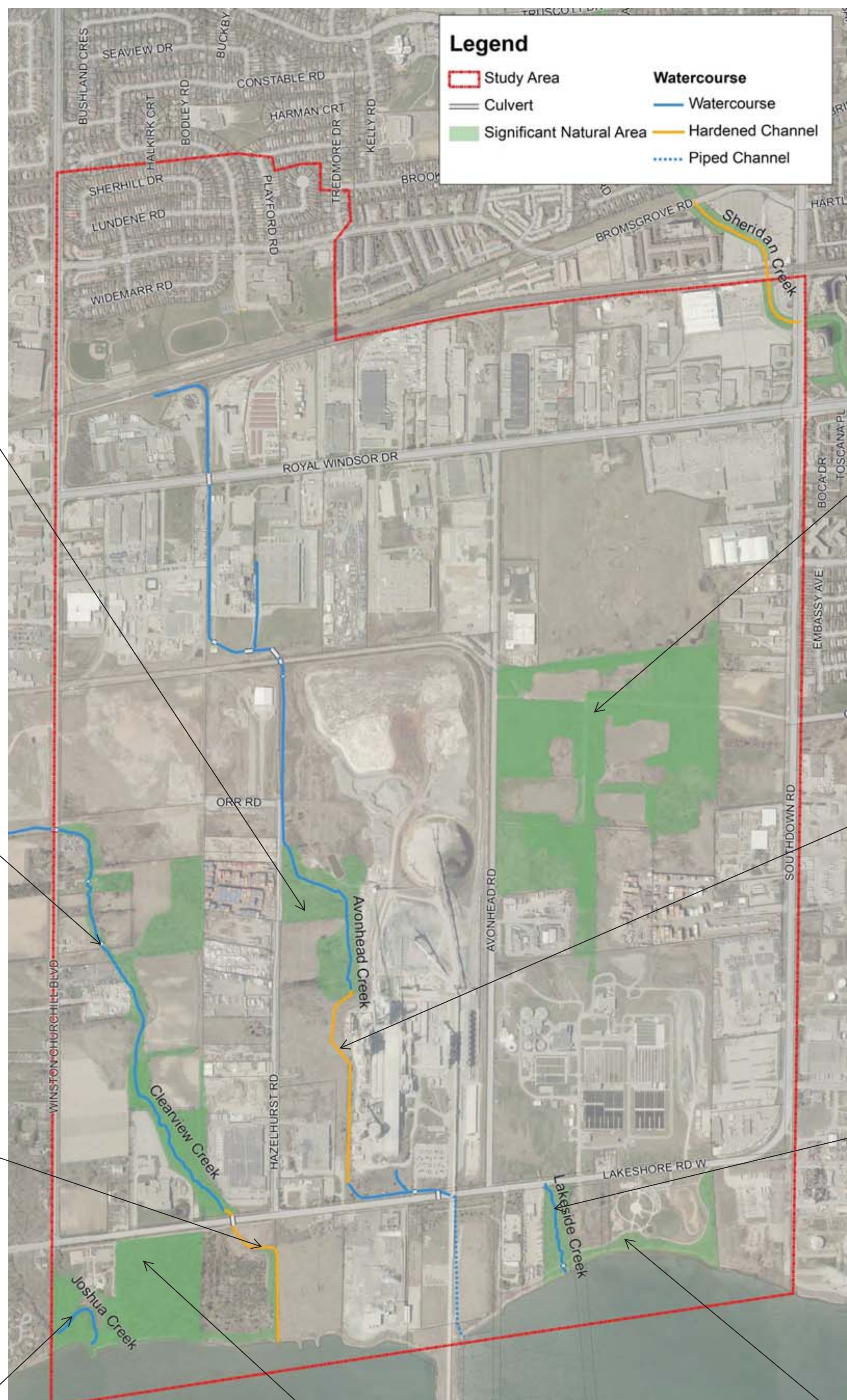


Road segments shown in green are able to contain the 100-year storm within the municipal roadway. Segments shown in red may experience spill of floodwaters onto surrounding lands.

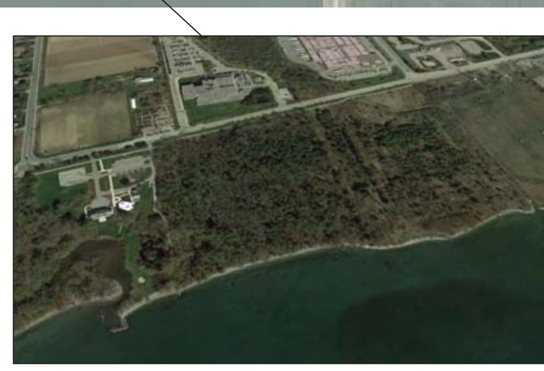
TMIG

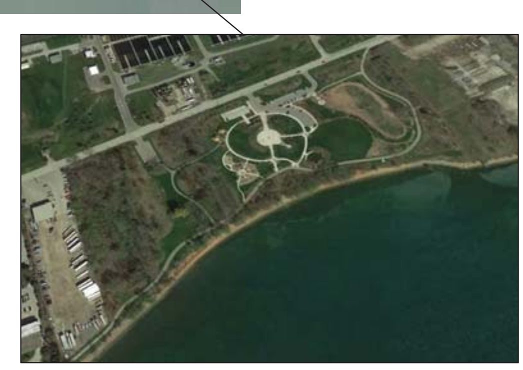
Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Existing Conditions: Natural Features



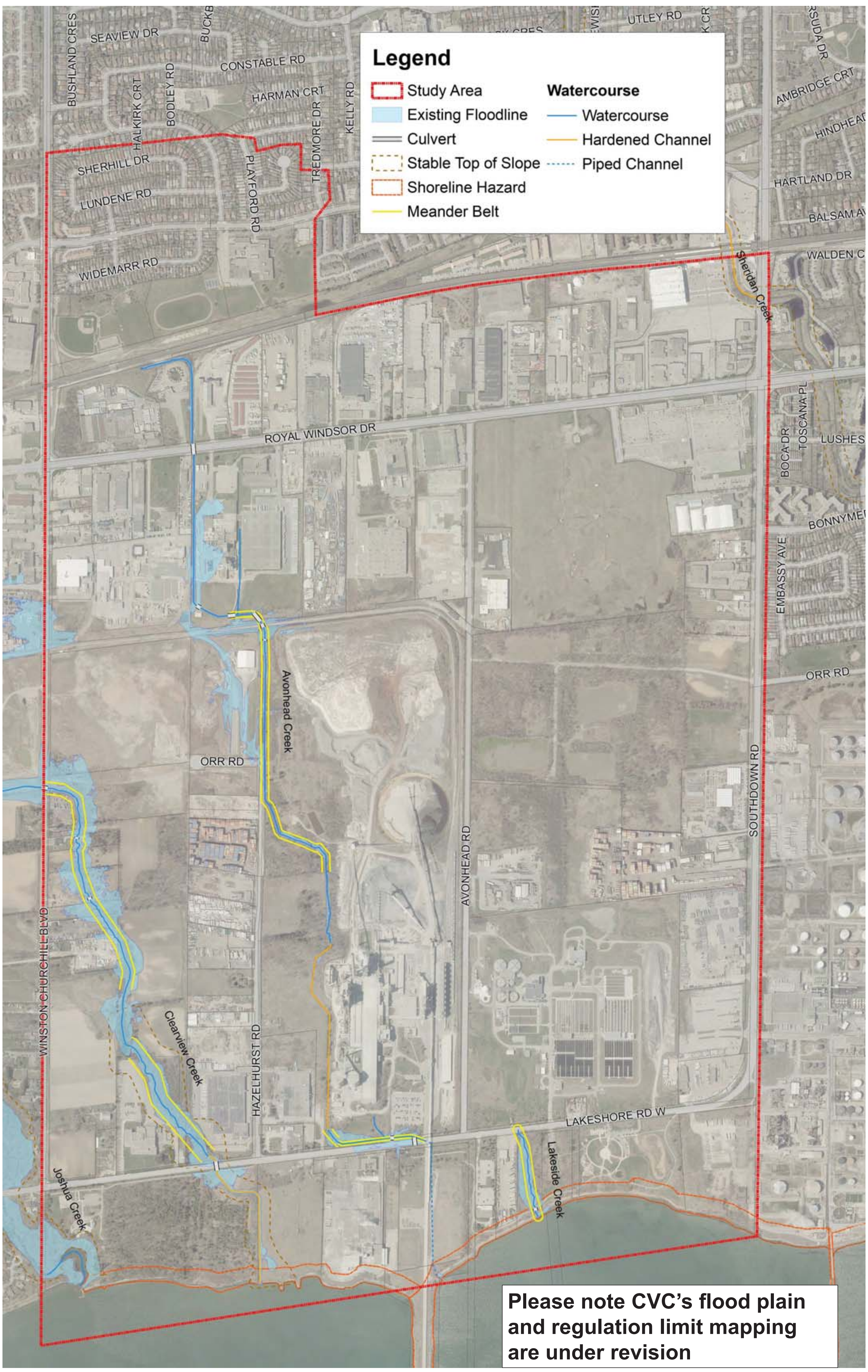
Creeks support warmwater fish typical of urban streams





Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Existing Conditions: Natural Hazards



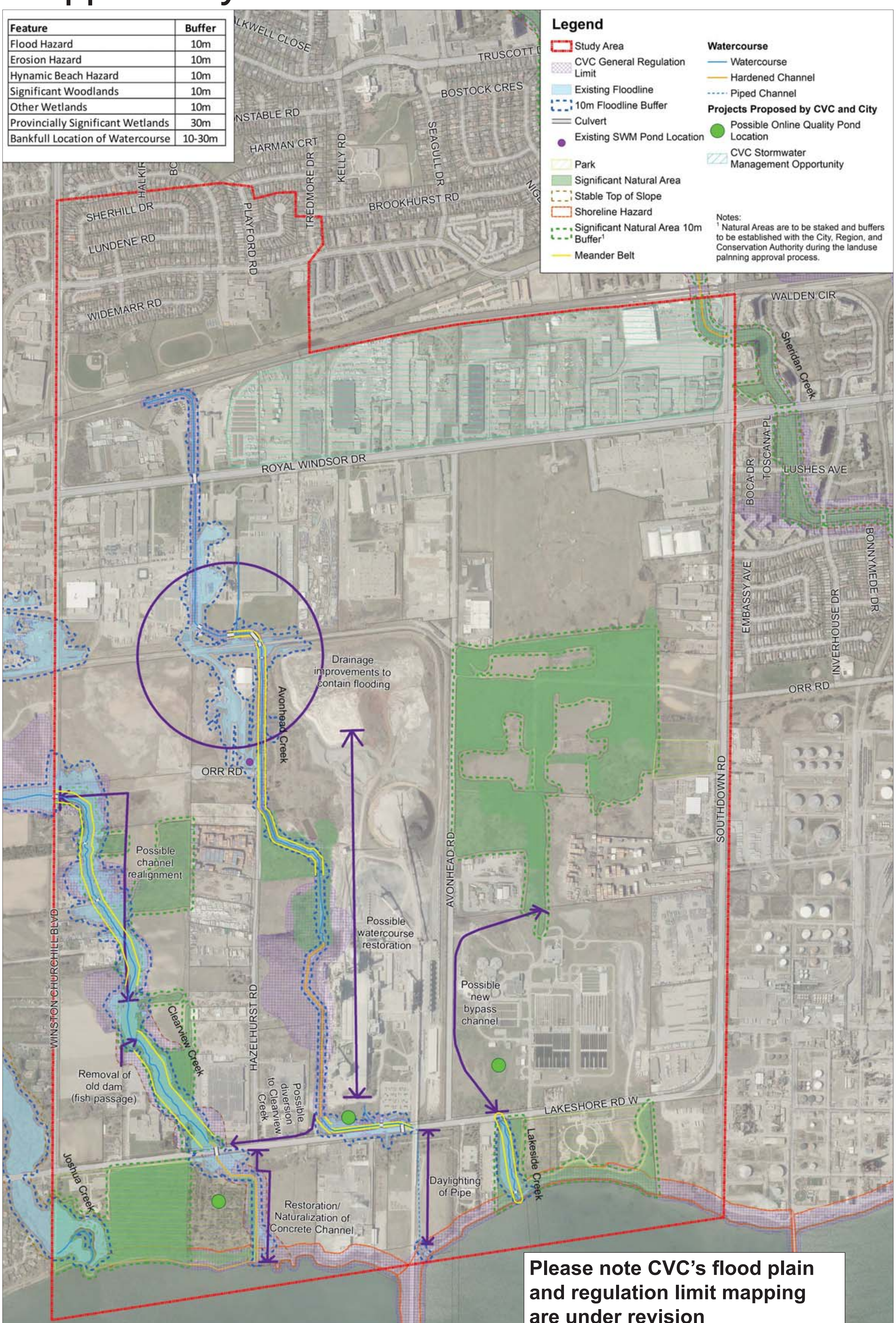
Long-term erosion hazards were estimated through meander belt mapping

Shoreline hazards defined through Conservation Authority regulation mapping

Flood hazards along the study area watercourses identified through computer modelling

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Summary of Opportunity and Constraints



Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Common Impacts of Increased Urban Development
(if not adequately mitigated)

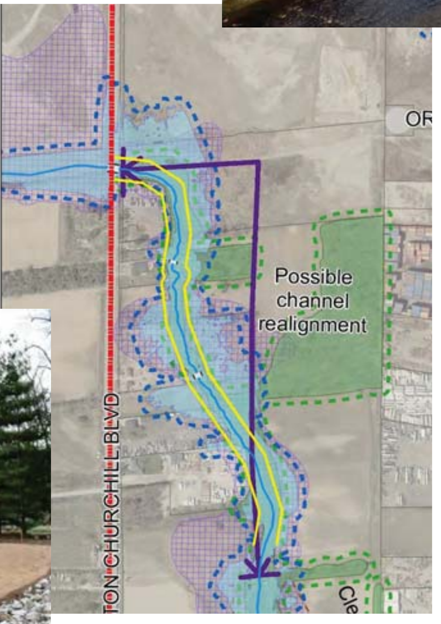
- Increased stormwater runoff volumes
- Increased flooding
- Decreased water quality
- Lower groundwater recharge
- Negative impacts to downstream fisheries
- Fragmentation/isolation of wildlife habitat
- Reduced Biodiversity






Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Long-List of Alternative Measures to Address Existing & Future Impacts



Alternative Solutions for Watercourse Improvements

Watercourse Restoration/Realignment of Clearview Creek and Avonhead Creek

Daylighting of piped creek reaches with new natural channel

Restoration/Naturalization of concrete channel

Removal of dam along Clearview Creek

Alternative Stormwater Management Solutions for Future Urban Development

Low Impact Development (Bioretention, infiltration trench, etc)

On-Site Storage (underground storage)

Centralized Stormwater Management Ponds

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Long-List of Alternative Measures to Address Existing & Future Impacts

Alternative Stormwater Management Solutions for Existing Urban Development

Retrofit of existing properties using shared Low Impact Development Measures (CVC Royal Windsor Drive project)

New stormwater management ponds to serve existing development lands

Alternative Solutions for Existing Storm Drainage Systems

Replace existing undersized storm sewers

Replace undersized bridge/culvert structures

Relief sewer or channel at Clarkson Wastewater Treatment Plant

Over control flows from future development to the capacity of sewers

Alternative Solutions for Natural Heritage Systems

Protect existing features in current locations

Realign, reconfigure, consolidate and enhance natural heritage features

Improve connectivity of existing wooded areas

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Evaluation of Alternatives

Natural Environment

- Potential impact on terrestrial system (vegetation, trees and wildlife)
- Potential impact on aquatic systems (aquatic life, surface water and groundwater)
- Potential to improve natural environmental conditions

Social Environment

- Disruption to existing community during construction (business disturbance, traffic, noise)
- Impacts to community in the long term (emergency access, land acquisition, aesthetics)
- Impacts to Archaeological resources and First Nations
- Timeliness of Implementation

Technical

- Effectiveness of solution in achieving current municipal and conservation authority standards
- Long term operations and maintenance
- Constructability
- Ability to meet regulatory requirements

Economic

- Estimated costs to implement project
- Estimated costs of long term operations and maintenance
- Estimated reduction in flood damages
- Consistent with/ enhancement to/ incentive for new/ re-development in study area

Next Steps

1. Modelling and assessment of impacts from future landuse changes and climate change
2. Screen the long-list of potential measures to address existing and future impacts
3. Develop a range of alternative strategies
4. Refine criteria used to evaluate the alternative strategies
5. Presentation of alternative strategies, evaluation and preliminary preferred strategy at Open House # 2, Fall of 2019
6. Issuance of Notice of Completion, 30 day public review period

Thank You For Attending!

MISSISSAUGA

Class Environmental Assessment
Southdown District Stormwater Servicing and Environmental Management Plan
City of Mississauga

Public Questionnaire
Public Information Centre# 1
June 11, 2019

TMIG

Thank you for attending tonight's Public Information Centre!

Your views are important to us. Please take a moment to complete this questionnaire. You can deposit it in the Comments box, or complete it later and submit it by mail or e-mail

The City of Mississauga is undertaking a Class Environmental Assessment Study to establish updated stormwater management requirements and watercourse improvements required to support long term growth and intensification within the City's Southdown District. The Southdown District Stormwater Servicing and Environmental Management Plan Reduction assessment will recommend stormwater management requirements to minimize flooding, erosion, water quality degradation and water balance impacts from urban development, and to identify stream restoration opportunities within the existing drainage systems.

1. **My property/interest is: *(Please check all that apply)***

[✓] within the Study Area
[✓] outside the Study Area
[✓] general interest
[ ] regulatory interest
[ ] other (please specify): ______________________________

[ ] residential property
[ ] commercial/industrial property
[ ] recreational property

2. **Do you have any comments or concerns regarding the existing conditions within the Study Area?**

____
____
____
____

3. **Do you have any comments or concerns about the potential Alternate Solutions presented for the study area? Are there other solutions that could be considered?** (continued on next page)

Stormwater Management for Future Urban Development

____
____
____

Stormwater Management for Existing Development

____
____
____

Under the Municipal Freedom of Information and Protection of Privacy Act, unless otherwise stated in the submission, any personal information included in a submission will become part of the public record

Improvements to Existing Watercourses

Improvements to Natural Heritage Systems

Improvements to Existing Storm Drainage Systems

Other Suggestions

4. Are there any other ideas or suggestions you would like to share?

CONCERN ABOUT MAXIMUM HOURLY / DAILY RAINFALL
CONCERN ABOUT SEDIMENT FROM ROADWAYS
CONCERN ABOUT FLOW RATE TO LAKE ONTARIO AND
AFFECT ON AQUATIC HABITAT

Please provide your contact information below (please print)

Your Name:

Your Address:

REDACTED

Your Telephone No.:

Your Email Address:

Do you want to be added to the project mailing list? [✓] Yes [ ] No

You can mail or e-mail your completed questionnaire by June 25, 2019 to:

Mr. Greg Frew
City Project Manager
City of Mississauga
201 City Centre Dr., Suite 800
Mississauga, ON L5B 2T4
Tel: 905-615-3200 Ext. 3362
Email: greg.frew@mississauga.ca

Mr. Steve Hollingworth
Consultant Project Manager
The Municipal Infrastructure Group
8800 Dufferin Street, Suite 200
Vaughan, ON L4K 0C5
Tel: (905) 738-5700 Ext. 359
Email: shollingworth@tmig.ca

APPENDIX G3

Public Information Centre # 2

ISSUED TO ALL INDIGENOUS COMMUNITIES AND STAKEHOLDERS WHO INDICATED AN INTEREST IN THE STUDY IN RESPONSE TO THE NOTICE OF COMMENCEMENT AND/OR PIC#1

From:	Rosalie Chung
Sent:	September 15, 2021 9:22 AM
Cc:	Steve Hollingworth; Greg Frew
Subject:	Southdown District Stormwater Servicing and Environmental Management Plan, City of Mississauga -Invitation to Public Information Centre #2
Attachments:	Notice of PIC2_Final.pdf

To Whom It May Concern:

The City of Mississauga is developing a stormwater servicing plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place. The study area is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

Attached is a notice for the second of two Public Information Centres (PIC) which is being hosted on the City's project website at:
https://www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan/

Should you have any questions or require additional information, please contact the Steve Hollingworth (905) 738-5700 ext. 359, or Greg Frew at the City of Mississauga (905-615-3200 ext. 3362).

Thank you for your assistance with this Study.

Regards,

Rosalie Chung, P.Eng
Water Resources Engineer

TMIG | TYLI
The Municipal Infrastructure Group Ltd.
a T.Y. Lin International Company

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.
8800 Dufferin Street, Suite 200
Vaughan, Ontario L4K 0C5
T 905.738.5700
F 905.738.0065
www.tmig.ca

September 14, 2021

PROJECT NUMBER 18137

«F4» «F5»
«F6»
«F7»
«F8»
«F9»
«F10», «F11», «F12»

ISSUED TO ALL LANDOWNERS IN THE STUDY AREA WITHOUT AN E-MAIL ADDRESS ON FILE

«GreetingLine»

Re: Southdown District Stormwater Servicing and Environmental Management Plan, City of Mississauga Invitation to Public Information Centre #2

The City of Mississauga is developing a stormwater servicing plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place. The study area is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

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Should you have any questions or require additional information, please contact the undersigned at (905) 738-5700 ext. 359, or Greg Frew at the City of Mississauga (905-615-3200 ext. 3362).

Thank you for your assistance with this Study.

Sincerely,

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.

Steve Hollingworth, P.Eng.
Consultant Project Manager
shollingworth@tmig.ca

cc: Greg Frew, City Project Manager, City of Mississauga

CITY OF MISSISSAUGA – NOTICE OF ONLINE PUBLIC ENGAGEMENT:
Southdown District Stormwater Servicing and Environmental Management Plan

WHAT?

The City of Mississauga is developing a stormwater servicing and environmental management plan that will protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown study area as future urban development and re-development takes place.

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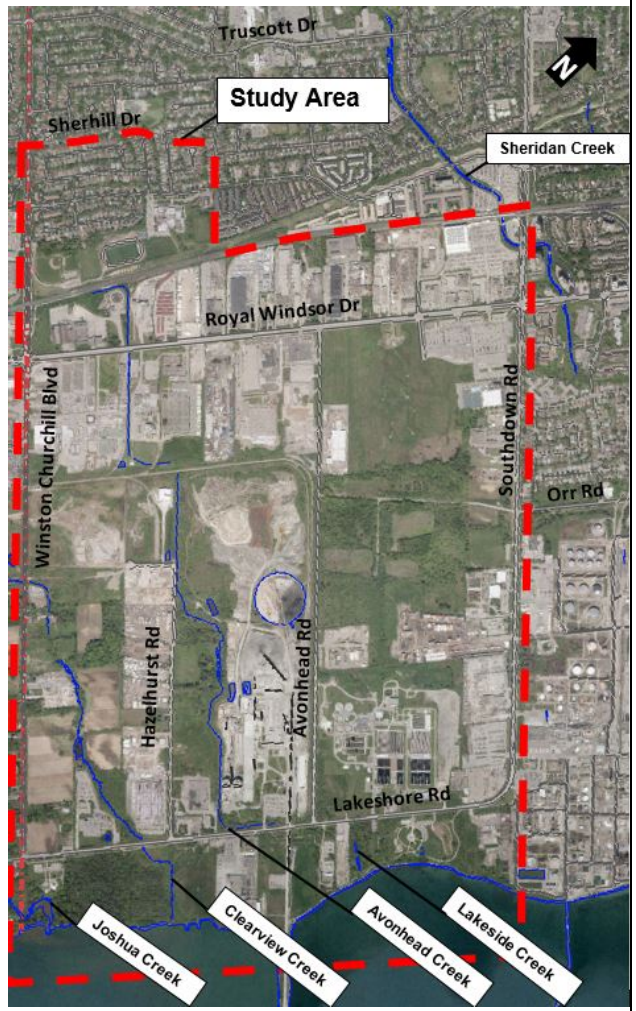


WHY?

