

3. NATURAL ENVIRONMENT

In order to develop a broad understanding of the natural environment features and functions within the GTA West Route Planning Study Area, relevant, regional-level¹ secondary source information was collected and analysed.

Secondary source information was obtained primarily from the regional-level Provincial Land Information Ontario (LIO) and Natural Resource Values Information Systems (NRVIS) databases and was augmented with regional-level information from other sources (i.e., municipalities, agencies and conservation authorities), as available.

The collection and analysis of secondary source information should be seen as the first step in the overall study process. Each subsequent stage builds upon the information and decisions of the preceding step. The regional-level information collected during this phase of the EA process has been carried forward from Stage 1 of the study for review and confirmation. During Stage 2 of the process, and through the fieldwork and additional investigations discussed previously, the information presented here will be refined and augmented with more detailed information, as needed for evaluating and selecting a preferred route alternative and final preliminary design. Input will be received from and shared with the public, stakeholders, municipalities, First Nations and Métis Communities and regulatory agencies as it becomes available and incorporated into the study, as appropriate.

3.1 PHYSIOGRAPHY AND LANDSCAPE

The southern Ontario Physiographic Unit Map indicates that the Study Area (illustrated in **Exhibit 1-2**) is located within the Peel Plain and Horseshoe Moraines physiographic regions. The Horseshoe Moraines describe an area of open soils (sandy materials) with a moderate level of stoniness.

3.1.1 Surficial Geology

Physiography

The Study Area lies predominantly within the South Slope and Peel Plain physiographic units described by Chapman and Putnam (1984). The South Slope is the south slope of the Oak Ridges Moraine and extends south to the Iroquois Shore and west to the Niagara Escarpment. Within the South Slope is the Peel Plain. The Peel Plain extends from just inside Durham Region southwest to the Niagara Escarpment. The South Slope is a bevelled till plain with low to moderate relief except where it is cut by

1. Regional-level refers to information that is available and comparable across the Study Area

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

major rivers including the Humber, Don and Rouge Rivers. The Peel Plain is predominantly a clay plain with low relief except where it is cut by major rivers.

Quaternary Geology

The quaternary (surficial) geology of the Study Area consists of glacial, glaciofluvial, and glaciolacustrine deposits of Pleistocene age (Singer et al., 2003). Specifically, the predominant surficial deposits are the Halton Till and the Newmarket Till (OGS, 2003). **Exhibit 3-1** illustrates the general quaternary geology of the Study Area.

Halton Till

The Halton Till or equivalent deposit occurs east of the Niagara Escarpment, over much of the Study Area and as a thin strip along the edge and over the lower slopes of the Escarpment (Singer et al., 2003). This silt to clayey-silt till is representative of the last Wisconsinan ice advance out of the Lake Ontario basin (MOE, 2001). The reddish colour of the till to the west is due to the colour of the underlying Queenston Shale, which makes up the parent material (CVC, 2002), otherwise the till is grey weathering to a buff-brown.

Newmarket Till

The Newmarket till underlies Halton Till and is a dense silt to sandy silt till. It is the surficial till deposit generally southeast of the Study Area.

Ice-contact deposits are also prevalent near Georgetown, with sand plain deposits near Huttonville, and Kleinburg. Overburden thickness in this portion of the Study Area ranges between 10 to 20 m in the west, though it can reach 50 m in some places (Singer et al., 2003) and thickens to over 100 m to the north and east.

Significant glaciolacustrine deposits are located in the vicinity of Milton and extend through Woodbridge/Kleinburg. The thickness of the deposits are generally less than 1 m and consist of clay, silt and fine sand overlying the Halton Till.