The stormwater drainage system in the Southdown area was last investigated in 2000 as part of the "Southdown Master Drainage Plan". Since that time, stormwater management criteria and standard practices have evolved, and there have been considerable changes to the local, regional and provincial policies.

For that reason, the City is conducting a new study to establish updated stormwater management requirements to minimize flooding, erosion, water quality degradation and water balance impacts from urban development, and to identify stream restoration opportunities within the existing drainage system.

HOW?

The study will complete the following:

- Inventory and characterize the stormwater drainage system within the study area, including the existing creeks, storm sewers, bridges, and culverts;
- Identify drainage deficiencies and provide direction on future infrastructure needs to meet City of Mississauga standards under the current and future conditions;
- Identify stormwater management facility requirements and associated targets/criteria to treat stormwater runoff from future urban development areas;
- Provide recommendations with respect to stormwater management, ecological restoration/enhancement opportunities within the study area watersheds;

Through the Municipal Class EA process, multiple alternative solutions have been developed and evaluated by the Study Team and will be refined through public and agency consultation (see below). The Study Team will then finalize the Recommended Plan for the study area based on the preferred alternative(s) as determined though these evaluations and consultations. At the end of the study, a Project File, documenting the study process will be available for public review.

GET INVOLVED!

Consultation is an important part of the EA process. We want to ensure that anyone with an interest in the study has the opportunity to provide input.

The first of two Public Information Centres (PICs) was held in June 2019 to review the study background, existing environmental conditions, and problems and opportunities within the study area.

A second PIC has been arranged via an online public engagement session to allow local residents, landowners and interested members of the public an opportunity to review and comment on the alternative stormwater management and stream restoration solutions being considered. Input gathered through the public engagement will be incorporated into the evaluation of the alterative(s) before finalizing the Recommended Plan. Project information will be made available to the public on the City's project website below beginning September 15th 2021 and will be open for comments until October 31st 2021:

https://www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan/

If you have any questions or comments regarding the study, require additional information, or wish to be added or removed from the study mailing list, please contact:

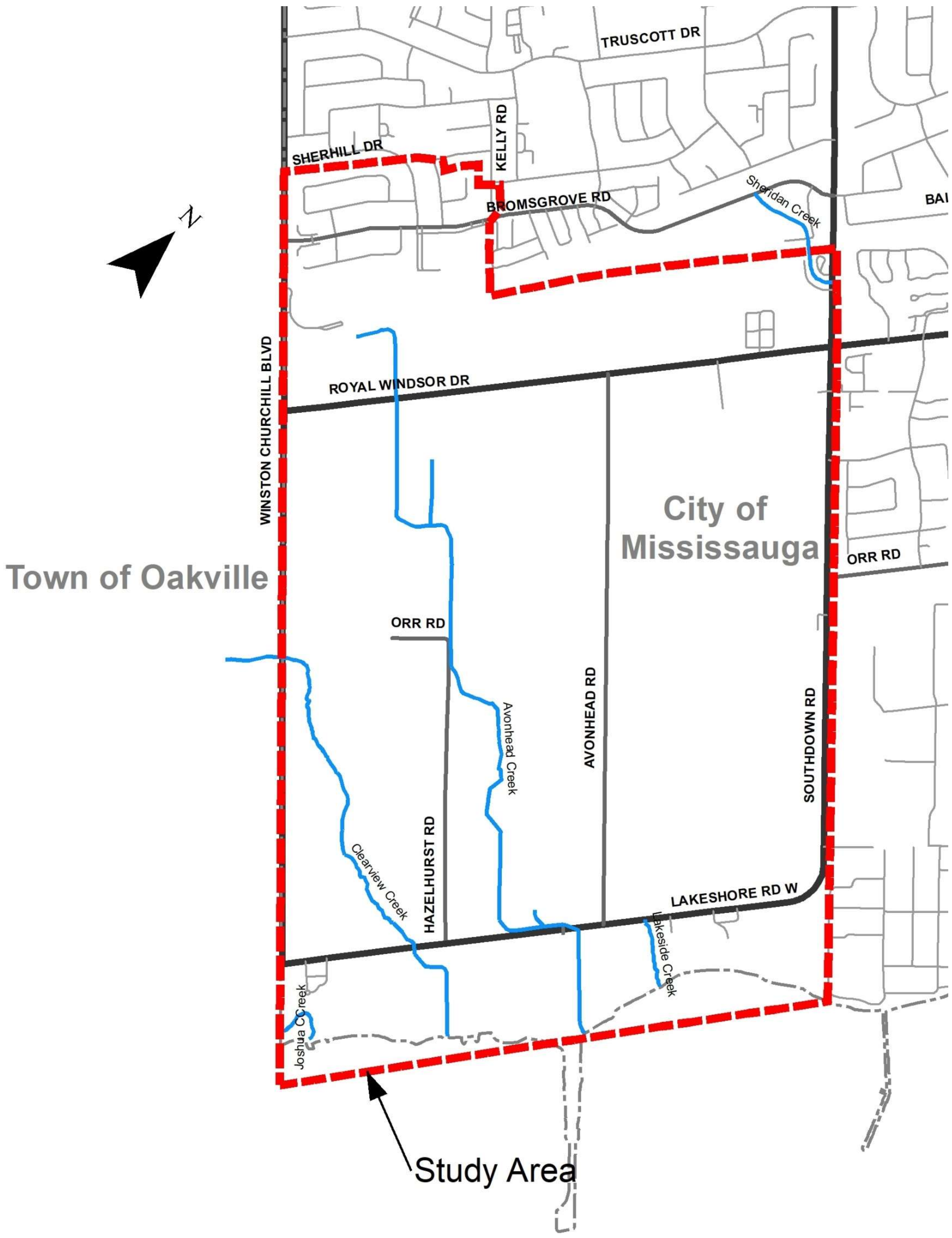
Greg Frew, P.Eng. *Project Manager* City of Mississauga 201 City Centre Dr., Suite 800 Mississauga, ON L5B 2T4 (905) 615-3200, ext. 3362 greg.frew@mississauga.ca	**Steve Hollingworth, P.Eng.** *Consultant Project Manager* The Municipal Infrastructure Group 8800 Dufferin St., Suite 200 Vaughan, ON L4K 0C5 (905) 738-5700, ext. 359 shollingworth@tmig.ca

COVID-19 Community Engagement Update: While we continue to respond to this pandemic, we are working hard to deliver essential services and projects to keep our City moving and safe. While we can't connect in-person at this time, we still want to connect! Opportunities to connect with the Project Team and share your input are noted above.

This notice was issued September 9, 2021.

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Welcome to Online Public Information Centre #2
September 15, 2021 to October 31, 2021



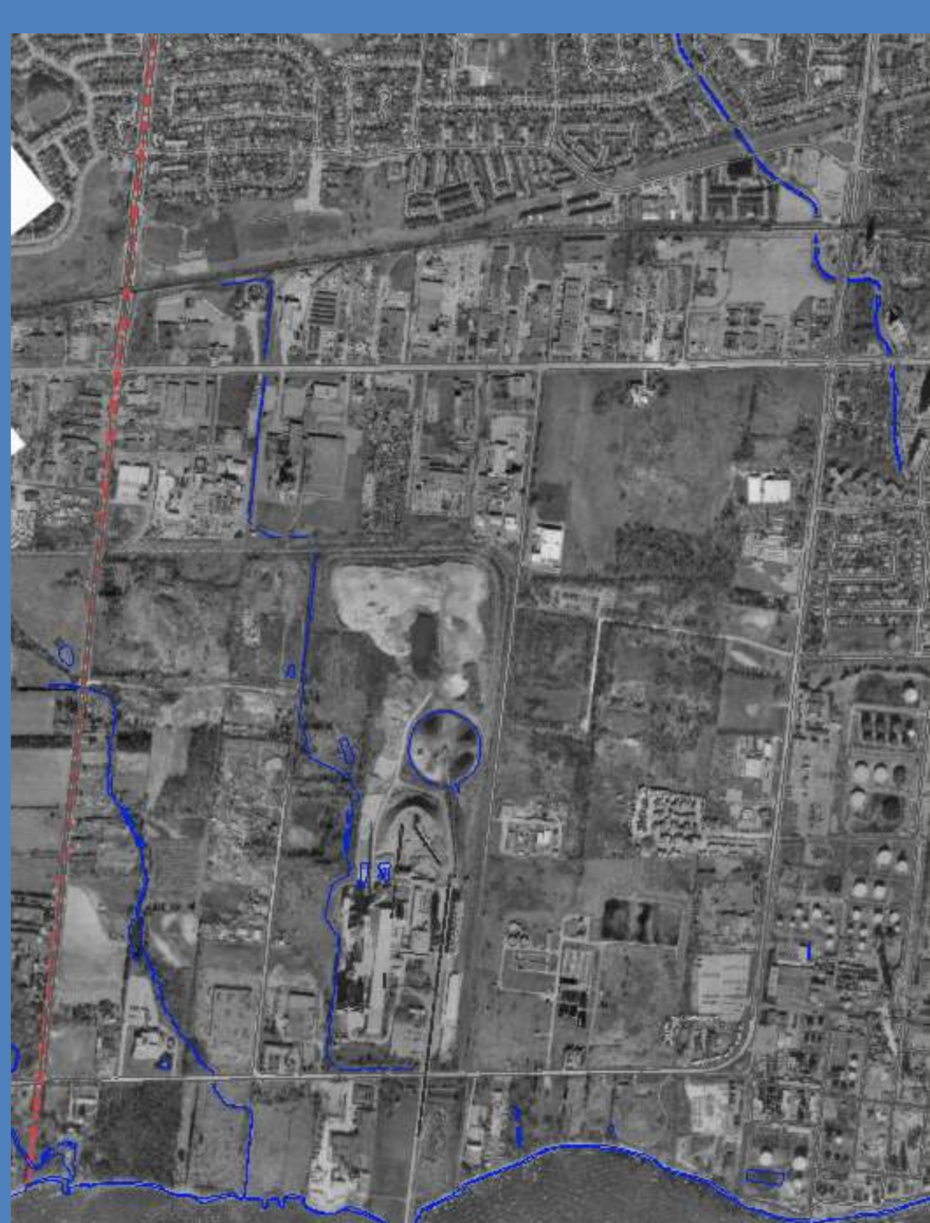
The purpose of this Public Information Centre (PIC) is to introduce you to this project, provide an overview of the existing conditions in the study area and obtain feedback from you regarding the alternative solutions considered and the preliminary preferred solutions that make up the Stormwater Servicing and Environmental Management Master Plan.

Instructions on how to provide feedback are provided at the end of this presentation.

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Study Purpose

The stormwater drainage system in the Southdown area was last investigated in 2000 as part of the "Southdown Master Drainage Plan". Since that time, stormwater management criteria and standard practices have evolved, and there have been considerable changes to the local, regional and provincial policies related to the protection and enhancement of watercourses and other natural heritage features. For that reason, a new Stormwater Servicing and Environmental Management Plan is needed ***to establish updated stormwater management requirements and watercourse improvements required to support long term growth and intensification***, as defined by the urban structure framework and policy of the Southdown Local Area Plan.



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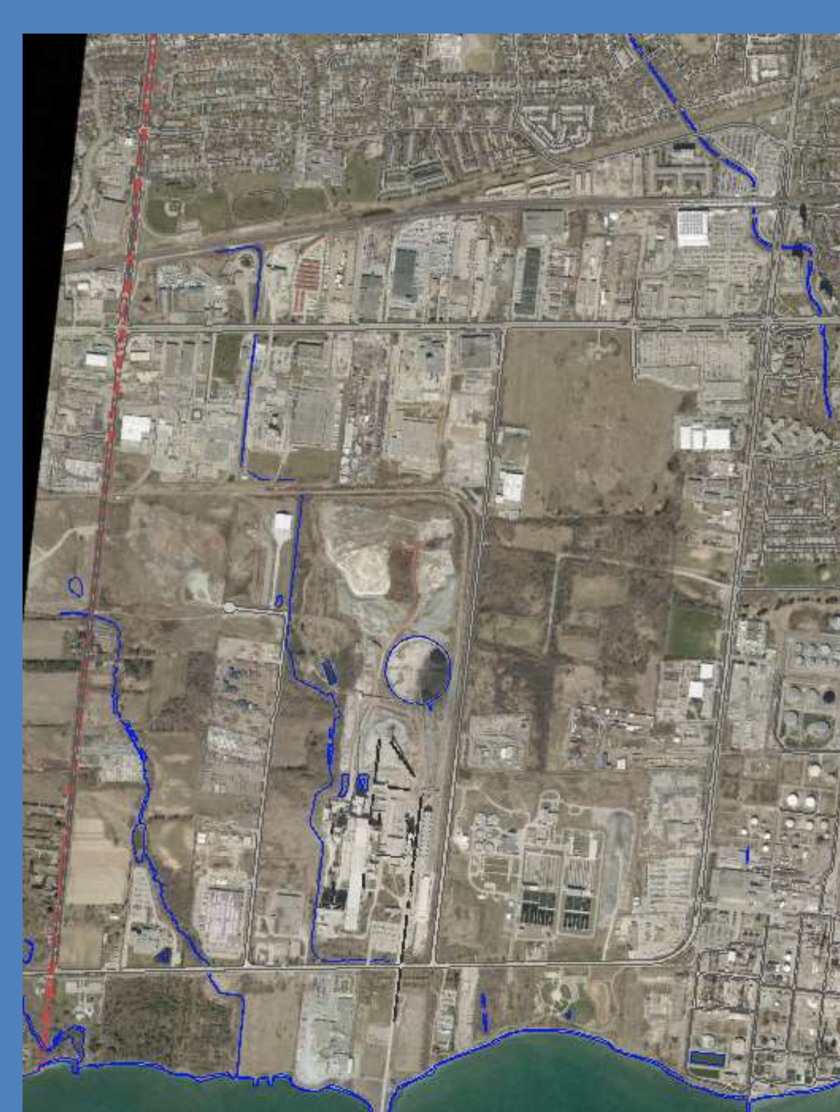
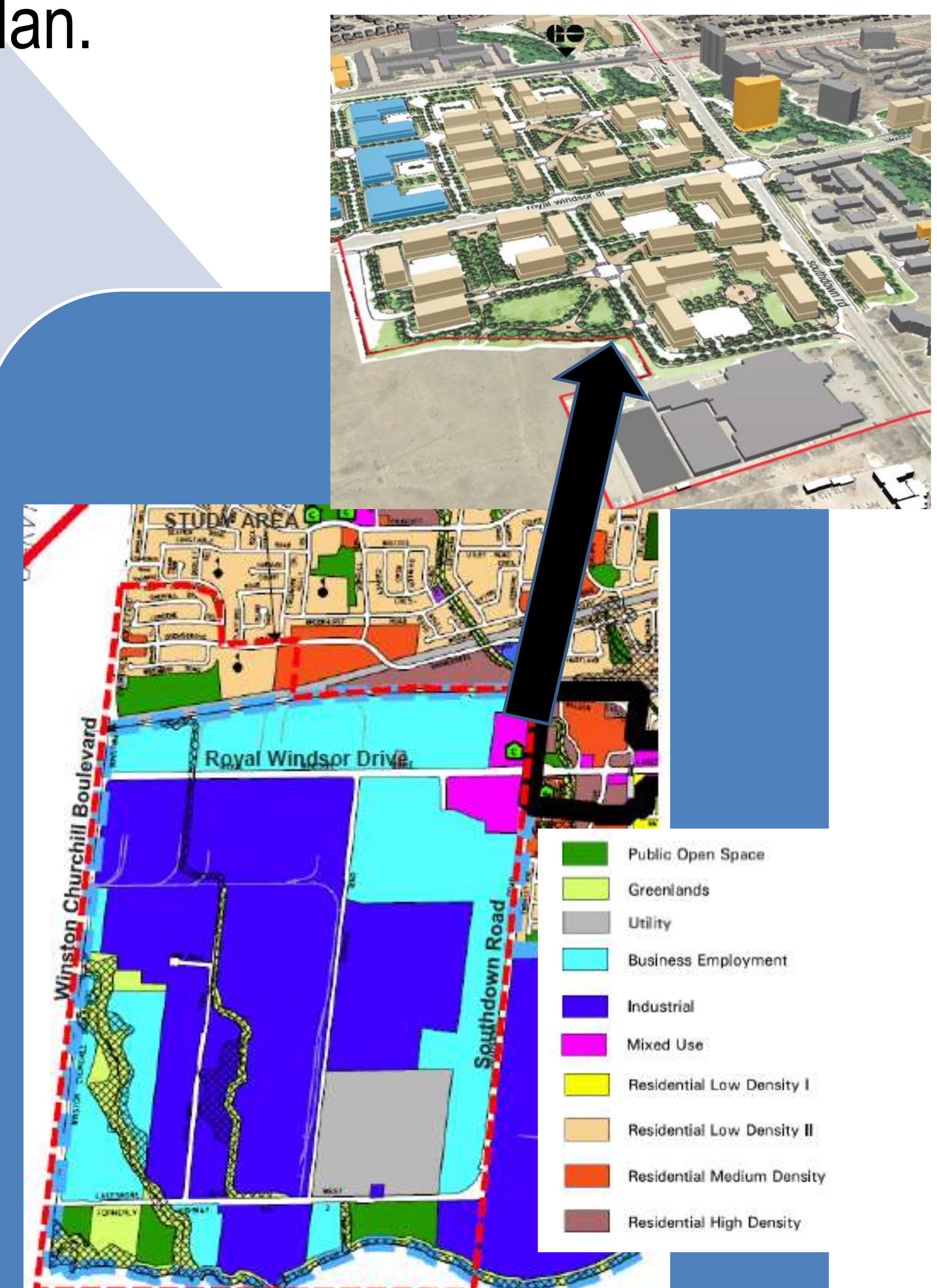


Today



Future Growth & Intensification

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Municipal Class Environmental Assessment (EA) Process

The study is being conducted as a Master Plan and is intended to satisfy Phases 1&2 of the Municipal Class EA process. Stakeholder input is an important component of the process.

Class EA Phase 1

Identify Problem or Opportunity

- Identify Need
- Initiate Consultation with the public and agencies
- **Notice of Commencement**

Background Review

- Obtain and review background documentation and initiate agency contact
- Identify data gaps to be address during the site inventory/ investigation

Class EA Phase 2

Site Inventory / Investigation

- Undertake natural heritage investigations
- Aquatic habitat assessment
- Incidental wildlife survey
- Undertake hydrology/hydraulics investigation
- Archeological Investigations
- Identify opportunities and constraints
- **PIC #1**

Evaluation of Alternatives

- Identify alternatives
- Complete impact assessments
- Evaluate alternatives
- Select preferred alternative

Preliminary Design / Project File Report

- Preliminary design of preferred alternative
- Recommendation for further study, if required
- PIC# 2
- Develop a staging and implementation plan
- Prepare Project File Report
- **Notice of Completion**
- 30-day Public Review

Implementation

Detailed Design / Implementation

- Detailed design of the proposed works
- Obtain permits and approvals
- Prepare contract drawings and tender documents
- Construction and operation of the works
- Post-construction monitoring

Project Timeline

2019

- Notice of Study Commencement issued March 2019
- Existing conditions inventories
- Public Information Centre (PIC) #1 held in June 2019

2020

- Development and analyses of alternative management solutions
- Agency consultation

2021

- PIC #2 to present the alternative solutions and evaluation results
- Confirmation of the preferred management solutions that make up the Master Plan
- Additional agency consultation
- Notice of Completion (fall 2021)
- File project with the Ministry of the Environment, Conservation and Parks

MISSISSAUGA

Re-record

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Existing Conditions: Study Area Watercourses


Clearview Creek downstream of Winston Churchill Blvd: meandering channel through sparse vegetation on private lots


Clearview Creek: online agricultural pond


Clearview Creek upstream of Lakeshore Rd: meandering natural channel through mature riparian vegetation


Clearview Creek downstream of Lakeshore Rd: concrete engineered channel


Sheridan Creek at CNR: concrete engineered channel


Avonhead Creek downstream of Royal Windsor Drive: narrow straightened channel/swale


Avonhead Creek through concrete plant: CSP and concrete lined channel


Lakeside Creek downstream of Lakeshore Road: natural channel through mature riparian vegetation


Joshua Creek: outlet to Lake Ontario


Avonhead Creek upstream of Lakeshore Road: grass-lined channel


Avonhead Creek downstream of Lakeshore Road: piped to outlet at Lake Ontario

TMIG

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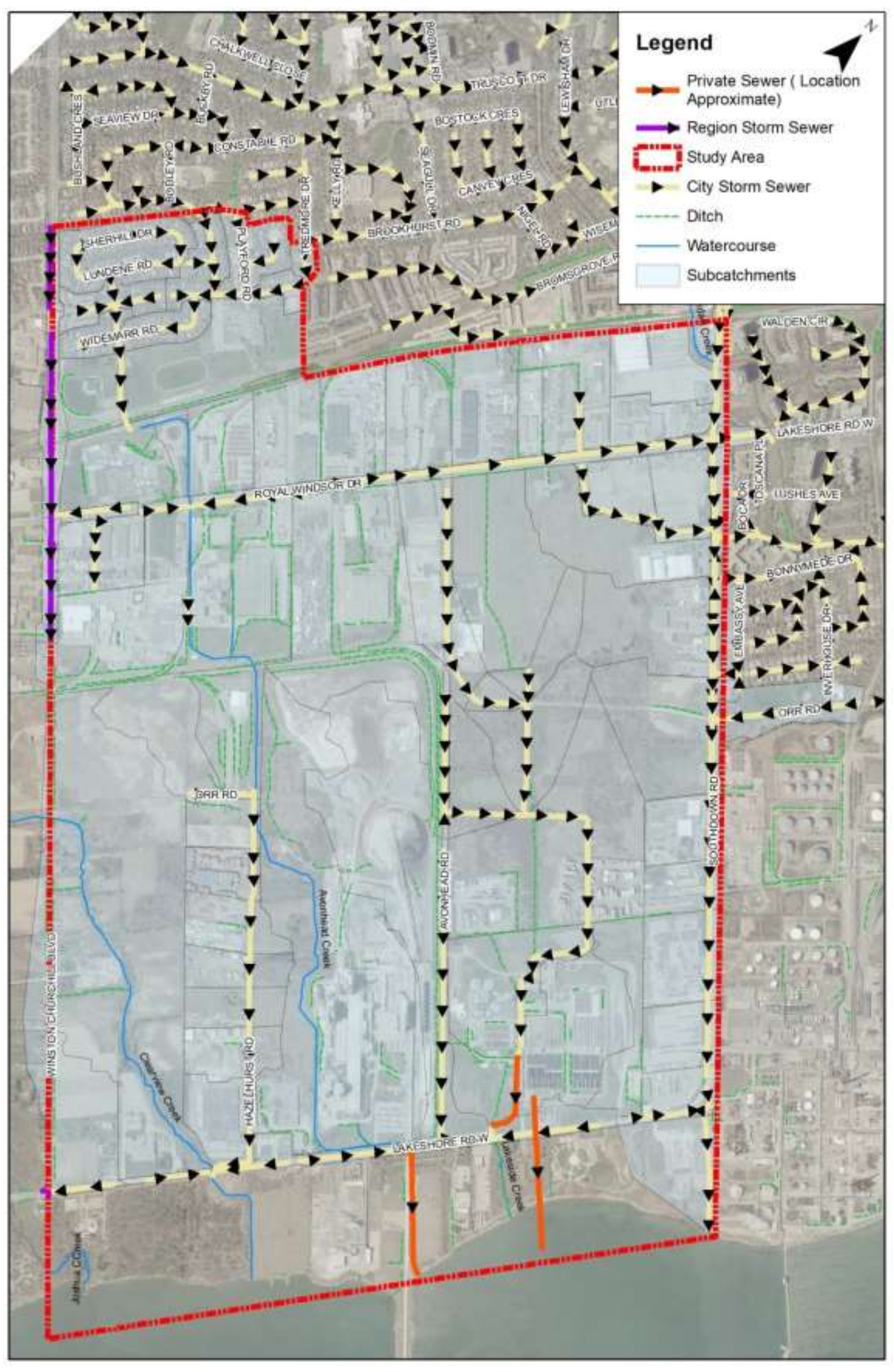
Existing Conditions: Storm Sewers and Road Drainage



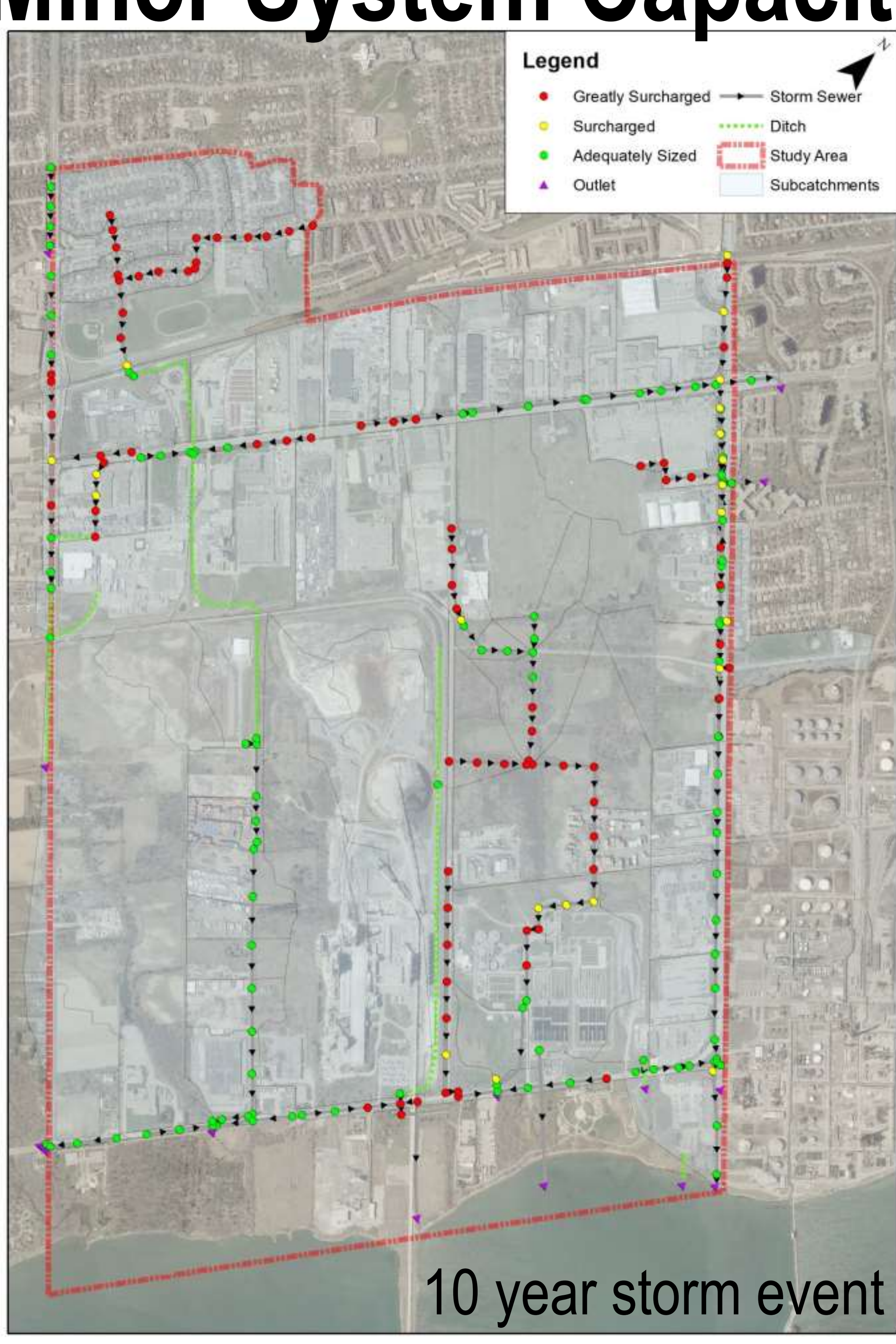
Computer modelling was completed to assess the capacity of the existing storm sewers and road drainage:

City of Mississauga design standards:

Storm sewer and ditch (minor) systems:
- 10-year storm for small sewers (<100 hectares)
- 25-year storm for large trunk sewers (>100 hectares)

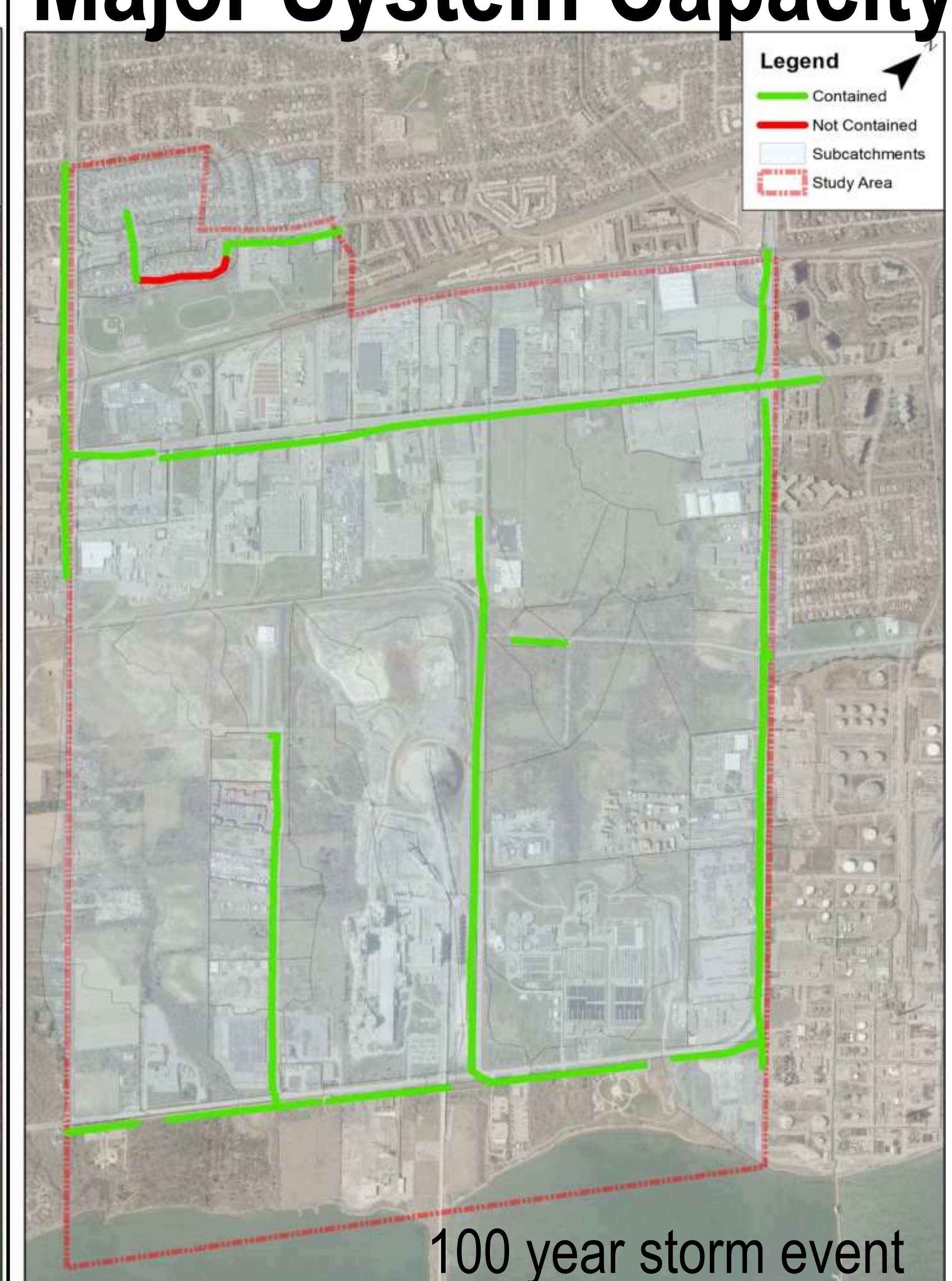
Road drainage (major) system:
- 100-year storm to be contained within the roadway or municipal easements

Minor System Capacity



Storm sewer segments illustrated in green are big enough to meet the City's capacity standards under the current landuses. Sewer segments illustrated in red are undersized which may cause stormwater to "backup" and pond on the road.

Major System Capacity

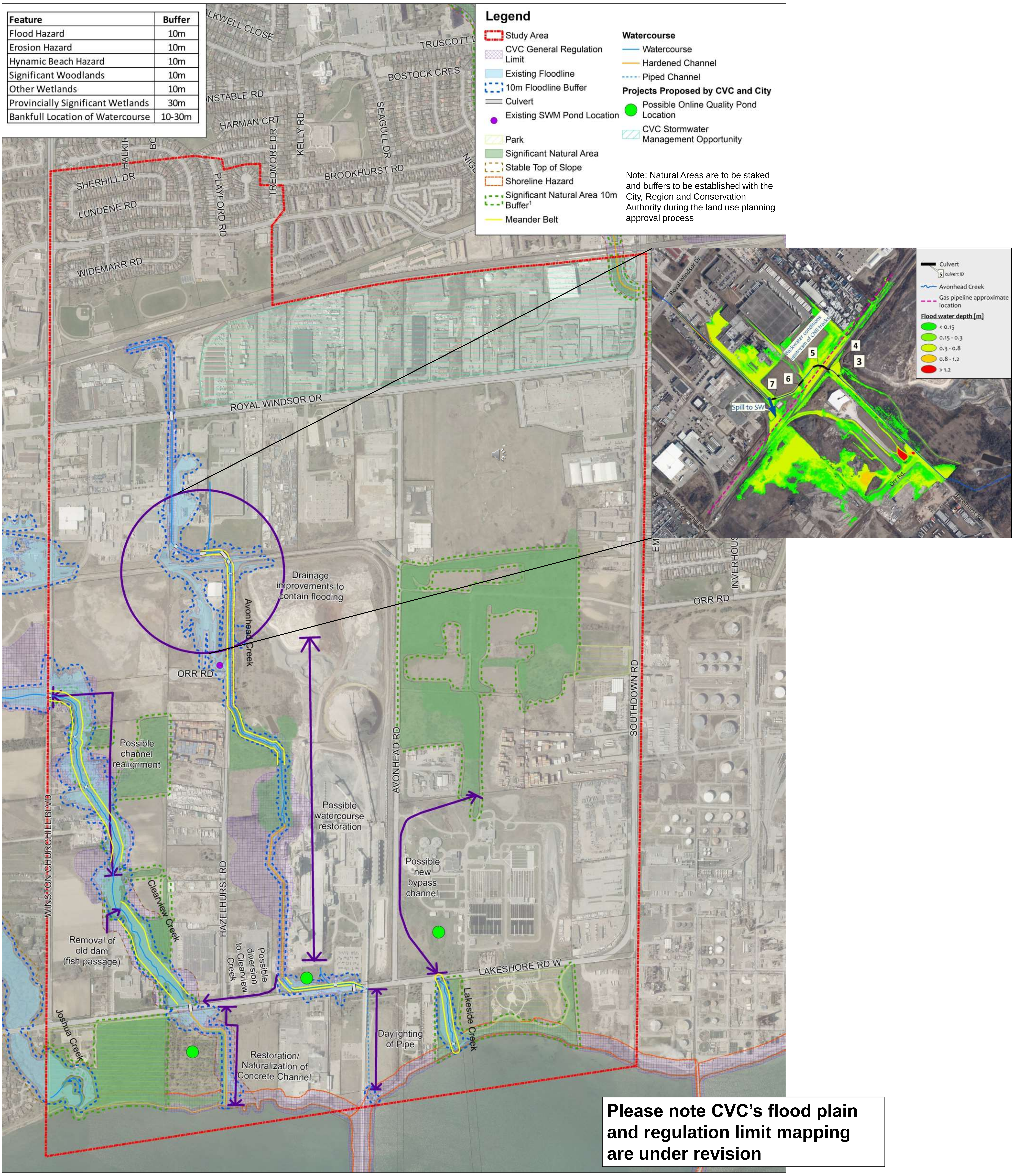


Road segments shown in green are able to contain the 100-year storm within the municipal roadway. Segments shown in red may experience spill of floodwaters onto surrounding lands.

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Summary of Opportunity and Constraints

Feature	Buffer
Flood Hazard	10m
Erosion Hazard	10m
Hynamic Beach Hazard	10m
Significant Woodlands	10m
Other Wetlands	10m
Provincially Significant Wetlands	30m
Bankfull Location of Watercourse	10-30m



Please note CVC's flood plain and regulation limit mapping are under revision

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Common Impacts of Increased Urban Development
(if not adequately mitigated)

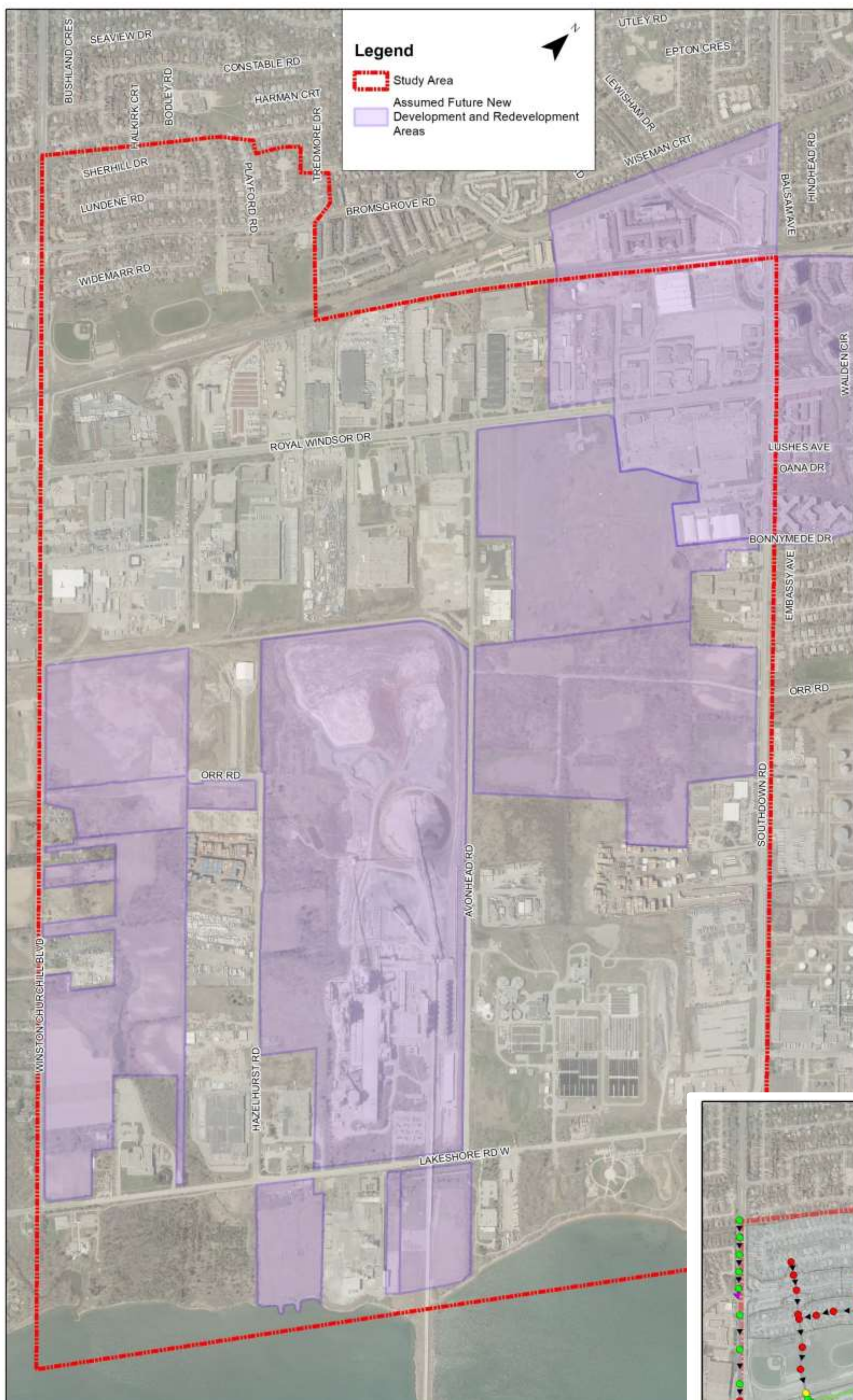
- Increased stormwater runoff volumes
- Increased flooding
- Decreased water quality
- Lower groundwater recharge
- Negative impacts to downstream fisheries
- Fragmentation/isolation of wildlife habitat
- Reduced Biodiversity






Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Alternative 1: Do Nothing



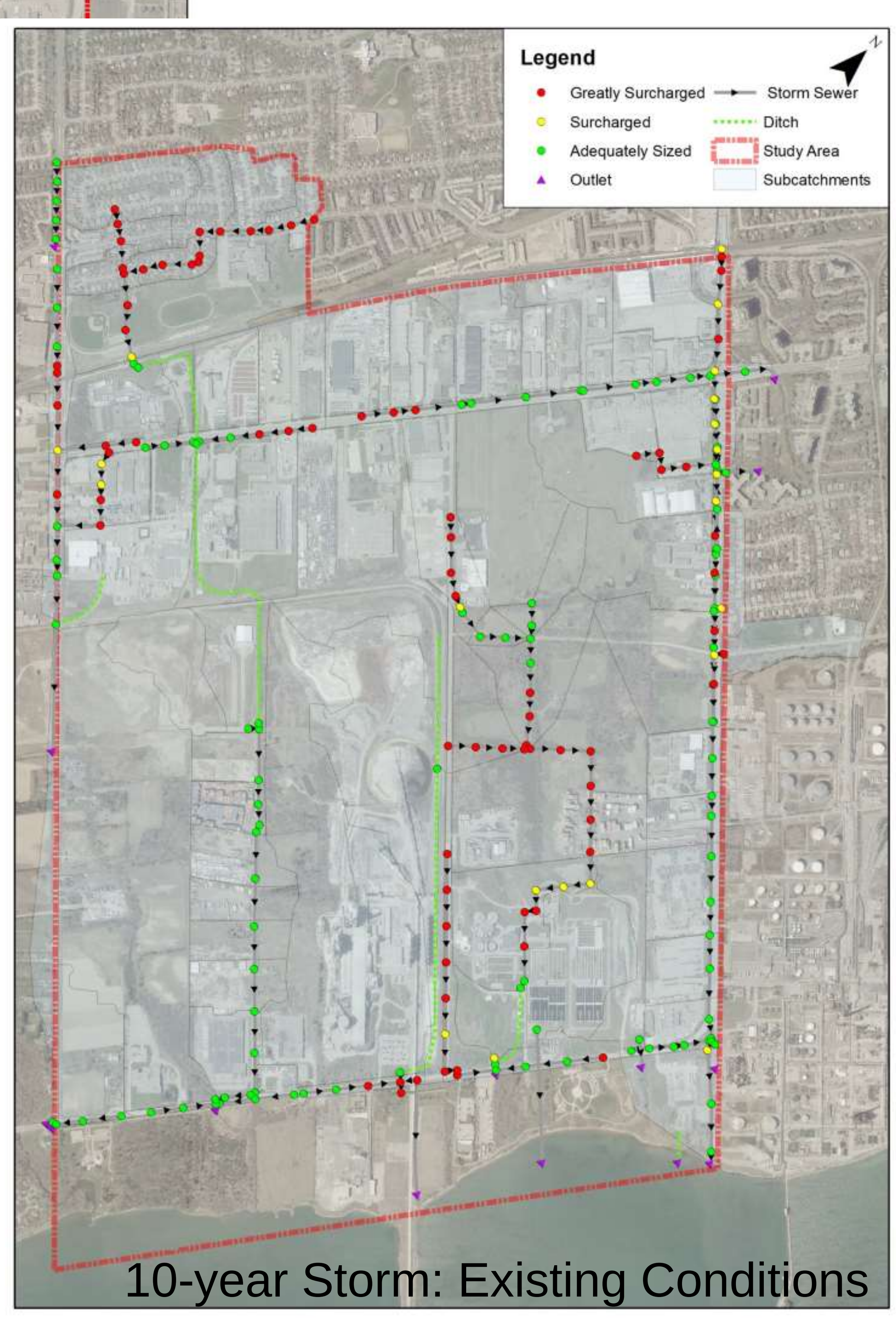
A hypothetical, worst case scenario to understand how sensitive the drainage systems are with respect to development and stormwater management in the study area. The Do Nothing alternative assumes that the remaining greenfield and under-developed properties in the study area will be developed with no on-site stormwater management controls