Other Units

Other units may be at or near surface in river valleys, and are referred to as Oak Ridges Moraine deposits, Thorncliffe Formation, Sunnybrooke Drift, Scarborough Formation, Don Formation and York Till, although the lower-most deposits are rarely exposed. The Oak Ridges Moraine deposits, where present, are found between Halton Till and Newmarket Till. The Thorncliffe and other lower deposits are found, where present, beneath the Newmarket Till. In certain areas, the Thorncliffe and Scarborough Formations have aquifer potential.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Bedrock Geology

The bedrock units within the Study Area were noted to consist of Palaeozoic sedimentary rocks composed of limestone, dolostone, sandstone, and shale sequences that overlie Precambrian bedrock (CVC, 2002). Outcrops are uncommon due to the thickness of overburden deposits that cover the bedrock within the Study Area, except along the Niagara Escarpment and in river valleys.

Below (east of) the Escarpment, the Queenston Formation underlies the Halton Till. This formation consists of thin to thick-bedded red shales of Ordovician age. Fine-grained iron oxide deposits (hematite) create the distinctive red colour, though green bands of shale are also present. The bedrock surface generally slopes to the east and southeast, although a number of bedrock valleys are apparent (CVC, 2002; Singer et al., 2003). These bedrock valleys are generally infilled with melt water, channel deposits, and Halton Till deposits of variable thickness.

The Queenston Formation is underlain by grey and blue shales, siltstones and limestones of the Georgian Bay Formation, which is generally not exposed at the surface within the Stage 2 Study Area but is the bedrock at depth beneath the eastern portion of the Study Area.

3.1 GROUNDWATER

3.1.1 Hydrogeology

Overburden Aquifers

In general, the availability of groundwater in the overburden ranges from good to poor within the Study Area. Most wells in the overburden aquifers are used for domestic supplies and livestock watering, but some are quite productive and provide a number of municipalities with water supplies.

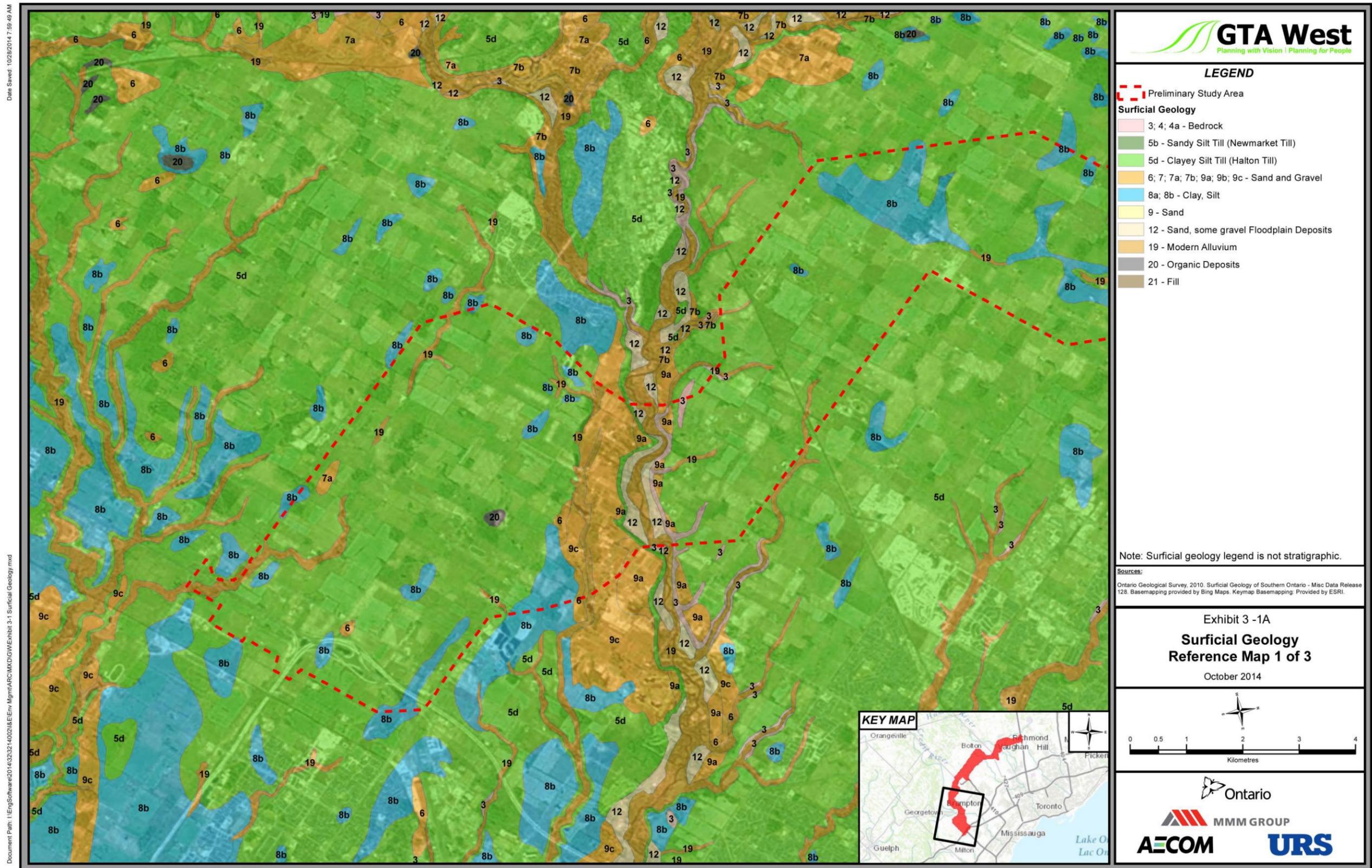
There are several aquifers documented within the Study Area in earlier work by Singer et al. (2003).