Impacts of Uncontrolled Future Development on Flood Flows

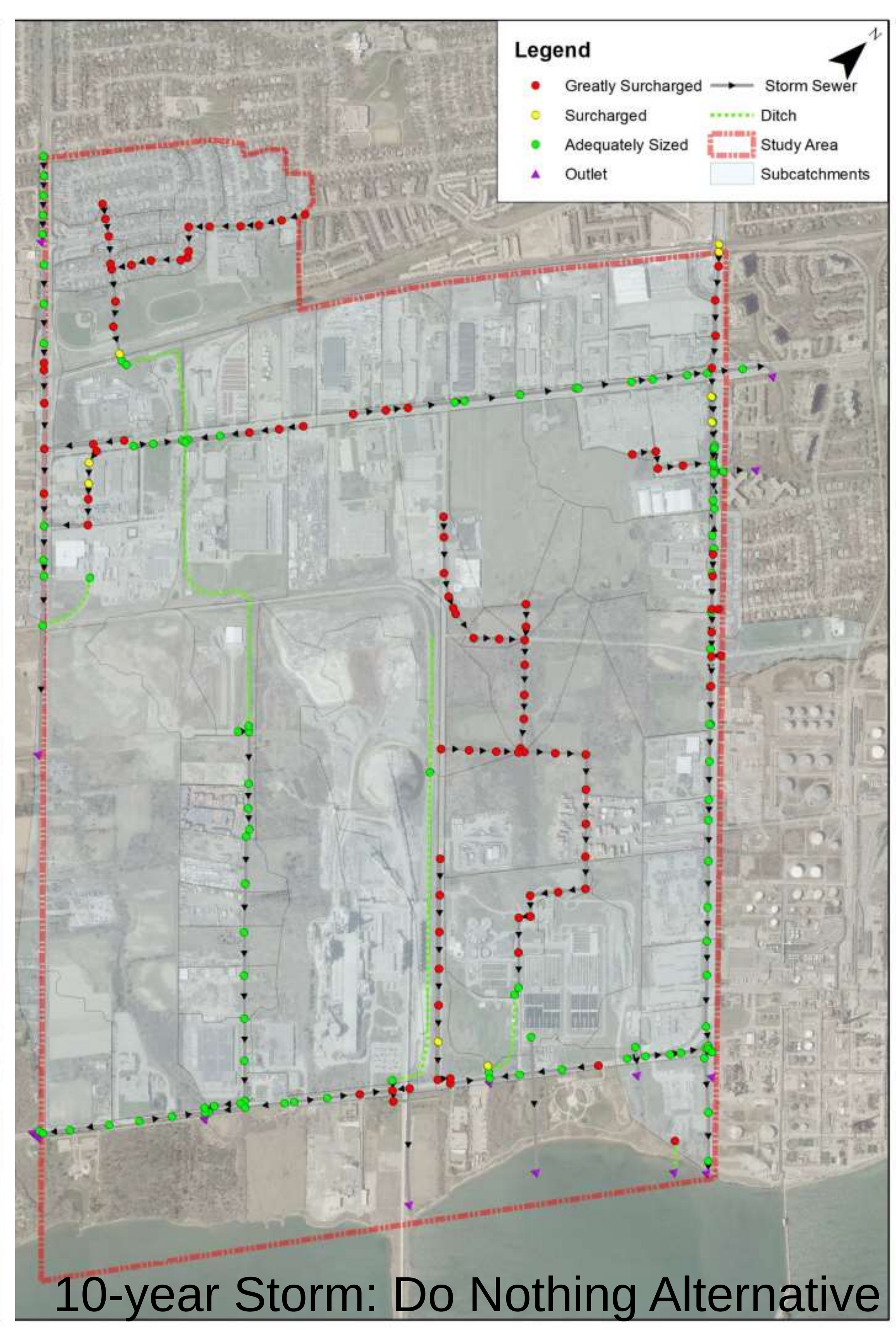
Clearview Creek		
Existing	Do Nothing	% Increase
8.80 m^3/s	11.22 m^3/s	27.5%

Avonhead Creek		
Existing	Do Nothing	% Increase
5.48 m^3/s	10.78 m^3/s	96.7%

Lakeside Creek		
Existing	Do Nothing	% Increase
4.17 m^3/s	5.56 m^3/s	33.3%



10-year Storm: Existing Conditions



10-year Storm: Do Nothing Alternative

Number of Storm Sewer Pipes Significantly Surcharged in a 10 Storm Event	
Existing	Do Nothing
79	95

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Alternative 2: Current Standard Stormwater and Environmental Management Approach

The current stormwater management criteria applicable to new development in the Southdown District are as follows:

- **Erosion Control**: Minimum 5 mm rainfall retention for drainage areas less than 5 ha and 25 mm – 48hr detention for drainage areas greater than
5 ha. Actual erosion control criterion may require geomorphologic assessment study to determine the appropriate erosion threshold.
- **Water Quality Control**: Enhanced Level of control (80% TSS removal)
- **Water Quantity Control**: Control post development flows to pre-development levels
- **Discharge to Municipal Storm Sewers**: Control post development peak flows for up to the 100 year storm to the 2 year pre-development flow.
- **Water Balance**: Maintain pre-development groundwater recharge to the extent feasible (this is usually satisfied by the retention of the first 5 mm of runoff)

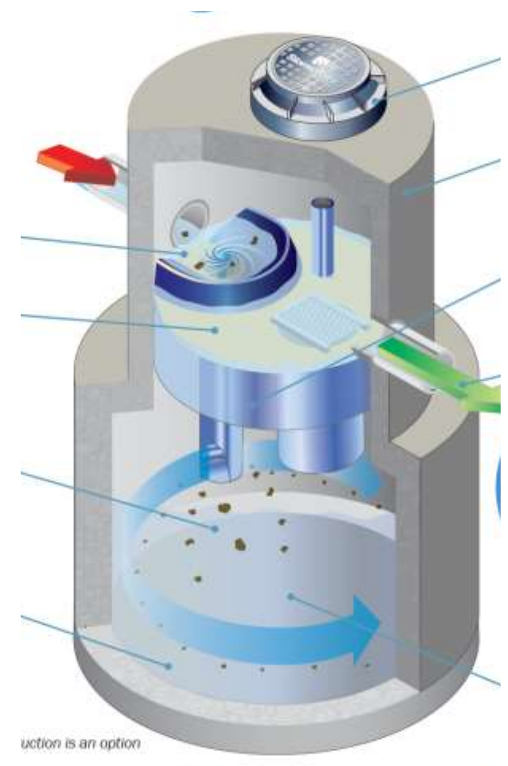
The current environmental management approach is to ensure that new urban development and re-development lands are appropriately set back from the limit of the natural heritage systems, including any natural hazards. Potential impacts to natural heritage features are to be mitigated through appropriate site design, stormwater management and restoration plans.

Typical Current Stormwater Management Practices

Traditional Stormwater Ponds

Underground Storage Systems

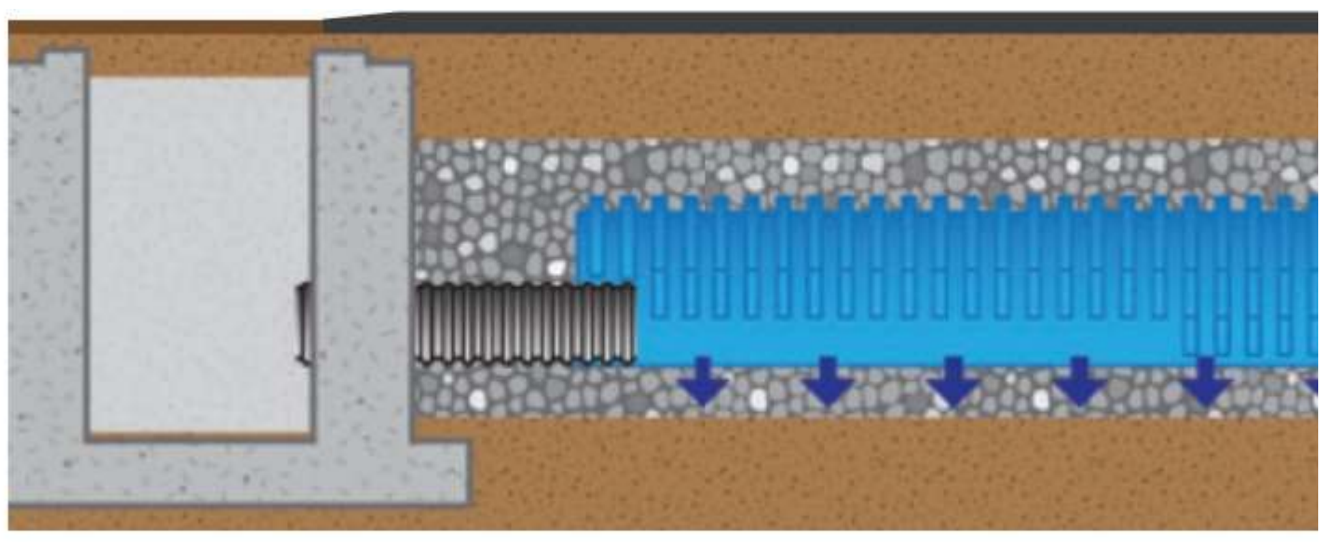
Oil-Grit Separators



Low Impact Development Practices

Bioretention Swales

Permeable Pavement



Underground Infiltration Chambers

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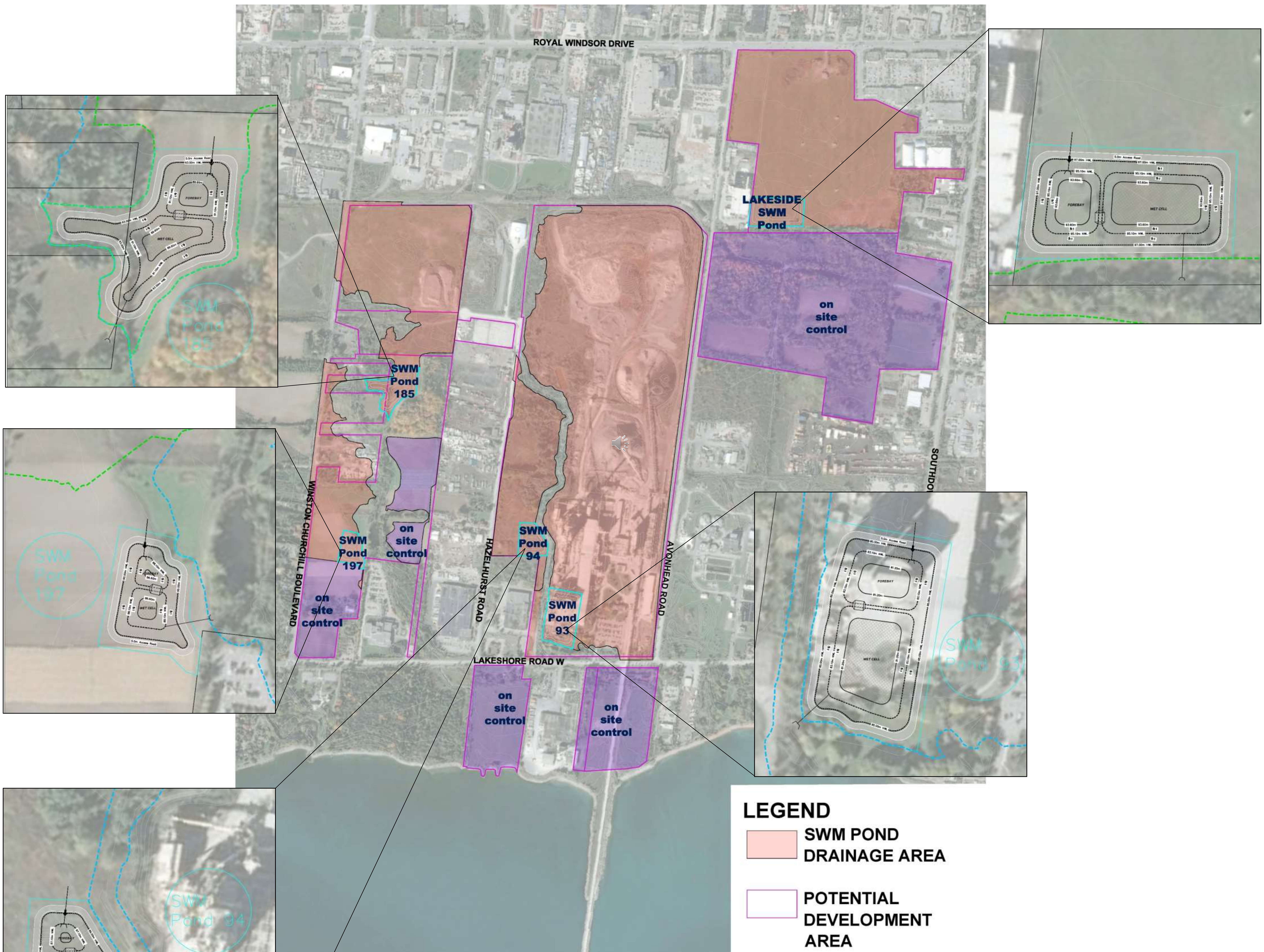
Alternative 3: Centralized SWM Facilities for Future Development



Pond ID	Contributing Drainage Area (ha)	Permanent Pool Volume	Active Storage Volume	Pond Block Area (ha)	Estimated Cost
Clearview Pond 185	20.07	3,465	11,147	1.50	$6.0 Million
Clearview Pond 197	8.84	1,384	5,062	0.77	$3.0 Million
Avonhead Pond 93	69.98	11,946	20,036	1.91	$9.1 Million
Avonhead Pond 94	10.82	2,413	6,924	0.88	$3.6 Million
Lakeside Pond	29.09	7,604	16,418	1.65	$7.5 Million

NOTE: Size and location of Centralized SWM Facilities are conceptual and subject to change

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Alternative 4: Retrofit SWM Facilities

The Mississauga Stormwater Quality Control Strategy Update (MSWQCSU) (Aquafor Beech, 2012) recommended three new retrofit on-line SWM facilities in the study area: Pond 401, 402, and 403. Pond 401 is proposed on City property associated with the future Fusion Park, Pond 402 is proposed on the privately owned concrete plant property, and Pond 403 is located on Peel Region property associated with the Clarkson WWTP.

Pond ID	Upstream Drainage Area (ha)	Permanent Pool Volume (m^3)	Predicted TSS Removal Efficiency	Pond Block Area (ha)	Cost (Based on Stormwater Quality Control Strategy Update, Dec 2012)
401 (Clearview)	448	40,875	77	3.40	$4.6 Million
402 (Avonhead)	210	7,753	67	0.44	$4.7 Million
403 (Lakeside)	145	13,693	78	0.90	$5.6 Million

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Alternative 5: Watercourse Improvements

Clearview Creek

- Realignment and reconstruction of channel west of Winston Churchill Boulevard (62 m wide corridor)
- Replacement of the concrete channel south of Lakeshore Road with a natural channel (62 m wide corridor)
- Removal of the online pond north of Lakeshore Road
- Cost: $19.1 Million

Avonhead Creek – North of Orr Road

- Replacement of the culvert under the access road and channel widening (3 m base width)
- Re-grading the property south of the railway to contain the spill over the tracks and safely convey it to Orr Road
- Cost: $0.6 Million

Avonhead Creek – South of Orr Road

- Naturalize channel upstream of Lakeshore Road (57 m wide corridor)
- Remove the flow diversion structure at Orr Road & Hazelhurst Road
- Realign the channel to outlet to Clearview Creek (57 m wide corridor)
- Cost: $31.9 Million

Lakeside Creek

- Replace the existing storm sewers with a naturalized channel (49 m wide corridor)
- New storage facility to control flows to the capacity of existing storm sewers through WWTP
- Cost: $17.8 Million

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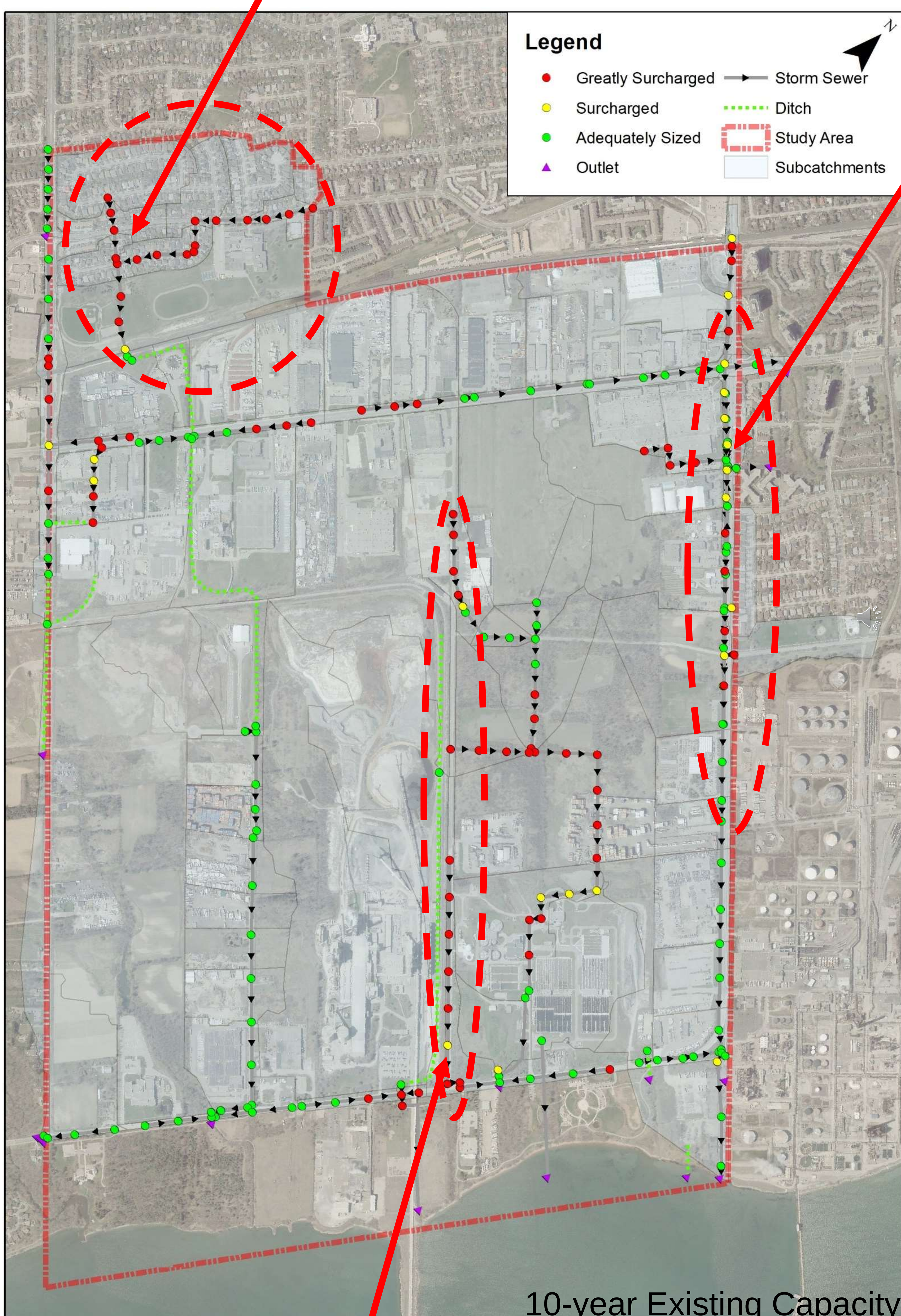
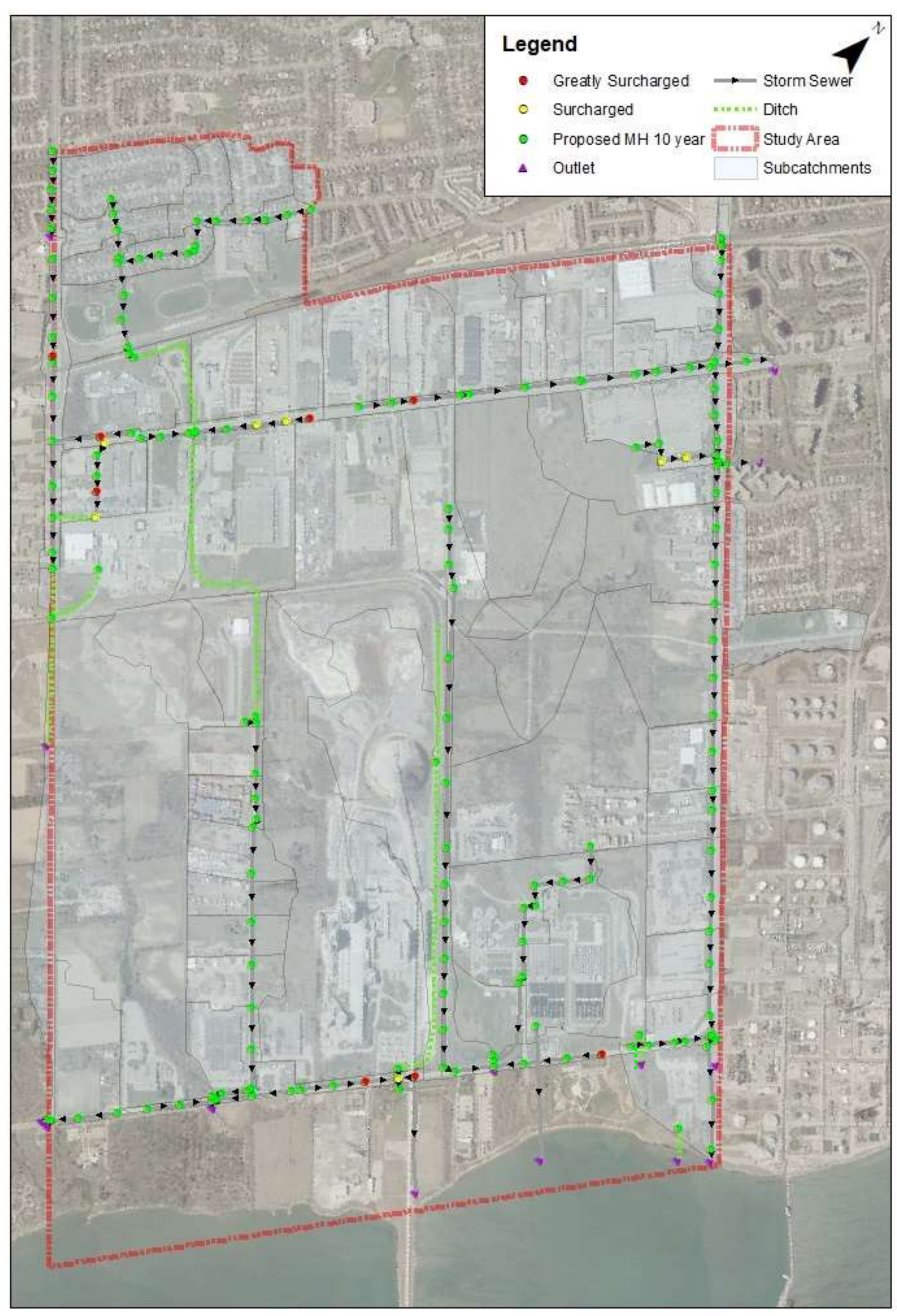
Alternative 6: Storm Sewer Upgrades

Upgrade existing sewers
Cost $3.7 Million

Upgrade existing twin storm sewers with single larger storm sewer
Cost $4.9 Million



Upsize existing storm sewers and extend storm sewer to north of Orr Road to eliminate sewers north of the WWTP – pipe sizes range from 825mm to 1500mm
$10.7 Million



10-year with Pipe Upgrades

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Evaluation of Alternatives

Natural Environment

- Potential impact on terrestrial system (vegetation, trees and wildlife)
- Potential impact on aquatic systems (aquatic life, surface water and groundwater)
- Potential to improve natural environmental conditions

Social Environment

- Disruption to existing community during construction (business disturbance, traffic, noise)
- Potential for acquisition of private land for implementation
- Impacts to recreational infrastructure (trails, parks)
- Impacts to archaeological resources and Indigenous communities

Technical

- Effectiveness in improving flooding, erosion, and water quality in the study area
- Challenges for implementation (landowner agreements, property acquisition, permitting and construction)
- Potential future maintenance requirements
- Resiliency to future climate conditions

Economic

- Estimated costs to implement project
- Estimated costs of long term operations and maintenance
- Potential impacts on future municipal revenues (gain or loss of tax revenue)

Evaluation of Alternative Solutions

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Overall		Financial Environment
	Impacts	Benefits	Impacts	Benefits	Challenges	Performance	Cumulative Impact	Cumulative Benefit	
Do Nothing	◑ Increased erosion and degraded water quality due to uncontrolled runoff from future development	○ No benefits, as no works are proposed	● No impacts, as no works are proposed	○ No benefits, as no works are proposed	● No challenges, as no works are proposed	○ Increased flow rates resulting in increased flooding and erosion in the watercourses	◕ **NOT RECOMMENDED** Uncontrolled flows from future development will have unacceptable impacts on flooding, erosion and water quality	○	No capital costs, as no works are proposed Potentially increased maintenance costs to repair infrastructure damaged by flooding and erosion
Current Standard Stormwater and Environmental Management Approach	● No impacts, as all stormwater controls would be implemented within the future development sites	○ No benefit to the natural environment	● No impacts, as all stormwater controls would be implemented within the future development sites	○ No benefit to social or cultural environments	● Few challenges anticipated for implementation of on-site controls to achieve applicable SWM criteria for future development sites	◕ Will mitigate impacts of future development on flooding, erosion and water quality, but will not improve existing degraded watercourses	● **RECOMMENDED** Adequately mitigates impacts of future anticipated development	◔	Capital costs are dependent on the form of development and suite of on-site controls implemented The on-site controls will be constructed and maintained by the developer / property owner
Centralized SWM Facilities for Future Development	● No impacts, as all SWM facilities would be constructed outside of the NHS limits	◔ The SWM facilities could be designed and landscaped to complement and enhance the adjacent NHS areas	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction	◔ Potential benefits to employees in the study area if recreational facilities (trails, lookouts) are integrated into the design of the SWM facilities	○ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners and developers for land and construction costs	◕ Will mitigate impacts of future development on flooding, erosion and water quality, but will not improve existing degraded watercourses	◑ **NOT RECOMMENDED** Prohibitive challenges to implement centralized SWM facilities for multiple development sites with different timelines, but should be considered if multiple development applications are advanced with similar timelines	◑	Estimated land and construction costs of $29.2 Million would be borne by the contributing development sites Increased long term operation and maintenance costs when the SWM facilities are assumed by the City

Least Impact / Greatest Benefit ● → ◕ → ◑ → ◔ → ○ Greatest Impact / Least Benefit

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Evaluation of Alternative Solutions

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Overall		Financial Environment
	Impacts	Benefits	Impacts	Benefits	Challenges	Performance	Cumulative Impact	Cumulative Benefit	
Retrofit SWM Facilities	◑ Vegetation and mature tree removals for implementation of the Clearview Creek facility	◔ Improved water quality in the watercourses south of Lakeshore Road	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction	◑ Potential benefits to the public if recreational facilities (trails, lookouts) are integrated into the design of the SWM facilities	○ Challenges to secure land from private property owners and Peel Region, challenges to capture storm flows for treatment while preserving baseflows and fish passage in the watercourses	◑ Will improve water quality in the relatively short length of watercourse between Lakeshore Road and Lake Ontario	◑ **NOT RECOMMENDED** Significant challenges to secure land for the SWM facilities, challenges to construct on-line water quality facilities on Clearview and Avonhead Creeks, does not improve water quality in watercourses north of Lakeshore Road	◑	Estimated land and construction costs of $29.2 Million .Increased long term operation and maintenance costs
Watercourse Improvements: Clearview Creek	◑ Vegetation and mature tree removals for Clearview Creek south of Lakeshore Road, temporary impacts to watercourse during construction	● Significant improvement in the quality and quantity of aquatic and terrestrial habitat	◕ Limited potential impacts to residents and businesses during construction	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	◔ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners north of Lakeshore Road, challenges to stage construction across multiple properties	◕ Erosion and flooding hazards would be fully confined to the channel corridor. The reduced flood plain and re-aligned corridor facilitates more functional land parcels for future development	◑ **RECOMMENDED** While there are significant challenges for implementation, there will be significant benefits to the natural environment, recreation and future developments with the realigned and protected channel corridor	◕	Capital cost of $19.1 Million Negligible increase in long term costs for maintenance of the channel corridors

Least Impact / Greatest Benefit ● → ◕ → ◑ → ◔ → ○ Greatest Impact / Least Benefit

TMIG

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Evaluation of Alternative Solutions

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Overall		Financial Environment
	Impacts	Benefits	Impacts	Benefits	Challenges	Performance	Cumulative Impact	Cumulative Benefit	
Watercourse Improvements: Avonhead Creek South of Orr Road	◕ Limited vegetation and mature tree removals, temporary impacts to watercourse during construction	● Improved fish passage from Lake Ontario and improvement in the quality and quantity of aquatic and terrestrial habitat	◑ Property required for the realignment of Avonhead Creek south of Lakeshore Road, potential impacts to residents and businesses during construction	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	◑ Moderate challenges to secure property south of Lakeshore Road, limited challenges to co-ordinate with the design of Clearview Creek south of Lakeshore Road	◕ Erosion and flooding hazards would be fully confined to the channel corridor. The reduced flood plain and re-aligned corridor facilitates more functional land parcels for future development	◑ **RECOMMENDED** While there are moderate challenges for implementation, there will be significant benefits to the natural environment, recreation and future developments with the realigned and protected channel corridor	◕	Capital cost of $31.9 Million Negligible increase in long term costs for maintenance of the channel corridors
Watercourse Improvements: Avonhead Creek North of Orr Road	◕ Negligible vegetation removals, temporary impacts to watercourse during construction	◔ Limited opportunities for ecological restoration or enhancements	◕ Limited potential impacts to residents and businesses during construction	◔ No benefits, as the works would be implemented on private properties	◕ Few technical challenges for implementation, but there are no mechanisms to compel the works to occur outside of a development application	◑ Flooding would be significantly reduced but the Regional flood would not be confined to the channel	◕ **RECOMMENDED** The works are relatively inexpensive and can be implemented relatively easily to achieve a significant reduction in the extent of flooding	◑	Capital cost of $0.6 Million Potential reduction in long term maintenance costs for larger culvert and channel

Least Impact / Greatest Benefit ● → ◕ → ◑ → ◔ → ○ Greatest Impact / Least Benefit

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Alternative	Natural Environment		Social/Cultural Environment		Technical Environment		Overall		Financial Environment
	Impacts	Benefits	Impacts	Benefits	Challenges	Performance	Cumulative Impact	Cumulative Benefit	
Watercourse Improvements: Lakeside Creek	◕ Moderate vegetation and mature tree removals required east of Avonhead Road	◕ Significant increase in the quality and quantity of aquatic and terrestrial habitat, but the system would remain piped through the WWTP and disconnected from the existing Lakeside Creek at Lakeshore Road	◕ Limited potential impacts to residents and businesses during construction	◕ Potential benefits to the public if trail systems are integrated into the design of the channel corridor	○ Significant challenges for co-ordination, co-operation and agreements among impacted and benefitting landowners, significant challenges to implement if not constructed in a single phase	◕ Erosion and flooding hazards would be fully confined within the new channel corridor	◑ **NOT RECOMMENDED** The predicted improvements to the natural heritage system cannot justify the significant challenges to implement this solution. The Avonhead Road storm sewer upgrade would provide similar flood protection to the Clarkson WWTP	◕	Capital cost of $17.8 Million Negligible increase in long term costs for maintenance of the channel corridors
Storm Sewer Upgrades	● No impacts, as works would be contained within existing developed road right-of-ways	◔ Removal or abandonment of the storm sewers east of Avonhead Road could facilitate future restoration and enhancement of the existing wooded area	◕ Potential noise, vibration, dust and traffic impacts to area residents and businesses during construction	○ No benefits, as works would be contained within existing developed road right-of-ways	● Few challenges anticipated with design, approvals and construction of storm sewer upgrades	◕ Storm sewers will meet current City storm drainage criteria, but will not improve existing degraded watercourses	● **RECOMMENDED** Recommended to be implemented to facilitate future urban development north of the Clarkson WWTP (Avonhead Road system) or as part of future planned road reconstruction projects (Southdown, Bromsgrove and Widemarr Road systems)	◑	Capital cost of $19.3 Million if implemented as standalone projects. Costs can be reduced if coordinated with future road reconstruction projects No additional long term operation and maintenance costs

Least Impact / Greatest Benefit ● → ◕ → ◑ → ◔ → ○ Greatest Impact / Least Benefit

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Project	Criteria and Objectives	Future Study Requirements	Phasing Consideration	Permits and Approvals	Other Considerations
Current Standard Stormwater and Environmental Management Approach	The City is not responsible for implementation of stormwater and environmental controls, but has a role in reviewing and approving development applications and ensuring that all criteria and guidelines are satisfied				
Clearview Creek Naturalization South of Lakeshore Road	Fully contain the Regional storm flood and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology and Coastal Assessment Geotechnical and Hydrogeology Investigations Utility Investigation	The realignment and naturalization south of Lakeshore Road should be coordinated with the realignment of Avonhead Creek south of Lakeshore Road	CVC MECP – SAR (if required) MECP – PTTW (if required) DFO	The realignment and naturalization south of Lakeshore Road should be integrated with the proposed City park at the Harding Waterfront Estate property
Avonhead Creek South of Lakeshore Road	Fully contain the Regional storm flood and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation	The realignment and naturalization south of Lakeshore Road should be coordinated with the realignment of Clearview Creek south of Lakeshore Road Interim works will be needed to tie into the existing Avonhead Creek if the realignment proceeds in advance of the realignment on the private property to the north	CVC MECP – SAR (if required) MECP – PTTW (if required) DFO	Property is required from two different parcels south of Lakeshore Road. A longer and more expensive culvert could potentially eliminate the need to secure land from the eastern property
Avonhead Road Storm Sewer System Modifications	Convey the runoff from a 10 year storm from the Avonhead Road right-of-way and the greater of existing flows or proposed controlled 100 year storm flows from external properties without surcharging	Geotechnical Investigation Utility Investigation	The storm sewer should be installed prior to development of the lands east of Avonhead Road	MECP – ECA MECP – PTTW (if required)	A small area immediately north of the Clarkson WWTP may need to continue to discharge to the storm sewer leading through the WWTP. Future development flows should be controlled to or below the available capacity in the storm sewer within the WWTP site
Southdown, Bromsgrove and Widemarr Road Storm Sewer Upgrades	Convey the runoff from a 10 year storm without surcharging (< 100 ha) Convey the runoff from a 25 year storm without surcharging (> 100 ha) Contain the 100 year storm flow within the road right-of-way	Geotechnical Investigation Utility Investigation	The storm sewer upgrades should be coordinated with planned road reconstruction and/or infrastructure renewal projects	CVC (for Southdown Road storm sewer outlet) MECP – ECA MECP – PTTW (if required)	The upgraded storm sewers for Bromsgrove and Widemarr Road may need to convey more than the 10 year storm flow in order to contain the 100 year storm flows within the road rights-of-way

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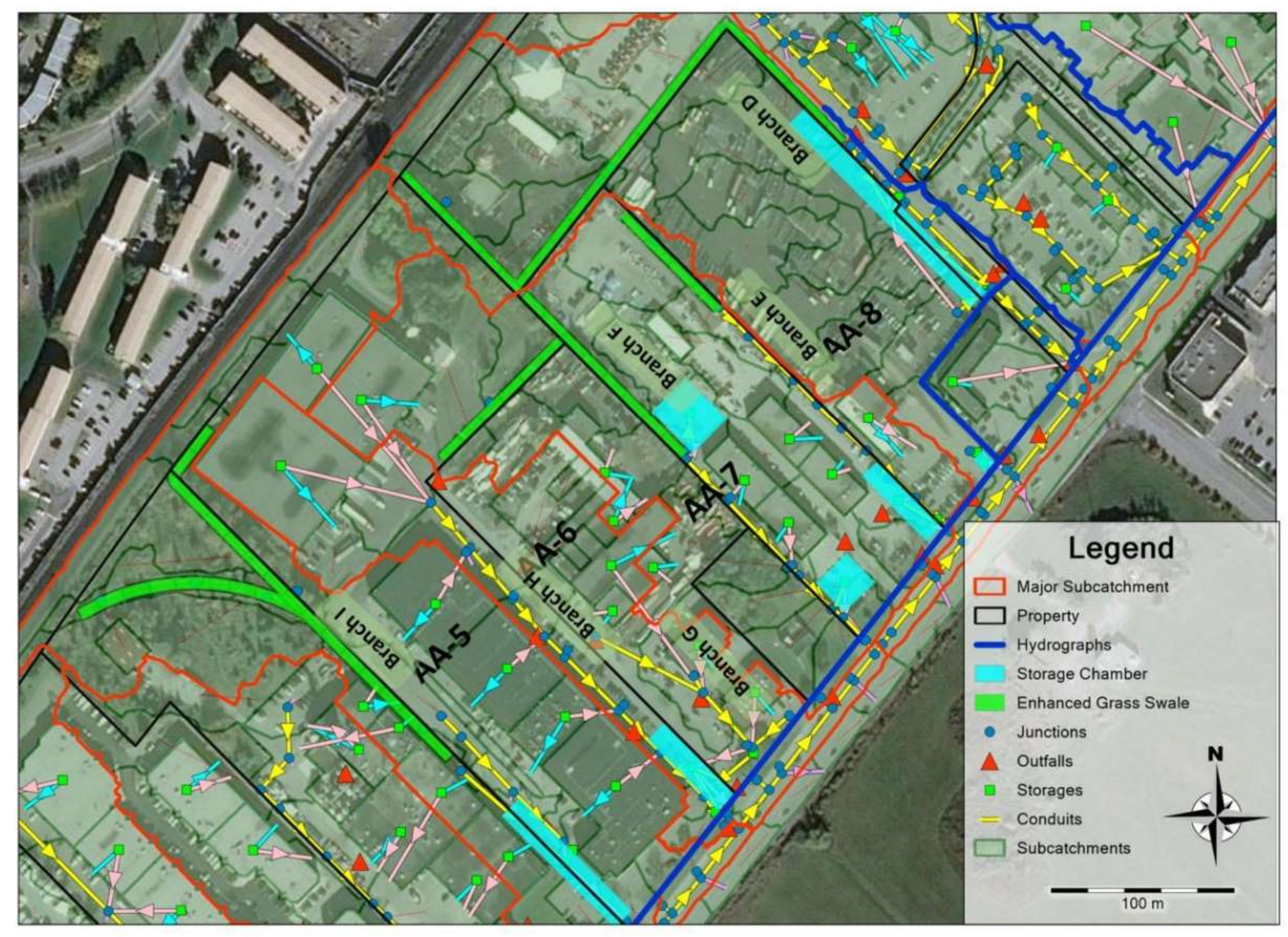
Project	Criteria and Objectives	Future Study Requirements	Phasing Consideration	Permits and Approvals	Other Considerations
Current Standard Stormwater and Environmental Management Approach	Achieve current standards for water quality, erosion mitigation, flood control, water balance and environmental protection Refer to the presentation material for this approach for the specific stormwater and environmental management criteria	Design, approval and construction of stormwater management infrastructure for future development and redevelopment in the study area is the responsibility of the developer as part of the normal development process for each property. The developer or property owner will also be responsible for long term operation and maintenance of all on-site stormwater management controls.			
Clearview Creek Realignment East of Winston Churchill Boulevard	Fully contain the Regional storm flood and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation	The works span multiple properties and should be coordinated to constructed as much of the channel as possible in a single phase. Interim works will be needed to transition to the existing channel upstream and downstream if implemented on a property-by-property basis	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga Region of Peel (for construction access from WCB) DFO	The recommended alignment is centred on the property line of the lots fronting Winston Churchill Boulevard If an agreement cannot be reached with the owner to the east, the channel may need to be implemented fully on the property to the west
Clearview Creek Dam Removal north of Lakeshore Road	Achieve a net benefit to the natural heritage system Ensure fish passage Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations	The works are located on a single property and can be completed in a single phase	CVC MECP – SAR (if required) MECP – PTTW (if required) MNRF (to remove fish and wildlife from the pond prior to removal) City of Mississauga Region of Peel (for construction access from WCB) DFO	It is expected that the property owner would implement these works to mitigate risks and liability associated with failure of the dam and potential impacts to downstream property and infrastructure
Avonhead Creek Flood Improvements North of CNR Tracks	Prevent any increase in the frequency or extent of flooding on adjacent properties	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation	The works can proceed independently but should ideally be coordinated with the flood containment project to the south	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga DFO	It is expected that these works would occur during any future expansion or redevelopment of 2500 Royal Windsor Drive

Southdown District Stormwater Servicing and Environmental Management Plan Municipal Class Environmental Assessment

Project	Criteria and Objectives	Future Study Requirements	Phasing Consideration	Permits and Approvals	Other Considerations
Avonhead Creek Flood Containment South of CNR Tracks	Convey the spill flow over the railway tracks and safely convey it to Orr Road Prevent any increase in the frequency or extent of flooding on adjacent properties Provide a freeboard of at least 0.3 m from the regulatory flood level to the proposed grades on the remainder of the site	Geotechnical and Hydrogeology Investigations	The works can proceed independently but should ideally be coordinated with the culvert and channel improvements to the north	CVC City of Mississauga Region of Peel (for construction access from WCB)	It is expected that these works would occur during development of 701 - 805 Winston Churchill Boulevard
Avonhead Creek Realignment West of Hazelhurst Road	Fully contain the Regional storm flood and all erosion hazards Achieve a net benefit to the natural heritage system Eliminate or minimize the need for long term maintenance	Archaeology (Stage 2 AA) Fluvial Geomorphology Geotechnical and Hydrogeology Investigations Utility Investigation	The existing and realigned channel are contained within a single property. Interim works may be required to connect to the existing culvert under Lakeshore Road if the realignment occurs in advance of the realignment of Avonhead Creek south of Lakeshore Road	CVC MECP – SAR (if required) MECP – PTTW (if required) City of Mississauga DFO	It is expected that these works would occur during future redevelopment of the existing concrete plant property

Additional Recommendations and Considerations

- CVC Grids study – benefits to Royal Windsor storm sewer system and Sheridan Creek if low impact development SWM practices are implemented on existing private properties



- Future Redevelopment – the majority of the study area developed prior to adoption of modern swm – future redevelopment of these sites (such as Clarkson GO Transit Hub) with current SWM will further improve water quality, flooding and erosion

- Future infrastructure renewal – road reconstruction projects should incorporate stormwater management, including LID to improve quality and quantity of runoff from city and regional roadways

Next Steps

1. Review public feedback and refine or confirm the preferred solution
2. Agency Consultation
3. Issue of Notice of Completion (Fall 2021)
4. Project File Report available for public review for 30 day period

Please complete the on-line survey which can be found on the project website

You can contact Greg or Steve with any other questions, comments or feedback on this project

Mr. Steve Hollingworth
Consultant Project Manager
The Municipal Infrastructure Group
8800 Dufferin Street, Suite 200
Vaughan, ON L4K 0C5
Tel: (416) 300-0415
Email: shollingworth@tmig.ca

Mr. Greg Frew
City Project Manager
City of Mississauga
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Mississauga, ON L5B 2T4
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Email: greg.frew@mississauga.ca

APPENDIX G4

Notice of Completion

NOTICE OF STUDY COMPLETION
Municipal Class Environmental Assessment Study Southdown District Stormwater Servicing and Environmental Management Master Plan

PROJECT BACKGROUND

The City of Mississauga has completed a Master Plan to establish a stormwater servicing and environmental management plan to protect, maintain and enhance the existing streams, groundwater, and natural environmental resources of the Southdown District study area as future urban development and re-development takes place. The study is being conducted in accordance with Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) process, following a Master Plan approach.

RECOMMENDED MASTER PLAN

Based on the Study findings and feedback received from the public and agencies, the recommended Master Plan includes a number of different projects to improve water quality, reduce flooding and erosion and enhance the quantity and quality of the watercourses and natural heritage systems through the study area. These projects are listed below and shown on the study area figure.

SCHEDULE A / A+ PROJECTS

- Upgrades to the existing storm sewers on Southdown Road, Bromsgrove Road and Widemarr Road
- Upgrades and extension of the existing storm sewers on Avonhead Road and decommissioning the existing storm sewers north of the Clarkson Wastewater Treatment Plan

STATUS

- These projects are pre-approved under the Municipal Class EA and can proceed to design and construction, but require the public to be notified. This Notice satisfies the requirements of the Municipal Class EA, but City may also notify area residents and businesses when construction is about to commence

SCHEDULE B PROJECTS

- Realignment and naturalization of Clearview Creek east of Winston Churchill Boulevard
- Realignment and naturalization of Clearview Creek south of Lakeshore Road
- Decommissioning the online pond on Clearview Creek north of Lakeshore Road
- Improvements to Avonhead Creek south of Royal Windsor Drive and associated grading improvements north of Orr Road
- Realignment and naturalization of Avonhead Creek north and south of Lakeshore Road

STATUS

- While the Master Plan addresses Phases 1 and 2 of the Municipal Class EA, additional investigations and public consultation will be carried out by the City or private proponent at a later date

A Master Plan has been prepared to document the planning and decision-making process for this study. It is being made available for review by the public, Indigenous communities, government agencies, and interested stakeholders from July 4, 2022, to August 4, 2022, on the City's project website:
https://www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan/

Should a member of the public request a hard copy of the Master Plan, the City will assess how this might be delivered in a manner that is consistent with regional and provincial guidelines supporting physical distancing during the current pandemic.

PROVIDING COMMENTS

If you have any questions, comments or concerns, please contact the project team:

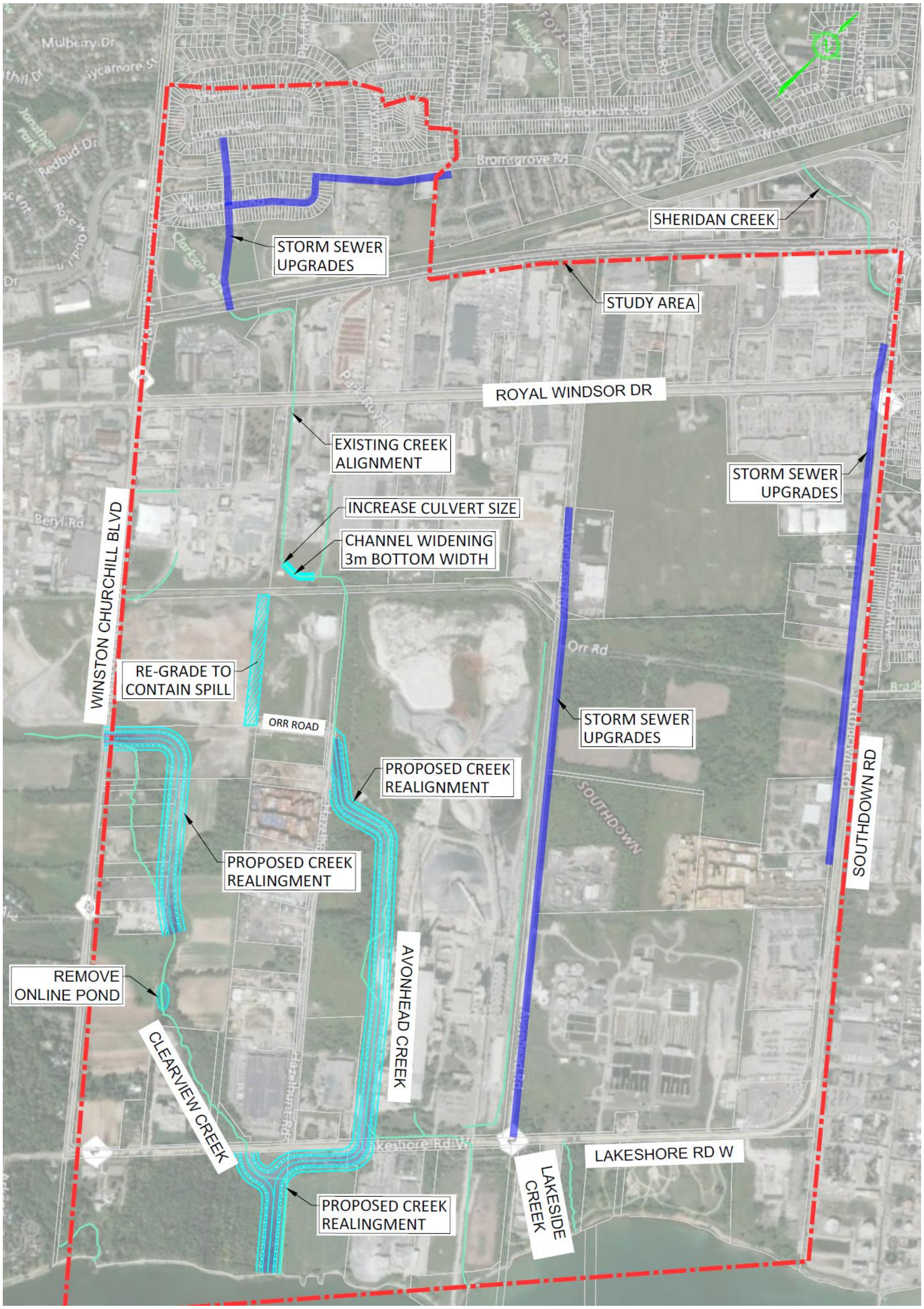
Greg Frew, P.Eng
Project Manager, City of Mississauga
905-615-3200 (Ext. 3362)
Greg.Frew@mississauga.ca

Steve Hollingworth, P.Eng
Director of Water Resources, TYLin
416-300-0415
Steve.Hollingworth@tylin.com

This Study was conducted in accordance with the planning process for Master Plans as outlined in the *Municipal Engineers Association Municipal Class Environmental Assessment* (October 2000, as amended in 2007, 2011, and 2015), which is approved under the *Ontario Environmental Assessment Act*. Personal information submitted is collected under the authority of the Environmental Assessment Act and will become part of the record that is available to the general

This notice was issued July 4, 2022.