The Upper Chinguacousy Aquifer is identified in the Town of Caledon and the Lower Chinguacousy Aquifer is located within the Municipalities of Brampton and Caledon. The upper aquifer consists of sand and gravel deposits up to 30 m thick with well yields from approximately 20 to 365 L/min. The lower aquifer consists of sand and gravel deposits with thicknesses ranging from a few metres up to 17 m, with average well yields ranging from 5.0 to 135 L/min.

The Etobicoke Aquifer is a confined aquifer in the headwaters area of Etobicoke Creek in Caledon. It consists of sand and gravel from a few to 12 m thick and well yields from 5.0 to 275.0 L/min.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

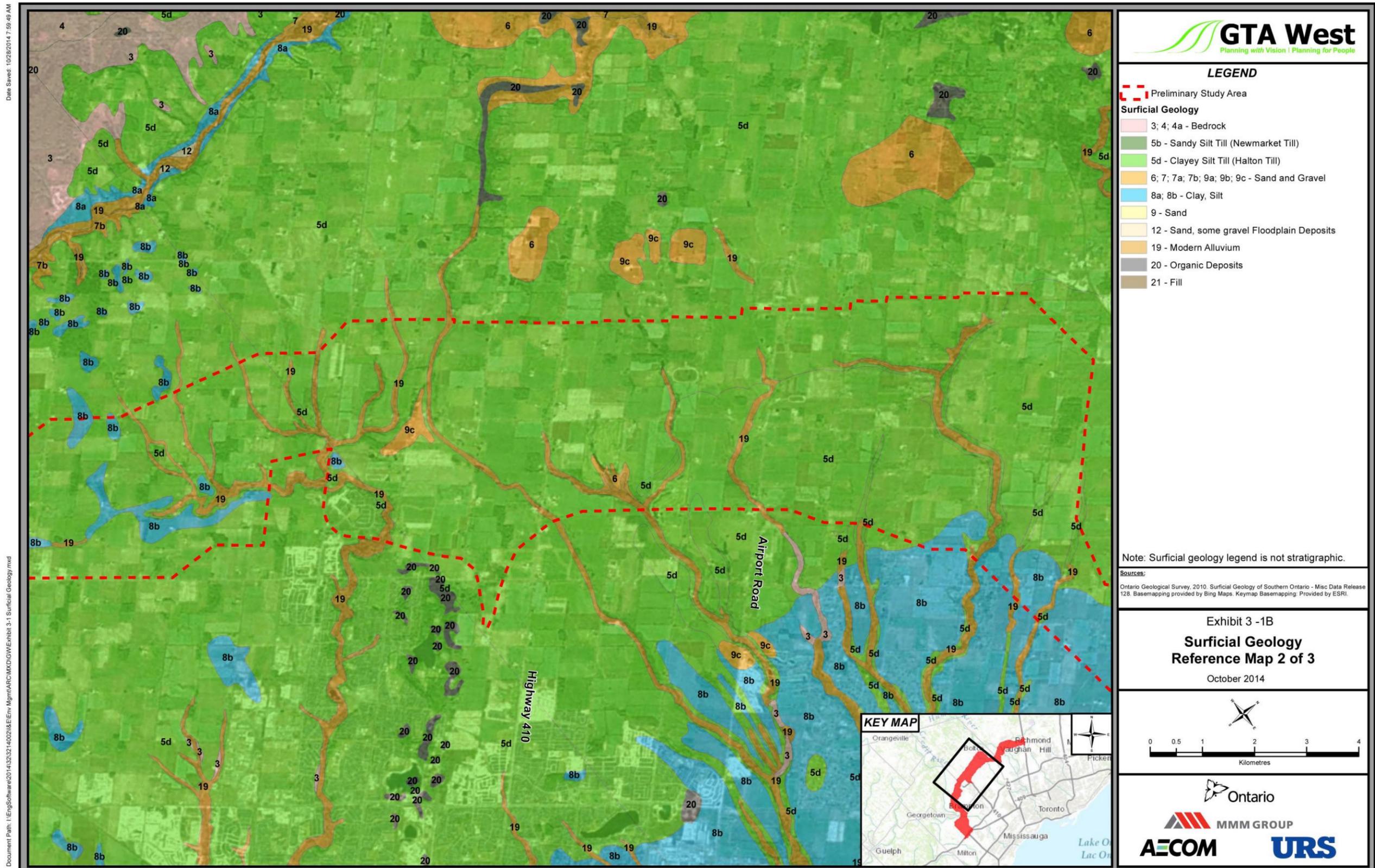
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Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

The Kleinburg Aquifer is located in the vicinity of Kleinburg. This local confined aquifer consists of sand and gravel deposits ranging in thickness from a few metres to 22 m, with average well yields ranging from 20 to 200 L/min, however a few wells have yields of up to 2,275 L/min.

The Woodbridge Aquifer is located in the Woodbridge area, south of Kleinburg. This confined aquifer is covered by glaciolacustrine clay deposits and consists of sand and gravel deposits ranging in thickness from a few metres to 21 m. Average well yields range from 25 to 225 L/min.

Following the naming of aquifers by Sharpe et al (1996), OGS (2003), Kassenaar and Wexler, (2006) and others, three aquifer zones or complexes have been identified using formation names rather than geographic location. The presence of these aquifers depends, therefore on the presence of the formation in a given area. The uppermost aquifer correlates with the Oak Ridges Moraine deposits and has been referred to as the Oak Ridges Moraine Aquifer Complex (ORAC). It is found north of the Study Area and in places can be correlated to granular zones south of the moraine in the South Slope physiographic unit. The Thorncliffe Aquifer Complex (TAC) occurs beneath the Newmarket Till within the Thorncliffe Formation, and similarly the Scarborough Aquifer Complex (SAC) occurs at depth within the Scarborough Formation. These aquifers are present in York Region and northern parts of Peel Region but are thin, and are not present everywhere in Halton Region.

An additional source for local water supply can be obtained from shallow weathered till and lacustrine deposits, however yields are low and water quality is vulnerable to local land use.

[Melt Water Channels](#)

There are no melt water channels located within the Study Area.