STUDY AREA AND RECOMMENDED PROJECTS



July 4, 2022 Project Number 18137

Trevor Bell
Regional Environmental Planner
Project Review Unit
Ministry of the Environment, Conservation and Parks
1st Floor, 135 St. Clair Avenue West
Toronto, ON M4V 1P5

Dear Trevor

Re: Southdown District Stormwater Servicing and Environmental Management Master Plan, City of Mississauga
Response to MECP Comments on Draft Master Plan Report

Thank you for reviewing and providing comments on our Draft Report for the Southdown District Stormwater Servicing and Environmental Management Master Plan, which we submitted in January 2022.

Recall from your initial review that the Master Plan is recommending a number of projects which fall under Schedule A, Schedule A+ and Schedule B undertakings under the Municipal Class EA. The Master Plan follows 'Approach 1' as outlined in the Municipal Class EA document. It is intended to satisfy Phases 1 and 2 of the Municipal Class EA, with additional investigations to be completed for Schedule B projects and documented in future Project File Reports.

We have repeated the comments provided by MECP on February 10, 2022 below, followed by our responses to describe how they have been addressed in the final report. The final report is available on-line at www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan

1. *The ministry recommends including information regarding current stormwater quality management facilities within the study area in the Existing Environments section of the report.*

   Response: Section 2.6.4.2 has been added to the report to note that there is no evidence of any existing stormwater quantity or quality treatment facilities in the study area.

2. *The ministry has concerns with the proposed realignment of the Clearview Creek channel downstream of Winston Churchill Blvd. Clearview Creek at that location has a natural meandering channel with vegetated buffers on both banks. The proposed realignment of the channel could disturb the established aquatic and floodplain habitat and the natural hydrologic regime of the creek. The proposed design of the new channel has a sharp 90 degree turn from the eastern direction to the south that could impede the streamflow during high water levels and discharges and cause flooding within upstream areas.*

   Realignment and improvements to the creek will be subject to a Schedule B Municipal Class EA. The ministry recommends refining this solution to mitigate potential adverse impacts to the creek. A commitment should be made to develop a monitoring plan during the EA process to ensure any changes do not impede the streamflow and natural hydrologic function of the creek.

   Response: It has been our experience that a well designed channel corridor can accommodate 90 degree bends without risk of excessive erosion. Note further that the bankfull channel can be configured with a much more gradual curvature within the overall channel corridor.

   Clearview Creek was realigned several years ago within a narrow corridor west of Winston Churchill Boulevard, including a 90 degree bend. This channel continues to function as designed with no apparent erosion at the 90 degree bend. Note finally that the proposed channel realignment has been accepted by Credit Valley Conservation (CVC) through their ongoing participation on the steering committee for the Master Plan.

   Regardless, the recommendation for the fluvial geomorphology study in Section 5.2.2.2 has been expanded to address this concern, and Section 5.3.1 has been revised (as requested by CVC) with enhanced commitments for minimizing and offsetting potential impacts to the natural heritage systems associated with the watercourse rehabilitation projects. Finally, Section 5.3.1.9 has been added to recommend a post-construction monitoring plan for the channel rehabilitation projects.

3. *The report indicates that no response was received from the Indigenous communities contacted about the Master Plan. The report also indicates that there are some undeveloped areas within the study area that retain some archaeological potential, and Stage 2 archaeological assessments (S2AAs) are recommended prior to construction in these areas.*
   The report should include a commitment to follow-up with the identified Indigenous communities regarding the undertaking of any S2AAs. Indigenous communities may want to have field representatives present and participating during S2AAs. It may be necessary to contact Indigenous communities by telephone in addition to by letter/email to ensure they are aware of any opportunities to participate in the planning process.

A commitment should also be made to immediately contact the identified Indigenous communities if archaeological resources are uncovered during construction. The ministry recommends, during subsequent Schedule B or C projects, developing a plan for work stoppage and a communication plan for contacting the Indigenous communities should any archaeological resources be uncovered.

Response: The commitment to engage with indigenous communities has been added to the 'requirements for future study' for all projects in Sections 5.1 and 5.2 where future archaeological studies are required. These sections have also been updated with the commitment to stop all work and contact indigenous communities immediately if archaeological resources are found during the Stage 2 AA and/or construction.

We trust that the above responses and enclosed Master Plan Report address your concerns. Please contact the undersigned if you have any remaining questions or comments.

Sincerely,

TYLin

Steve Hollingworth
Director of Water Resources
steve.hollingworth@tylin.com

cc: Greg Frew, City of Mississauga

TYLin

July 4, 2022 Project Number 18137

Dorothy Di Berto, RPP
Senior Manager
Planning and Development Services
Credit Valley Conservation
1255 Old Derry Road
Mississauga, ON L5N 6R4

Dear Dorothy

Re: Southdown District Stormwater Servicing and Environmental Management Master Plan, City of Mississauga
Response to CVC Comments on Draft Master Plan Report

Thank you for reviewing and providing comments on our Draft Report for the Southdown District Stormwater Servicing and Environmental Management Master Plan, which we submitted in January 2022 and have discussed over several steering committee meetings with the City of Mississauga.

We have repeated the comments provided by CVC dated February 14, 2022, followed by our responses to describe how they have been addressed in the final report. The final report is available on-line at www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan.

1. *Section 2.1.6 outlines CVC's role in the review of the Master Plan but also our role in development review and permitting. The section states that the CVC regulation extends 10m beyond various hazards, however this should be revised to state 15m. Additionally, the section does not list wetlands as part of the regulated features. Please amend accordingly.*

   Response: The section has been revised accordingly

2. *It should be noted that CVC's regulation 160/06 is text based and as such the mapping is only a general guide (i.e. the presence of wetlands may be identified in the field but not mapped). Please include a note that the regulation is text based under Figure 2-2.*

   Response: A note has been added to this effect under Figure 2-3

3. *Appendix D - Hydrological Model Development and Existing Conditions Output - it is noted that the CVC model has not been included in this appendix although it is referenced in the report. It is assumed that the model will be included in this appendix.*

   Response: We believe it is only necessary to provide the calculations for input parameters and VO model schematics for the TMIG modelling in Appendix D, in order to support the modifications made to the hydrology model. Digital copies of the both the original and TYLin modified hydrologic and hydraulic models have been included with the final submission

4. *Figure 2.7 (also known as Figure 5 in the NH Report App A) Please amend to include Peel's Core Greenlands mapping. Specifically, a portion of Core Greenlands occurs in the Avonhead Creek watershed east of Hazelhurst Road that is not identified as Mississauga NHS but should be included here until field refinements occur. It is noted that 3 wetland units have been mapped in this area; please also note that any wetlands greater than 0.5ha are also a component of the City's Significant Natural Area (in addition to all wetlands of any size being regulated by CVC). Please revise the Figures to correctly identify any NAS as well as including Peel's Greenlands System layer.*

   Response: Section 2.3.2 and Figure 2-8 have been revised as requested.

5. *At the southwestern extent of the study area, Peel Core Greenlands include the large, treed feature that mainly consists of cultural plantation (CUP) with some cultural woodland and cultural savannah habitat associated with SD1. Figure 2.7 shows a direct connection between the included CUP3 to the not included CUP2-A. Please either include Peel's Core Greenland layer as provided and look to refine in later stages, or please discuss any field findings that apply to exclude this CUP2-A, since cultural plantations can be included as a Core Feature in Peel's Greenland System, where they meet size criteria.*

   Response: Section 2.3.2.2 has been added to discuss the field findings related to vegetation communities outside of the Mississauga Natural Areas. Figure 2.8 has been updated to include Peel's Greenlands mapping, and a new Figure 2-1 has been added to the report to illustrate the Region's Greenlands System Core Areas.

6. *Section 2.7 Summary of Existing Conditions Opportunities and Constraints, discusses the various mapped constraints and identifies buffers for each. Although they are not mapped, CVC staff have identified potential wetlands via development applications and as such,*

wetlands should be listed as potential constraints. Further, under the buffer list in Figure 2-22, 'other wetlands' should include a 15m buffer.

Response: The buffer table included on Figure 2-23 has been removed to avoid any confusion or discrepancies. Wetlands have been added as protected features and typically applicable buffers have been added to Section 2.7.1.

7. *Section 2.7 also discusses the CVC regulation mapping and notes that the mapping does not reflect updated hydraulic/hydrologic mapping and associated floodplain. As stated above, it should be noted that the regulation is text based to avoid confusion, and clarify that the mapping is approximate.*

   Response: The reference to CVC's regulation limit mapping in this section has been clarified as requested.

8. *Section 5.1.2.2. recommends compensation for removal of any "mature vegetation", while section 5.3.11 speaks to restoration as per the City's Tree Preservation By-Law. While these are supported, at minimum, it should be noted that CVC recommends offsetting loss of the NHS both in terms of area and ecological function (regardless of age). Particularly where NH feature loss is within CVC's regulated area, please refer to CVC's Ecological Offsetting Guideline when calculating feature loss and replacement expectations in order to truly result in a "net environmental benefit to the NHS".*

   Response: Section 5.3.1.1 has been updated to include CVC's requirements related to vegetation removals.

We trust that the above responses and enclosed Master Plan Report address your concerns. Please contact the undersigned if you have any remaining questions or comments.

Sincerely,

TYLin

Steve Hollingworth
Director of Water Resources
steve.hollingworth@tylin.com

cc: Greg Frew, City of Mississauga

TYLin

July 4, 2022 Project Number 18137

Bruno Morgado
Optimization Manager
Ash Grove, a CRH Company
2300 Steeles Avenue West 4th Floor
Concord, ON L4K 5X6

Dear Bruno

Re: Southdown District Stormwater Servicing and Environmental Management Master Plan, City of Mississauga
Notice of Study Completion

Thank you for your participation to date in the Southdown District Stormwater Servicing and Environmental Management Master Plan, which we have prepared on behalf of the City of Mississauga.

Recall that we met (virtually) on October 15, 2021 to review the materials from our second Public Information Centre for the project, which was provided in an on-line format and open for comments from September 15 to October 31, 2021.

We received your subsequent letter dated October 28, 2021 and have incorporated your feedback in the final Master Plan Report, which is available on-line at www.mississauga.ca/projects-and-strategies/environmental-assessments/southdown-district-stormwater-servicing-and-environmental-management-plan.

We have repeated the comments provided in your letter of October 28, 2021 below, followed by our responses to describe how they have been addressed in the final report.

1. *CRH would like to see language in the report regarding flexibility for the alignment of a potentially reconstructed Avonhead Creek through the CRH lands*

   Response: Please refer to Section 5.2.6.5 of the report, which specifically notes that the alignment suggested in the Master Plan can be revised as required.

2. *CRH would like to see language in the report regarding flexibility for the configuration and width of a potentially reconstructed Avonhead Creek through the CRH lands*

   Response: Please refer to the response to the comment above. Please also refer to the Section 5.2.6.2, Requirements for Future Studies, Fluvial Geomorphology Investigation, which states that the width and configuration of the channel would be refined through that study.

3. *CRH would like to have some assurance that future minor building expansions or other minor site modifications will not trigger a requirement to implement some or all of the recommended channel reconstruction, and that these works would only be required as part of a major re-development of the site.*

   Response: Please refer to Section 5.2.6.5 of the report, which notes that the channel would only be expected to be implemented as part of a major redevelopment of the property that would require modifications to the watercourse regardless.

4. *CRH would like to ensure that they are consulted and involved in the planning of any proposed diversion of Avonhead Creek southwest to Clearview Creek at Lakeshore Road, to ensure that the alignment and/or connection point to the existing Avonhead Creek on the north side of Lakeshore Road does not impact the plant's current or planned operations*

   Response: Please refer to Section 5.1.3.3 of the report, which commits the City to consulting with Ash Grove in the event that the City proceeds with modifications to Avonhead Creek at and south of Lakeshore Road in advance of any improvements to the watercourse north of Lakeshore Road.

We trust that the above responses and enclosed Master Plan Report address your concerns. Please contact the undersigned if you have any remaining questions or comments. Please also refer to the enclosed Notice of Completion for additional information on the study and process to resolve any outstanding concerns.

Sincerely,

TYLin

Steve Hollingworth
Director of Water Resources
steve.hollingworth@tylin.com

cc: Greg Frew, City of Mississauga

APPENDIX G5

Other Stakeholder and Agency Consultation

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.
8800 Dufferin Street, Suite 200
Vaughan, Ontario L4K 0C5
T 905.738.5700
F 905.738.0065
www.tmig.ca

MEETING MINUTES

PROJECT	Mississauga Southdown SWM Servicing EMP		
CLIENT / MUNICIPALITY	City of Mississauga	CLIENT REFERENCE	
DATE / TIME	May 31, 2018 / 1:30 pm		
LOCATION	201 City Centre Drive, Mississauga – 8F Superior Room		
MEETING PURPOSE	Coordination with Conservation Authorities		
ATTENDEES	City of Mississauga	Greg Frew	
	Credit Valley Conservation	Dorothy DiBerto, Phil James, Kyle Vander Linden, Aloma Jonker, Bill Trenouth, Karen Chisholme	
	Conservation Halton	Matt Howatt	
	TMIG	Rosalie Chung, Steve Hollingworth	
TMIG PROJECT NUMBER	18137		

ITEM	DISCUSSION	ACTION BY
1	G Frew provided a brief overview of study, and confirmed with CVC that the study area was expanded to include the area between Royal Windsor Drive and the rail tracks to the north.	
2	TMIG provided an update on the study. A pipe network model is under development, using the PCSWMM model. The CVC watershed hydrologic models have been further discretized through the study area to support area-specific targets for future development and redevelopment in the study area.	
3	CVC is currently studying the 14 properties north of Royal Windsor Drive for a potential communal LID installation. B Trenouth stated that the consultant working for CVC is ground-truthing drainage conditions in the Royal Windsor Drive area, based on a topo survey and review of available site plan. Drainage areas to Royal Windsor Drive and to Sheridan Creek will be delineated in detail based on field surveys. The properties will be modelled with EPA SWMM in detail to size future potential retrofits. B Trenouth agreed to share the survey drawing and/or catchment delineation with the City and TMIG when available.	**CVC**

ITEM	DISCUSSION	ACTION BY
4	Timing for the CVC study for the Royal Windsor Drive area was discussed. R Chung confirmed that the drainage delineation for TMIG's PCSWMM model has already been completed, and set-up of the PCSWMM pipe model is well underway. B Trenouth indicated that the SWMM model for CVC's study likely won't be complete until mid to late summer. TMIG will continue with the setup of the PCSWMM model for the Southdown study area, including the Royal Windsor Drive storm sewer system, on the basis of the information provided by the City. B Trenouth will provide a copy of the SWMM model to TMIG when it is finalized, and TMIG will determine if or how the model set-up and results can be integrated with the PCSWMM modelling for the Southdown SWM Servicing and EMP study.	**TMIG** **CVC**
5	B Trenouth indicated that CVC's current approach to simulating future climate change in hydrologic modelling is to increase storm intensity's (IDF curves) by 20%. TMIG can contact Neelam Gupta for more information on CVC's hydrologic modelling and climate change approach. Neelam Gupta is also managing the CVC's update of the hydrologic & hydraulic models and flood plain mapping and should be contacted directly for an update on timing for the watersheds within the study area	**TMIG**
6	K Chisholme presented an update on the restoration of Clearview Creek. The project was initially driven by restoring Clearview Creek downstream of Lakeshore Road where it is concrete channel, but also assesses the full creek in terms of fluvial geomorphology and ecology. Three realignments have been identified for the concrete portion but preference has not been evaluated. CVC will provide all relevant existing conditions data to TMIG as soon as possible (ahead of finalizing the study)	**CVC**
7	K Chisholme provided an update on the Shoreline Strategy (LOISS) project. The Characterization Study is essentially complete and should be released in July or August	
8	K Vander Linden presented an update on a project called GRID ECON, an analysis that puts a monetary value to LID's and engineering models. The study is still in the early stages, with plans to apply the EPA SWMM based 'SUSTAIN' model to optimize SWM recommendations.	
9	Daylighting of Avonhead Creek south of Lakeshore Road was proposed in the 2015 Avonhead Creek study. K Chisholme indicated that the new owners of the cement plant are less supportive of an open channel feature on their property, and the project has essentially stalled. K Chisholme noted that portions of the cement plant site are lower than the adjacent watercourse, which then drops approx. 10 feet down to the channel north of Lakeshore Road.	
10	S Hollingworth stated that the Phase 1 report for the Southdown study should be available by late summer / fall 2018. D DiBerto requested a copy of the report when available. It was agreed that CVC would be circulated the Phase 1 study report, and S Hollingworth suggested a subsequent meeting to discuss the findings and get an update on the CVC initiatives in the study area	**TMIG**

ITEM	DISCUSSION	ACTION BY
11	S Hollingworth indicated that the first Public Information Centre will take place in either late fall 2018 or early 2019.	
12	CVC staff indicated that they have contacts with many property and business owners in the study area, both for the LID project site north of Royal Windsor Drive and past stewardship and planning activities. CVC agreed to provide landowner contact information for these properties to the City	**CVC**
13	CH will like to continue to be involved in the communication and process of the study and recognizes that Joshua Creek watershed is a small portion to the overall study area.	**City/TMIG**

PLEASE NOTE: If these minutes do not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

DISTRIBUTION All Attendees

MINUTES PREPARED BY

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Steve Hollingworth, Rosalie Chung

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MEETING MINUTES

PROJECT	MISSISSAUGA SOUTHDOWN SWM SERVICING EMP		
CLIENT / MUNICIPALITY	City of Mississauga	CLIENT REFERENCE	
DATE / TIME	May 24, 2019 / 10:00 am		
LOCATION	201 City Centre Drive, Mississauga – 8F Superior Room		
MEETING PURPOSE	Review Existing Conditions Report and Opportunities & Constraints		
ATTENDEES	City of Mississauga	Greg Frew	
	Credit Valley Conservation	Dorothy DiBerto, Shari Faulkenham, Rizwan Haq, Neelam Gupta	
	TMIG	Steve Hollingworth	
TMIG PROJECT NUMBER	18137		

ITEM	DISCUSSION	ACTION BY
1	R Haq and N Gupta provided an update on CVC's flood plain mapping program. Lakeside Creek mapping is complete, and Avonhead creek is approx. 90% complete. HEC-RAS 2D modelling has been used for Avonhead Creek at Orr Road, and the predicted flood limit extends further west than determined through the 1D model.	
2	R Haq and N Gupta noted that CVC is still determining the most appropriate means of regulating the flood plain on Avonhead Creek south of Orr Road, as the majority of the flow in the system will be conveyed southward along the Hazelhurst storm sewer and road surface, with only baseflow continuing in the watercourse east of Hazelhurst. R Haq and N Gupta recommended that TMIG mention the need for safe access along Hazelhurst Road and potential surface flooding at the intersection of Hazelhurst and Lakeshore in the opportunities and constraints section of the report. Notes from Neelam "*Peak flows from the Clearview Creek (greater than 100 year) and Avonhead Creek (greater than 2 year) will spill on the Lakeshore road. Recommendations should be provided in the report to safely convey spill flows from Lake Shore Road to Lake Ontario*".	**TMIG**
3	CVC staff suggested that the proposed restoration of Avonhead Creek through the concrete plant could also include the removal/re-configuration of the diversion structure at Orr Road if the new channel has sufficient capacity to relieve the flood flows to the Hazelurst Road storm sewer and road surface.	

ITEM	DISCUSSION	ACTION BY
4	CVC staff indicated that the flood plain mapping for this section of Mississauga should be finalized later in 2019, and presented to CVC's board for endorsement in early 2020. The information is expected to be rolled out to the public in Spring 2020	
5	CVC will provide the updated flood plain mapping to the City and TMIG when final. TMIG will update the pending Public Information Centre (PIC) materials to indicate that CVC's flood plain mapping is under revision. It was agreed that the subsequent SWM modelling could proceed on the basis of the draft floodline mapping to date.	**TMIG**
6	D DiBerto indicated that CVC reviewed a Functional Servicing Report and provided draft plan conditions for the Lifetime industrial subdivision, located on the east side of Winston Churchill Boulevard north of the Clearview Creek crossing. G Frew stated that the draft plan of subdivision does not show up as 'approved' in the City's mapping, G Frew agreed to contact planning staff to determine the status of the application (21T-15001)	**G Frew**
7	CVC Comment # 5 regarding Lakeside Creek drainage boundaries was discussed. R Haq confirmed that only the watershed overview figure (2-9) was out of date, and the actual hydrologic model catchment mapping is correct	
8	D DiBerto and S Faulkenham noted that CVC generally takes the lead in 'field-truthing' the Core Greenlands features identified in the Region's Official Plan. TMIG / PECG will update the mapping and reference relevant policies from the Region's OP in the report	**TMIG**
9	The potential diversion from Avonhead Creek to a reconstructed Clearview Creek was discussed. S Faulkenham indicated that, as Avonhead Creek is currently piped south of Lakeshore Road and CVC's initiative to daylight the creek south of Lakeshore Road appears to have stalled, CVC would be open to having the potential diversion to Clearview Creek considered in the development of alternative management strategies	
10	Treatment of the 'holes' in the large NHS area between Avonhead Road and Southdown Road was discussed. S Faulkenham indicated that CVC would be willing to consider 'reconfiguration' of the NHS to create a single higher quality feature with the same or greater area, but recommended that TMIG review the Core Greenland policies in the Regional Official Plan to determine if it could be approved under the Regional Official Plan	**TMIG**
11	S Faulkenham indicated that creation of NHS linkages, is one of CVC's objectives for the study area, especially linkages to the lake and a continuous east-west corridor along the waterfront.	
12	S Hollingworth noted that many of the comments included in Appendix B (Integrated Watershed Management Team comments) would be difficult to address. Many of them would result in the study recommending remedial works on existing developed properties, and the City can't implement these works outside of a development application. D DiBerto stated that the comments are provided for information/discussion, and any questions should be directed to the	**TMIG**

ITEM	DISCUSSION	ACTION BY
	IWM team. G Frew stated that the City is in the process of setting up a separate meeting with the IWM team following the PIC.	
13	R Haq stated that TMIG should consult CVC's criteria document to confirm SWM criteria for the study area. R Haq indicated that the minimum volume control criterion would be 2 mm, but actual water balance / volume control criteria are site-specific.	**TMIG**
14	S Hollingworth noted that the SWM quality retrofits recommended by previous studies did not appear reasonable to TMIG, and would not likely be carried forward in the recommended stormwater strategy for the Southdown Area. R Haq asked that deleting the previously recommended retrofits be justified, particularly if they have been included in past City development charges and water quality strategies.	**TMIG**
15	S Hollingworth provided an update on the project schedule. The first PIC is scheduled for June 11, and TMIG will continue to develop and evaluate the different management strategies over the summer of 2019. The preliminary preferred strategy is to be presented to the public in a second PIC in fall 2019, with the study completed and Notice of Completion issued by the end of 2019	
16	D DiBerto noted that she typically manages private development applications, whereas Jakub Kilis at CVC usually manages environmental assessment projects. S Hollingworth stated that the study was being completed as a Master Plan under the Municipal Class EA, but it will provide SWM and NHS recommendations for future private development and redevelopment in the study area along with recommendations for improvements to public infrastructure. It was agreed that D DiBerto would remain the primary point of contact at CVC.	