[Bedrock Aquifers](#)

Below the Escarpment, only the top 3 to 5 m of the Queenston Formation is weathered and may provide sufficient quantities of water to meet domestic requirements. Specific capacity values range from 0.5 to 20 litres per minute per metre (L/min/m) (Singer et al., 1994; 2003). The Georgian Bay Formation, which underlies the Queenston Formation, is not considered to be a significant source of water. Groundwater only occurs in the top 3 to 5 m of the formation, with average specific capacities of 0.5 to 10 L/min/m (Singer et al., 1994; 2003).

[Groundwater Flow](#)

Groundwater is subject to continuous movement, the rate of which is a function of the hydrogeologic characteristics of the material, through which it moves, and the existing hydraulic gradients and temperature. Groundwater moves well through more permeable materials such as sand, gravel and fractured bedrock, and more slowly through silts and clays.

Overburden and bedrock groundwater flow is directed predominantly towards Lake Ontario to the south-southeast (CVC, 2006) but is influenced locally by topography and stream valleys.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

[Groundwater Recharge and Discharge](#)

Groundwater recharge occurs to some degree across most of the landscape with discharge generally restricted to low lying areas and stream valleys. Recharge depends on the permeability of surficial soils, slope and vegetation. The Study Area is predominantly underlain by relatively low permeability Halton till and is characterized by low to moderate slopes with a variety of surface cover varying from agricultural fields to forest. In general, recharge is low to moderate across the Study Area but may be locally high where sandy soils are at the ground surface. Discharge areas occur as seasonally active to permanent ongoing areas where groundwater reaches the surface environment and depends on position within a watershed. In headwater areas, recharge can be seasonal becoming permanent further downstream. Discharge also depends on the depth into the landscape that streams may have cut and in the Study Area deeper valleys may intercept aquifers providing localized enhanced discharge.

[Groundwater Protection Areas](#)

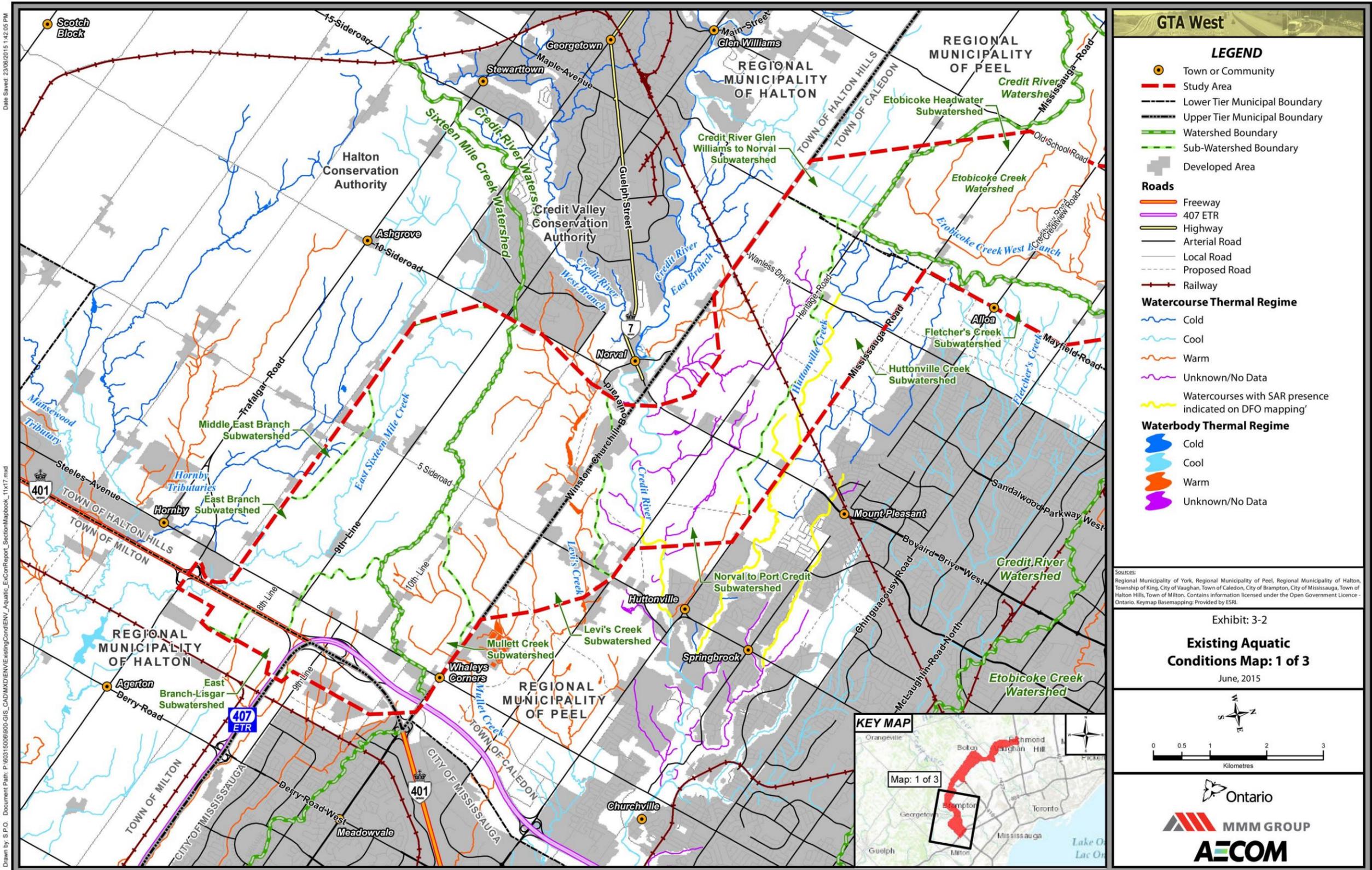
Wellhead Protection Areas (WHPA) and “Aquifer Vulnerability” are regional groundwater protection designations.

A WHPA is a designation applied to the recharge area of a well in order to minimize, through land use restrictions, the potential for contaminants to enter well water. As the entire recharge area for a well is often too large to be managed effectively, the most sensitive areas are delineated and managed. Delineating sensitive areas is achieved through the establishment of time-of-travel capture zones. These zones are based on the direction and speed of groundwater flow to a well. These zones represent the horizontal distances that water is likely to travel through the aquifer towards the well over a set period of time (e.g., 0 to 2, 2 to 10, and 10 to 25-years). The only WHPA near the Study Area corresponds to municipal wells in Kleinburg.

3.2 SURFACE WATER / WATERSHEDS AND SUB-WATERSHEDS

The biotic sections of the natural environmental discussion that follow have been organized by watershed. The Study Area encompasses portions of four watersheds, as shown in **Exhibit 3-2**, specifically, Sixteen Mile Creek, Credit River, Etobicoke Creek, and Humber River. **Table 3-1** lists the relevant subwatersheds for each of those watersheds and main watercourses within each. A brief summary of the general characteristics of each watershed is provided below. The subsequent sections that discuss fish and fish habitat, and terrestrial environmental conditions are presented in relation to these watersheds and their respective subwatersheds and watercourses for which secondary source information is available. Details regarding flow, thermal regime, morphology, fish community, and noted sensitivities are covered in **Section 3.4** Fish and Fish Habitat. **Section 3.7** presents a summary of designated natural environmental features present within the Study Area.