PLEASE NOTE: If these minutes do not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

DISTRIBUTION	All Attendees
	Rosalie Chung, TMIG

MINUTES PREPARED BY

Steve Hollingworth
shollingworth@tmig.ca

STRONG FOUNDATIONS. STRONG FUTURE.

ASH GROVE
A CRH COMPANY

Mr. Greg Frew
City Project Manager
201 City Centre Drive, Suite 800
Mississauga, ON L5B 2T4

October 28, 2021

Mr. Frew,

Comments on Southdown District Stormwater Servicing and Environmental Management Plan

I am providing this letter as a response to the Southdown District Stormwater Plan as it relates to the CRH Cement Plant. The Plant has been in operation since 1956 and owns over 250 acres of property in the Southdown District. After reviewing the various proposals with yourself and Steven Hollingworth, we can acknowledge that this project can have significant impacts to our current and future operations depending on the preferred option selected.

As you know, the CRH Plant on Lakeshore Road is critically located in terms of alignment with the preferred options which will result in a potentially reconstructed Avonhead Creek through CRH lands. From our discussion, it has been made clear that the City of Mississauga has no intention of obtaining land nor constructing a re-aligned Avonhead Creek through the CRH lands unless there is a comprehensive plan created for redevelopment of the land owned by CRH. CRH has no intention of ceasing operations or selling the land in the foreseeable future and as such, we would like to see the following reflected in the final Project File Report:

- CRH would like to see language in the report regarding flexibility for the alignment of a potentially reconstructed Avonhead Creek through the CRH lands
- CRH would like to see language in the report regarding flexibility for the configuration and width of a potentially reconstructed Avonhead Creek through the CRH lands
- CRH would like to have some assurance that future minor building expansions or other minor site modifications will not trigger a requirement to implement some or all of the recommended channel reconstruction, and that these works would only be required as part of a major re-development of the site.
- CRH would like to ensure that they are consulted and involved in the planning of any proposed diversion of Avonhead Creek southwest to Clearview Creek at Lakeshore Road, to ensure that the alignment and/or connection point to the existing Avonhead Creek on the north side of Lakeshore Road does not impact the plant's current or planned operations

We look forward to continuing to work with you on this project as the plans for the Southdown District Stormwater and Environmental Servicing Study are finalized. If there is any other information you require, please do not hesitate to contact me.

Sincerely,

Bruno Morgado
Optimization Manager
Ash Grove, a CRH Company
M: 905-467-2433
E: Bruno.Morgado@ashgrove.com

Bell Canada Municipal Operations Centre - C/O TELECON DESIGN INC.
7777 Weston Rd,
Vaughan, Ontario L4L 0G9
Ph: (905) 569-2882

APPLICATION FOR PLANT LOCATION AND CONSENT

Applicant: The Municipal Infrastructure Group
Mark Up #:74170
Applicant Ref #: N/A
Location: Winston Churchill Blvd, Southdown Rd, Royal Windsor Dr
SwitchingCenter/NNX: CLARKSON/855
Date Received From Applicant: 2019-02-25
Marked By: Mahshid Zeinali

APPLICATION FOR PLANT LOCATION AND REQUEST

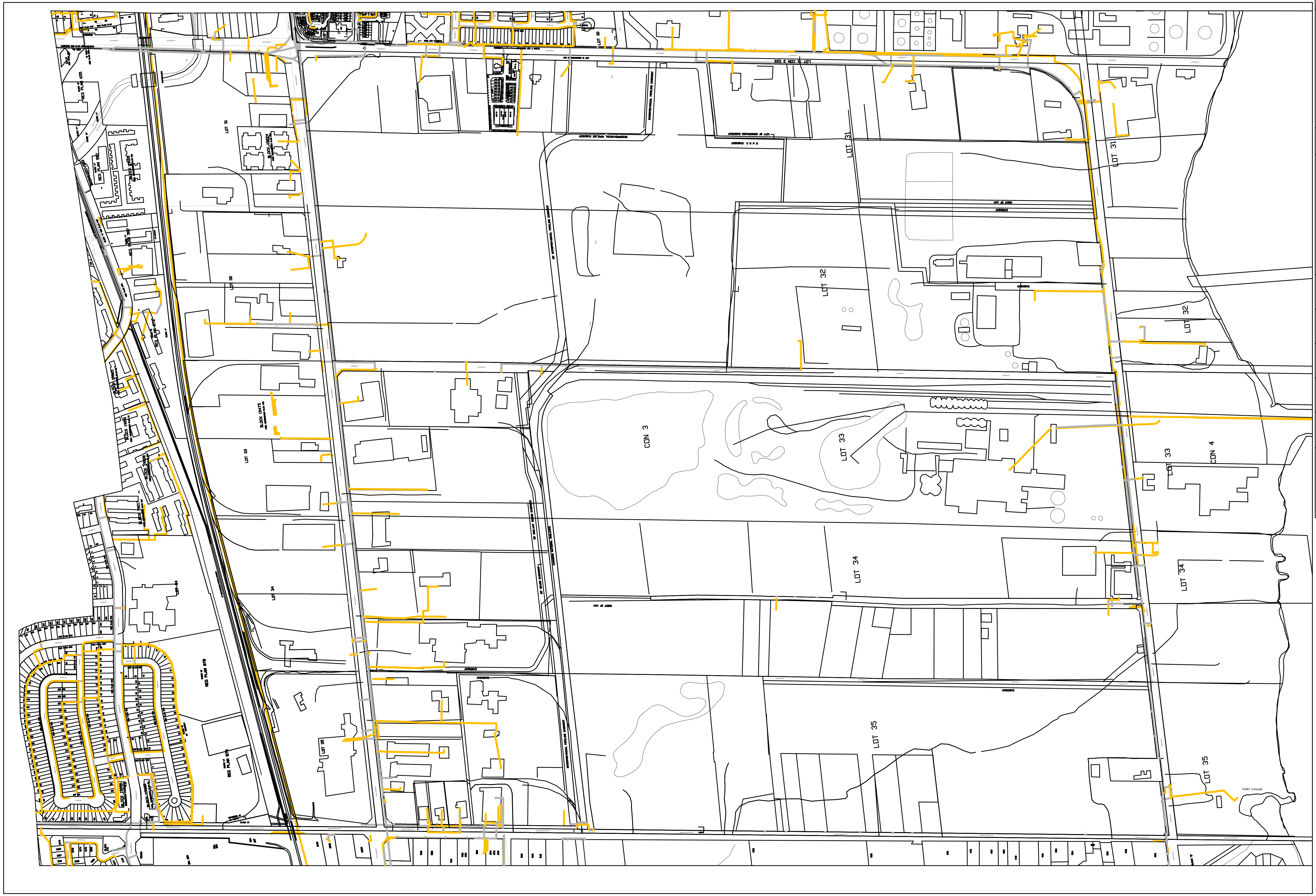
- [x] **Existing and/or proposed Bell Canada underground plant are indicated on the attached plan**
- [ ] **Our records show no existing and / or proposed underground plant within 2m of your proposed installation**
- [ ] **Conflict indicated**
- [ ] **Meets with our approval**
- [x] **Not for PUCC approval - Mark up only**
- [ ] **If within 1 metre of Bell plant, hand dig**

REMARKS: Call for locates 1.800.400.2255. Tie-in measurements are a guideline only and physical verification may be required by applicant to determine the true separation between plants. Maintain clearance of 0.6m. Hand dig when crossing Bell plant.

PROCEDURES TO FOLLOW:

1. **Request locates prior to construction 1-800-400-2255**
2. **If exact location and depth are critical - test pits are recommended**
3. **Bell Canada plant location information is approximate**
4. **If the location of your proposed design changes, it will be necessary to re-apply**
5. **Permits expire six(6) months from approval date**

Signature:	Date:
Mahshid Zeinali	March 18, 2019



PLEASE NOTE:

THIS DRAWING IS FOR MARKUP ONLY - NOT FOR PERMIT TO PROCEED CONSTRUCTION. BELL CANADA PLANT LOCATION IS APPROXIMATE.

BELL CANADA

Municipal Operations Department
Floor 5 Blue, 100 Borough Drive
Scarborough, Ontario, M1P 4W2
Ph. 416−296−6929

Bell Canada Legend Info

- Existing Conduit
- Existing Buried Cable
- Existing Manhole
- Existing Handhole / GLB
- Existing Rhino Cabinet
- Existing Interface
- Existing Bell Pole
- Existing Pedestal/ ONU Unit

CALL FOR LOCATES
1-800-400-2255

HAND DIG
if within 1m of Bell plant

HAND DIG
when crossing Bell plant

Maintain clearance of 0.6m

If further details required
You must acquire Locates or Test Pits

telecon design MEMBER OF TELECON GROUP
7777 WESTON RD
VAUGHAN, ONT. CANADA L4L 0G9
TEL: (905) 569-2882

Rosalie Chung

From: Utility Circulations <UtilityCirculations@cogecopeer1.com>
Sent: Tuesday, February 26, 2019 9:16 AM
To: Jenny Pathmanapan
Subject: Cogeco Peer 1 CLEARANCE: Mississauga Southdown District Utility Locates

RE: Mississauga Southdown District Utility Locates
Sent By: Jenny Pathmanapan
Received on: 2/25/2019 1:43:20 PM

Hello,

Cogeco Peer 1 ONLY has underground infrastructure in the following Ontario Municipalities:
Barrie, Brampton, Essa, Markham, Mississauga, Richmond Hill, Vaughan.
City Of Toronto (East York, Etobicoke, North York, Scarborough, Toronto, York).

As this clearance is for Cogeco Peer 1 (Ontario), please remember to get clearances from
Cogeco Cable and Cogeco Connexion (contact information available from the appropriate Municipality).

INFORMATION ONLY.
Cogeco Peer 1 does not have any structure in the outlined area.

Cogeco Peer 1 has NO OBJECTION to the proposed work.

Thank You,

Cogeco Peer 1; Mark-Ups Team

Phone: (416) 847-0848
Email: Utility.Circulations@cogecopeer1.com <mailto:Utility.Circulations@cogecopeer1.com>

Hello,

We will be commencing the Southdown District Stormwater Servicing and Master Plan Environmental Assessment. The study area (in red on the attached map) is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

Can you please confirm if there are any existing works above or below ground, within or very close the proposed study area? Please provide figures if there is anything of interest.

Enbridge Gas Distribution Inc.
500 Consumers Rd.
North York, ON, M2J 1P8
Canada
www.enbridge.com/gas

Mark-ups@enbridge.com

ENBRIDGE

EGD File Number: 20970197

Re: Utility Locates

- By law utility locates must be obtained prior to starting any excavation or ground disturbance activity, such as pile driving, boring, auguring or digging.
- Contact Ontario One Call at 1-800-400-2255 or www.on1call.com at least 5 business days before beginning work to obtain utility locates.
- Please refer to the **"Third Party Requirements In the Vicinity of Natural Gas Facilities"** for requirements and precautions for working safely in the vicinity of natural gas pipelines. The most recent version of this document is available at: https://www.enbridgegas.com/gas-safety/pipeline-safety.aspx
- Enbridge's responses are based on the information available and are valid for a period of 6 months from issue.

☐ **VITAL MAIN**

- You are working within 3m of a Vital Main Pipeline. In order to accommodate Enbridge vital main standby requirements, our Damage Prevention department must be contacted a minimum of three business days prior to commencing any excavation at 1-866-922-3622 to schedule a site meeting.

☐ **NEB PERMIT REQUIRED**

- When crossing or working within 30m of the right-off-way of an NEB regulated natural gas pipeline, a permit must be obtained from the pipeline company (attached).
- Completed permit applications may be submitted to the Enbridge Gas Distribution Inc. Engineering Dept. at alexander.hadjis@enbridge.com.

☐ **CONFLICT**

- We have an **OBJECTION** to your proposed plant as indicated. Please refer to the attached drawings for information on our existing or proposed gas plant.
- You must submit a revised design for our approval that meets the requirements detailed in the Third Party Requirement book before proceeding.
- If relocation of our plant is required, please contact:

☐	Toronto Region	Jaclyn Mui	416-495-7222	jaclyn.mui@enbridge.com
☐	Central Region West	Marcel Mallia	416-758-4793	marcel.mallia@enbridge.com
☐	Central Region East	Neerajah Raviraj	905-927-3156	neerajah.raviraj@enbridge.com
☐	Niagara Region	Rhonda Nicholson	905-641-4815	rhonda.nicholson@enbridge.com
☐	Eastern Region Ottawa	Sonia Padamadan	613-748-6861	sonia.padamadan@enbridge.com

☐ Proposed work is crossing an Enbridge easement. Please contact Anissa Trenholm in our Land Department at 416-753-6937

☐ **NO-CONFLICT**

- We have **NO OBJECTION** to your proposed plant as indicated. Please refer to the attached drawings for information on our existing and/or proposed gas plant. GAS MAINS MUST BE FIELD LOCATED. Before digging, please call ONTARIO ONE CALL at 1-800-400-2255 for free gas locates.

☒ **GENERAL LOCATION**

- Refer to the attached drawings for information on our existing and/or proposed gas plant within the road allowance.
- The information provided is for **GENERAL LOCATION ONLY** and is not an approval. Detailed plans must be submitted for our review before an approval will be granted.

Kind Regards,

Plate: TT15

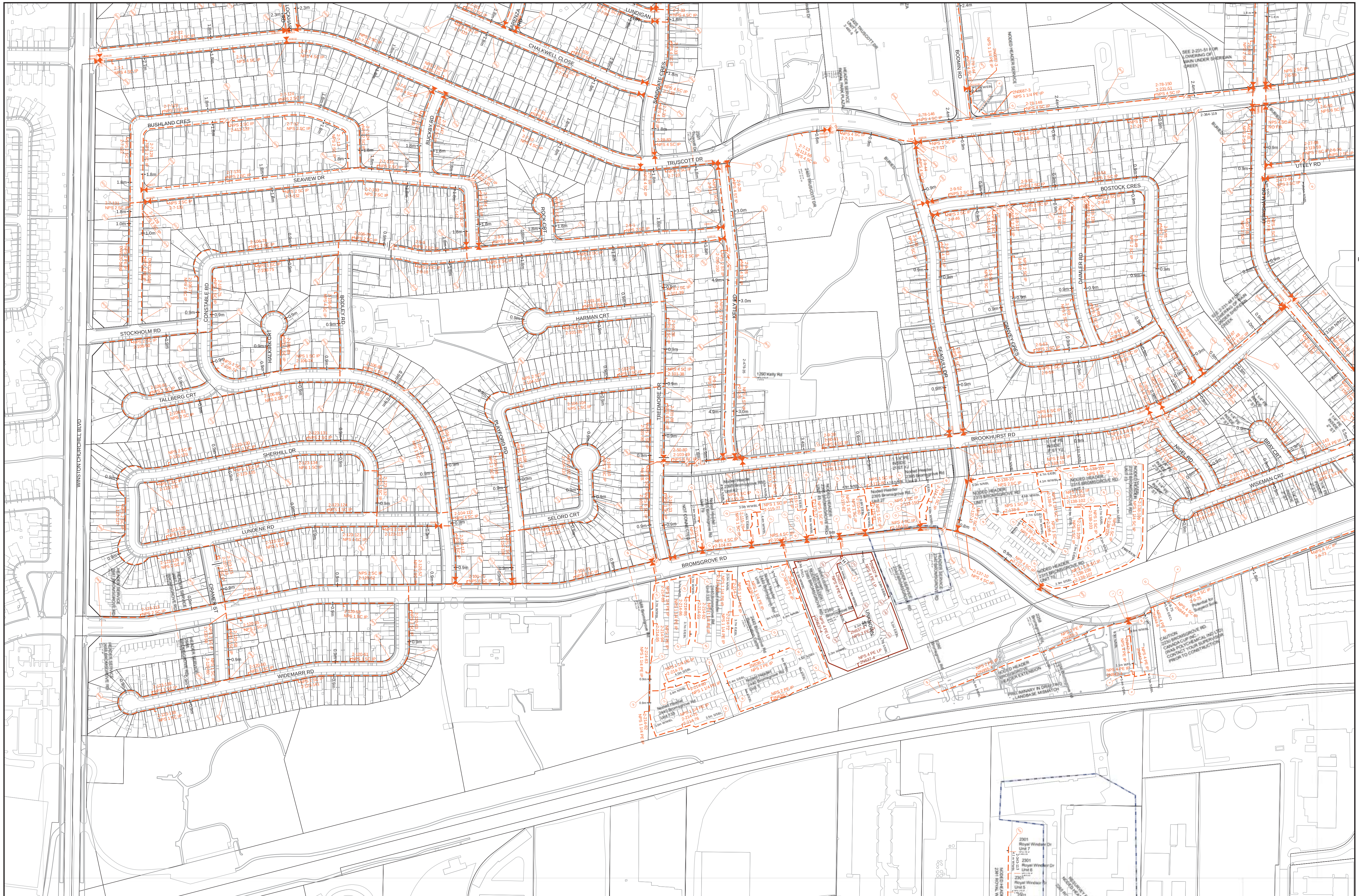


Plate: TT34

Plate: TT35

Plate: TT17

Plate: TT36

N

Network Numbers and Pressure Types:
2245 - IP, 2121 - IP, 1220 - IP, 1200 - LP

ENBRIDGE

Atlas Plate Record

Plotted By: gisadmin	Date of Last Revision: 2015 Jun 20	Date Plotted: 2018 May 03
Scale: 2400	Reviewed By: sharmav	Plate Number: TT16
	Region: Area 20 - Mis	

Plate: TT16

Plate: TT36

Plate: TT18

N

Network Numbers and Pressure Types:
2109 - HP, 1220 - IP

ENBRIDGE

Atlas Plate Record

Plotted By: gisadmin	Date of Last Revision: 2015 Jun 20	Date Plotted: 2018 Apr 18
Scale: 2400	Reviewed By: sharmav	Plate Number: TT17
	Region: Area 20 - Mis	

Plate: TT17

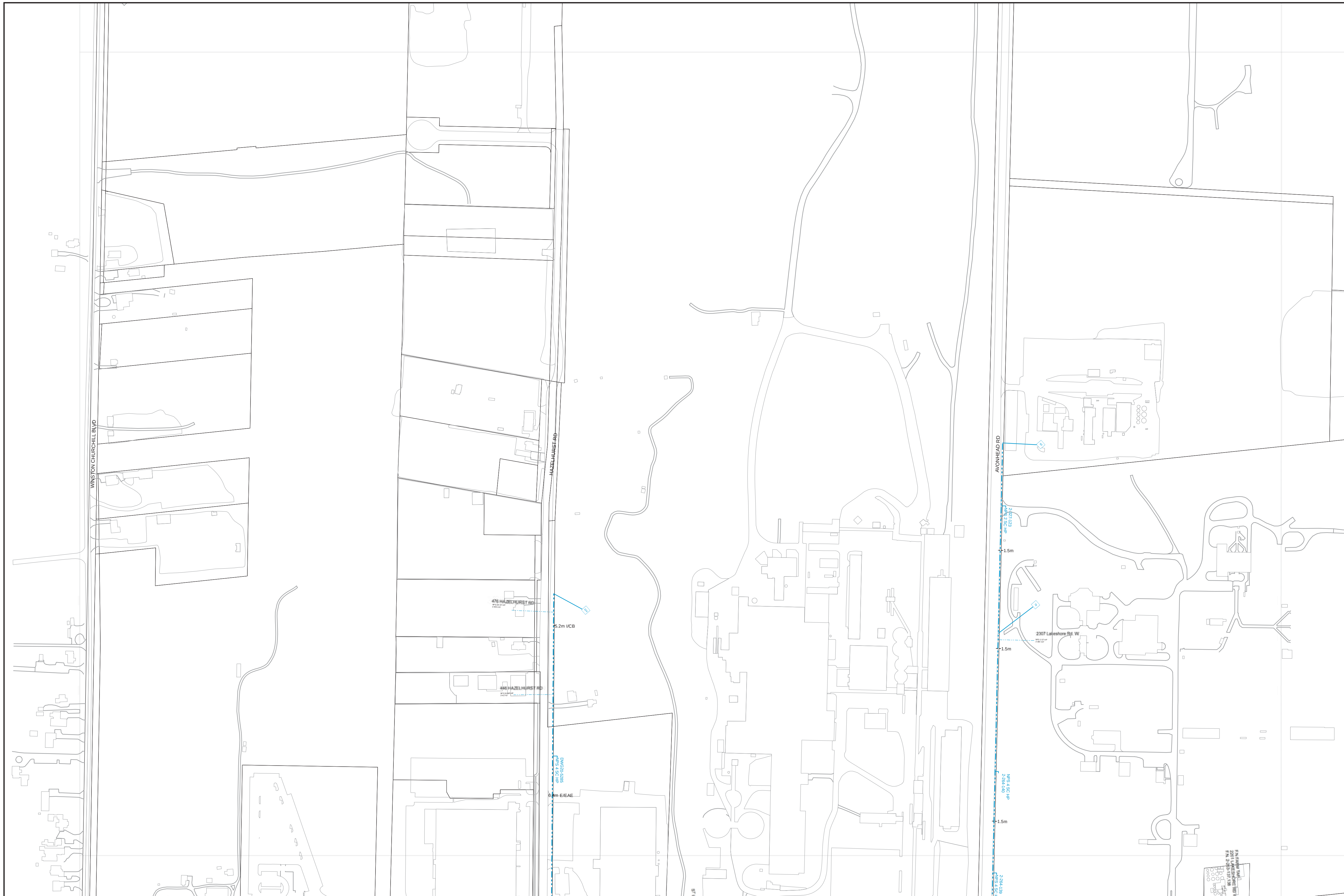


Plate: TT19

N

Network Numbers and Pressure Types:
2109 - HP

ENBRIDGE

Atlas Plate Record

Plotted By: gisadmin	Date of Last Revision: 2015 Feb 06	Date Plotted: 2018 Apr 13
Scale: 2400	Reviewed By: matelav	Plate Number: TT18
	Region: Area 20 - Mis	

Plate: TT18

Plate: TT38

Atlas Plate Record			
Plotted By: gisadmin	Date of Last Revision: 2015 Feb 06	Reviewed By: matelav	Date Plotted: 2015 Feb 11
Scale: 2400	Region: Area 20 - Mis		Plate Number: TT19

N

ENBRIDGE

Network Numbers and Pressure Types:
2109 - HP

Plate: TT16 Plate: TT35

Plate: TT17 Plate: TT55

Plate: TT37

N

Network Numbers and Pressure Types:
2143 - IP, 2121 - IP, 2109 - HP, 1220 - IP

ENBRIDGE

Atlas Plate Record

Plotted By: gisadmin	Date of Last Revision: 2015 Feb 06	Date Plotted: 2017 Dec 24
	Reviewed By: matelav	
Scale: 2400	Region: Area 20 - Mis	Plate Number: TT36

Atlas Plate Record

Plotted By: gisadmin

Date of Last Revision: 2015 Feb 06

Date Plotted: 2017 Nov 02

Reviewed By: matelav

Scale: 2400

Region: Area 20 - Mis

Plate Number: TT37

ENBRIDGE

Network Numbers and Pressure Types:
2121 - IP, 2109 - HP

Plate: TT37

Plate: TT19

Plate: TT56

N

Network Numbers and Pressure Types:
2109 - HP

ENBRIDGE

Atlas Plate Record

Plotted By: gisadmin	Date of Last Revision: 2015 Feb 06	Date Plotted: 2015 Feb 11
	Reviewed By: matelav	
Scale: 2400	Region: Area 20 - Mis	Plate Number: TT38

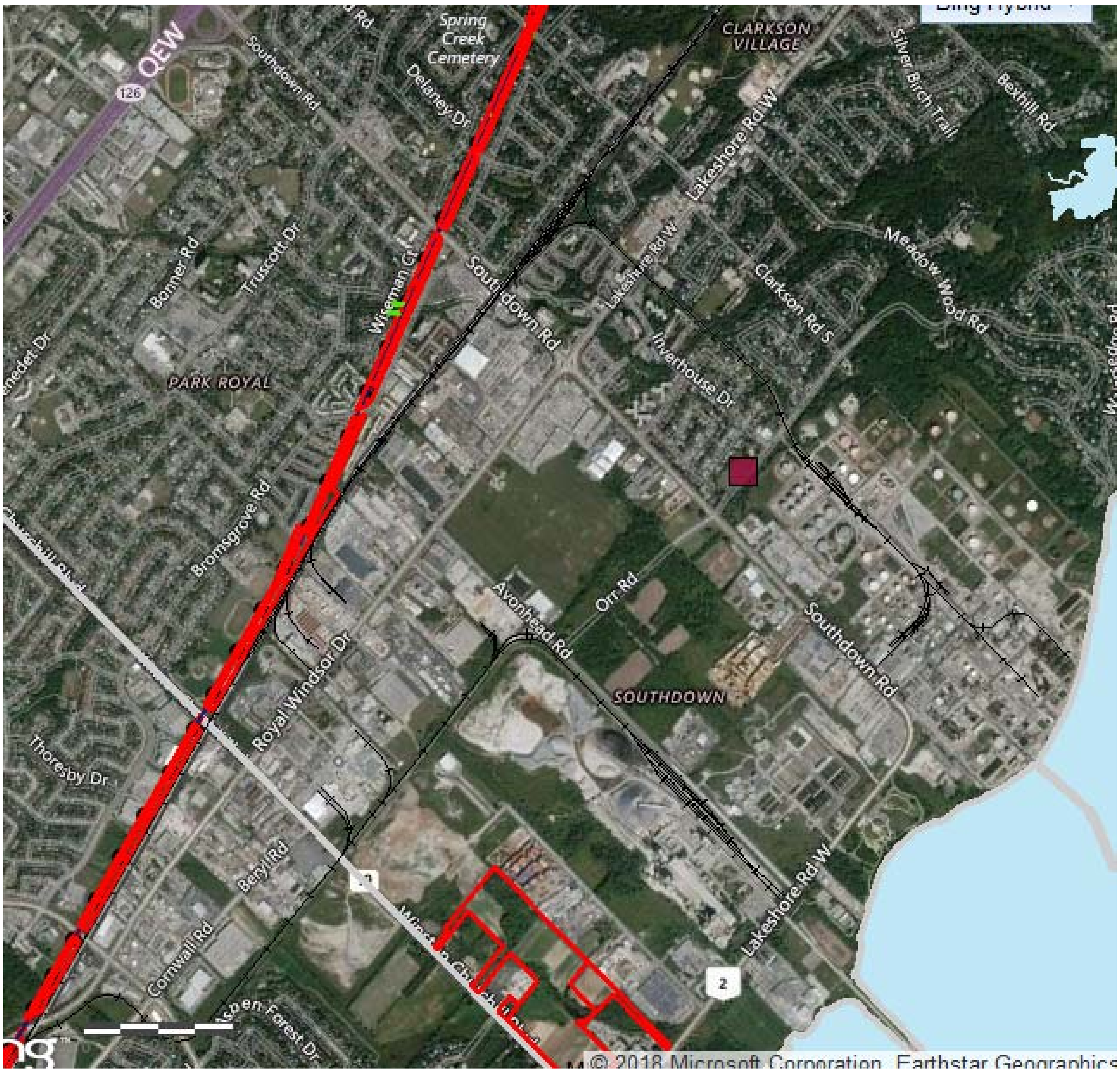
Rosalie Chung

From: greg.gowan@hydroone.com
Sent: Friday, May 11, 2018 2:40 PM
To: Jenny Pathmanapan
Subject: RE: Utility Locates

Hi Jenny,

Please contact me if any of the EA activities impact the Hydro One Transmission corridor shown in red below.

Thanks,



Greg Gowan
Real Estate Coordinator

Hydro One Networks Inc.
185 Clegg Road, R32
Markham, ON | L6G 1B7

Tel: (905) 946-6232
Cell: (416) 527-3487
Fax: (905) 946-6242
Email: Greg.Gowan@HydroOne.com

www.HydroOne.com

From: SCHATZ Richard
Sent: Friday, May 11, 2018 9:13 AM
To: GOWAN Greg
Cc: 'SM_TPUCC'; TPUCC DRAWINGS; 'Jenny Pathmanapan'
Subject: RE: Utility Locates

Hi Greg,

I am forwarding this to you as it is in Mississauga.

Regards,

Richard (Rick) Schatz SR/WA
Senior Real Estate Coordinator

Hydro One Networks Inc.
Tel: 905-946-6233
Cell: 416.735.2909
Email: Rick.Schatz@HydroOne.com

From: TPUCC DRAWINGS
Sent: Friday, May 11, 2018 8:41 AM
To: 'Jenny Pathmanapan'
Cc: 'SM_TPUCC'; SCHATZ Richard
Subject: RE: Utility Locates

Good Morning Jenny,

Thank you for informing Hydro One of your upcoming project. Hydro One **does not** own or operate underground high voltage facilities in the area described by the attachments received **May 8, 2018**.

Hydro One does own a Right of Way that run adjacent to (north of) the rail corridor (north of Royal Windsor Rd.). I have attached a real estate representative who may be able to provide more information.

Regards,

Mark Wallbank
Grid Operations Technologist
Hydro One Networks Inc.
230 Bayview Dr., Barrie

ROGERS

Rogers Communications
Outside Plant Engineering
3573 Wolfdale Road
Mississauga, ON L5C 3T6

Markup Response Form

Application Date	May 9, 2018	**Applicant:**	The Municipal Infrastructure Group Ltd.
Date Returned:	June 12, 2018		
Rogers Ref. No.:	M182454	**Applicant Job No.:**	N/A
Location:	Southdown District		

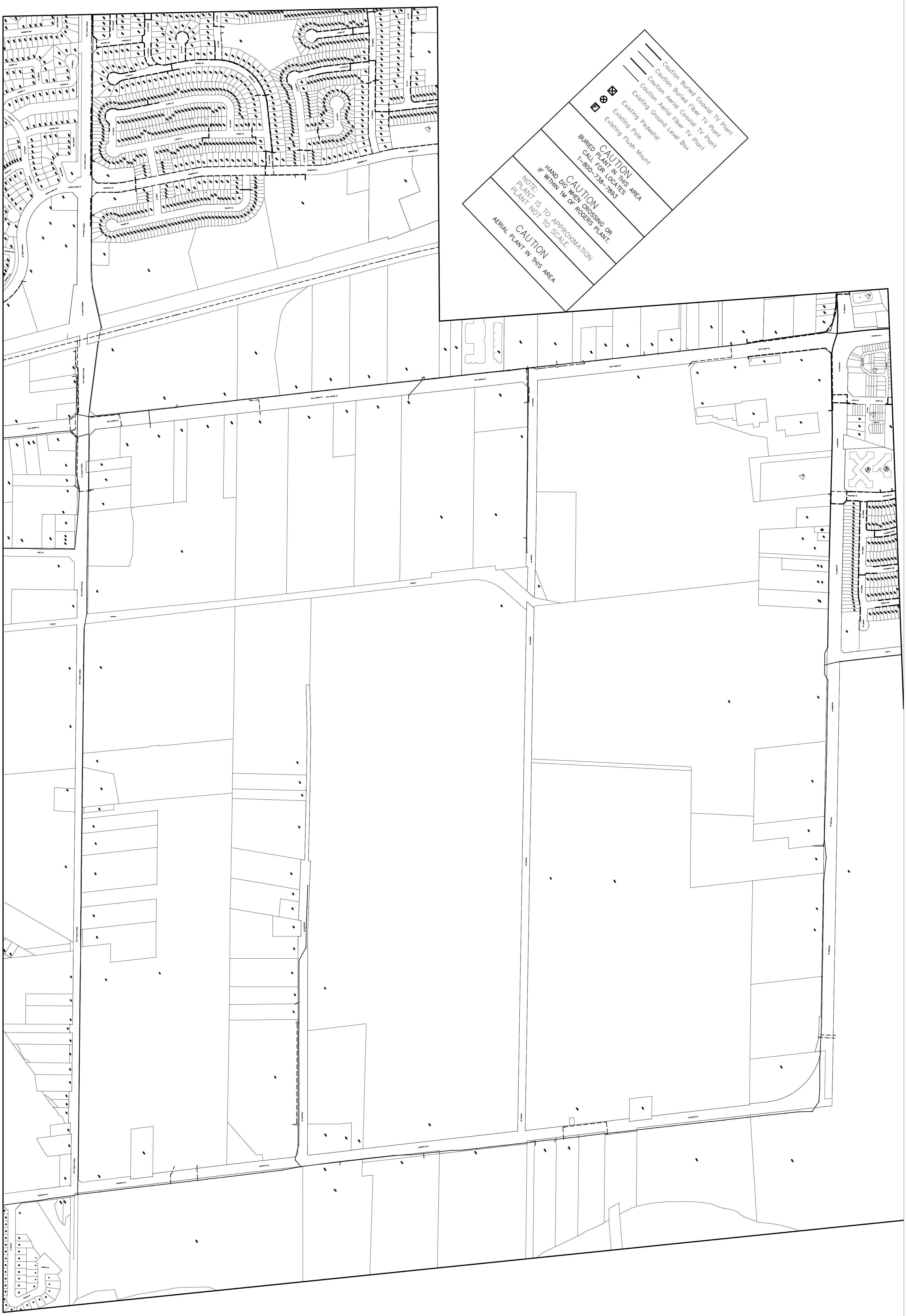
Rogers Communications has reviewed your drawing(s) as requested and returns one marked-up copy.
Our comments follow below with an "X" indicating Rogers' stance on your proposed plan.

Comments:

☐	**No Conflict**	Rogers Communications currently does not possess existing plant in the area indicated on your attached plans.
X	**No Conflict For your Reference**	Rogers Communications currently has existing plant as marked on your drawing. Our standard offset in this municipality is: **1.75m P/L on regional rds & 2.3m P/L on town rds.** Please ensure you maintain clearances of 0.3 m vertically and 0.6m horizontally.
☐	**EXTREME CAUTION**	Use vactruck and expose ducts, maintain minimum of 0.6m clearance.
☐	**CONFLICT**	Your proposed construction appears to encroach within existing Rogers Communications plant. Please relocate your proposed construction to allow adequate clearance of 0.3 m vertically and 1 m horizontally.
X	**CAUTION**	Rogers Communications has aerial plant in this area, as it is indicated on the attached plans.
X	**CAUTION**	Fiber Optic Cable is present in the area of your proposed construction.
☐	**Note**	Proposed Fiber Optic Cable in a joint use duct structure .
☐	**Note**	Plant currently under construction.
X	**Note**	Please inform Rogers Communications well in advance of the proposed construction schedule in order to coordinate our plant relocation.
X	**Note**	Locates are still required. Call for locates at 1-800-738-7893
X	**Note**	Hand dig when crossing, or within 1.0m of existing Rogers plant.
X	**Note**	Plant is to Approximation.

Farzad Kahkeshan
CAD Technician
289 657-8154

June 12, 2018
DATE


Caution Buried Coaxial TV Plant
Caution Buried Fiber TV Plant
Caution Aerial Coaxial TV Plant
Caution Aerial Fiber TV Plant
Existing Ground Level Box
Existing Pedestal
Existing Pole
Existing Flush Mount
CAUTION
BURIED PLANT IN THIS AREA
CALL FOR LOCATES
1-800-738-7893
CAUTION
HAND DIG WHEN CROSSING OR
IF WITHIN 1M OF ROGERS PLANT.
NOTE:
PLANT IS TO APPROXIMATION
PLANT NOT TO SCALE
CAUTION
AERIAL PLANT IN THIS AREA

Rosalie Chung

From: Telus Utility Markups <telusutilitymarkups@Telecon.ca>
Sent: Saturday, March 16, 2019 5:30 AM
To: Jenny Pathmanapan
Subject: RE: Mississauga Southdown District Utility Locates Telus 2019-1416

CAUTION: Telus has cable in 360GT's leased ducts and vaults, close to the proposed route or area, along railway tracks. Please refer to 360GT's drawings.

Indira Sharma
Project Support
289-657-8256
7777 Weston Road
Vaughan, ON L4L 0G9

www.telecon.ca

WE MOVED! Please update your records with our new address:
7777 Weston Road Vaughan, ON L4L 0G9

From: Jenny Pathmanapan <jpathmanapan@tmig.ca>
Sent: Tuesday, March 12, 2019 10:31 AM
To: Telus Utility Markups <telusutilitymarkups@Telecon.ca>
Cc: Rosalie Chung <rchung@tmig.ca>
Subject: Mississauga Southdown District Utility Locates

Hello,

We will be commencing the Southdown District Stormwater Servicing and Master Plan Environmental Assessment. The study area (in red on the attached map) is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.

Can you please confirm if there are any existing works above or below ground, within or very close the proposed study area? Please provide figures if there is anything of interest.

Thank you,

Jenny Pathmanapan, B.Sc
Junior Water Resource Analyst

TMIG | The Municipal Infrastructure Group Ltd.
8800 Dufferin Street, Suite 200 | Vaughan, Ontario L4K 0C5
p: 905.738.5700 x231 | f: 905.738.0065 | tmig.ca

GROUP TELECOM

C/O Telecon Design Inc
7777 Weston Road,
Vaughan, Ontario L4L 0G9

Ph: (905) 569 2882   Fax: (905) 460-8956
GT.MOC@telecon.ca

APPLICATION FOR PLANT LOCATION AND CONSENT

Applicant: TMIG | The Municipal Infrastructure Group Ltd.
Mark Up #: GT19-997
Applicant Ref #: Utility Record Request
Location: Royal Windsor Dr
Date Received from Applicant: 03-21-2019
Marked By: Mary Tina

APPLICATION FOR PLANT LOCATION AND REQUEST

- [x] **Existing and/or proposed Group Telecom underground plant are indicated on the attached plan**
- [ ] **Our records show no existing and / or proposed underground plant within 2m of your proposed installation**
- [ ] **Conflict indicated**
- [ ] **Meets with our approval**
- [x] **Not for PUCC approval - Mark up only**
- [ ] **If within 1 meter of GT plant, hand dig**

REMARKS: Group Telecom has existing plant along C.N.R. Maintain standard separation when crossing this cable. Call for locates 1.800.400.2255. Maintain clearance of 0.6m. Hand dig when crossing Group Telecom plant. Call 877.865.6193 for locate if plant is in railway property**.**

PROCEDURES TO FOLLOW:

1. **Request locates prior to construction 1-800-400-2255**
2. **If exact location and depth are critical - test pits are recommended**
3. **Group Telecom plant location information is approximate**
4. **If the location of your proposed design changes, it will be necessary to re-apply**
5. **Permits expire six (6) months from approval date**

Signature:	Date:
Mary Tina	Mar 22, 2019
______	____


GROUP TELECOM
5025 Creekank Rd 5F
Mississauga, Ontario, L4W 0B6
Ph. 905–614–6820
This plan or drawing is the property of Group Telecom and the copyright of which is owned by Group Telecom. This plan or drawing may not be copied or used by others without the written consent of Group Telecom, which may be withheld at Group Telecom Canada's discretion.
Existing GT plant
CALL FOR LOCATES
1-800-400-2255
HAND DIG
if within 1m of GT plant
HAND DIG
when crossing GT plant
Maintain clearance of 0.6m
If further details required
CALL 1-877-865-6193
You must acquire Locates or Test Pits
for locates, if plant is in railway property
Dwg # - 1
Mark Up # - GT19-997
Designer - Mary Tina
exchange
PLEASE NOTE:
THIS DRAWING IS FOR MARKUP ONLY - NOT FOR PERMIT
CONSTRUCTION. GROUP TELECOM PLANT LOCATION IS APPR
CON 4
CON 3

Rosalie Chung

From: phil.arbeau@zayo.com on behalf of Utility Circulations <utility.circulations@zayo.com>
Sent: Sunday, March 31, 2019 2:17 PM
To: Jenny Pathmanapan
Subject: Re: Mississauga Southdown District Utility Locates
Attachments: Key Planx.pdf

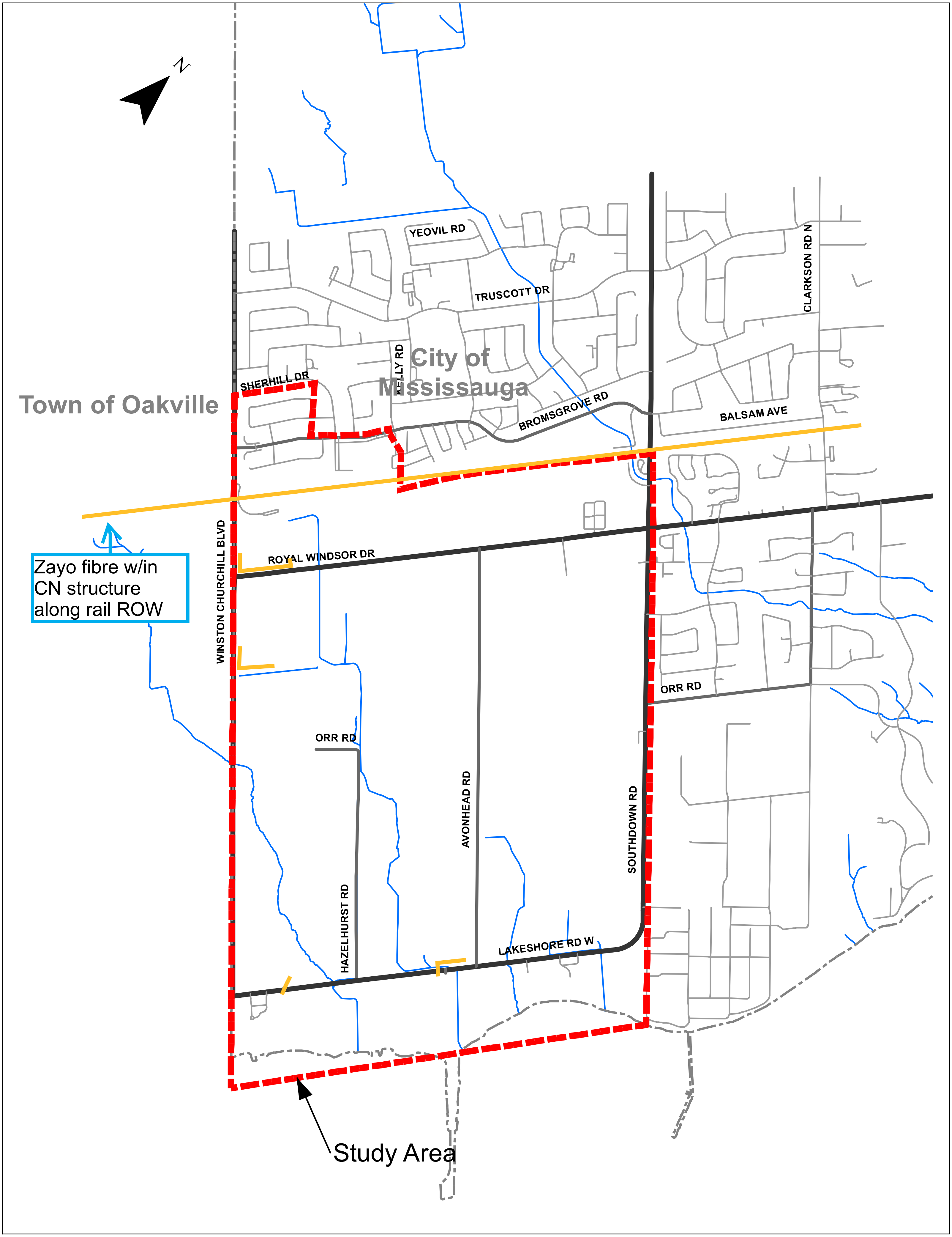
Good afternoon,

Zayo does have existing plant in the area indicated in your submission. Please maintain standard clearances and we have no objection. Please note we can only mark up files we are provided. Thank you.

Phil Arbeau
Utility Circulations

On Tue, 12 Mar 2019 at 11:18, Jenny Pathmanapan <jpathmanapan@tmig.ca> wrote:

> Hello,
>
> We will be commencing the Southdown District Stormwater Servicing and Master Plan Environmental Assessment. The study area (in red on the attached map) is bounded by Winston Churchill Boulevard to the west, Southdown Road to the east, Lake Ontario to the south, and headwater drainage boundaries near Royal Windsor Drive to the north.
>
> Can you please confirm if there are any existing works above or below ground, within or very close the proposed study area? Please provide figures if there is anything of interest.
>
> Thank you,
>
> Jenny Pathmanapan, B.Sc
> Junior Water Resource Analyst
>
> **TMIG | The Municipal Infrastructure Group Ltd.**
> 8800 Dufferin Street, Suite 200 | Vaughan, Ontario L4K 0C5
> p: 905.738.5700 x231 | f: 905.738.0065 | tmig.ca


N
YEOVIL RD
TRUSCOTT DR
CLARKSON RD N
KELLY RD
City of Mississauga
SHERHILL DR
Town of Oakville
BROMSGROVE RD
BALSAM AVE
Zayo fibre w/in CN structure along rail ROW
ROYAL WINDSOR DR
WINSTON CHURCHILL BLVD
ORR RD
ORR RD
AVONHEAD RD
SOUTHDOWN RD
HAZELHURST RD
LAKESHORE RD W
Study Area