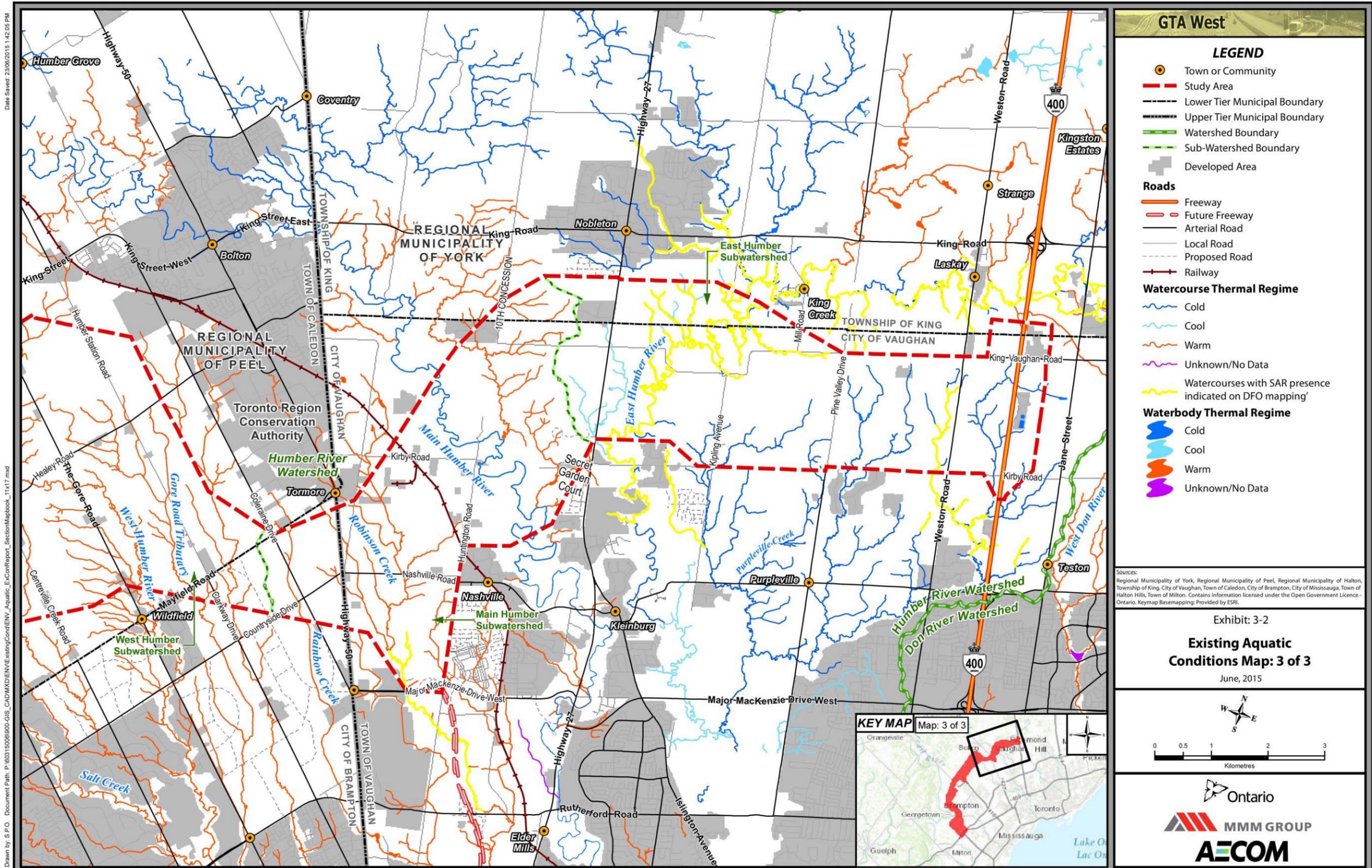
GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
 Working Paper Update
 June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-1 Summary of Watersheds within the Study Area

WATERSHED	SUBWATERSHED	MAIN WATERCOURSES
Sixteen Mile Creek	East Sixteen Mile Creek	East Sixteen Mile Creek
	Middle Sixteen Mile Creek	Hornby Tributary
Credit River	Mullet Creek	Mullet Creek
	Levi Creek	Levi Creek
	Norval to Port Credit	Credit River
	Huttonville Creek	Huttonville Creek
	Fletcher's Creek	Fletcher's Creek
Etobicoke Creek	Etobicoke Headwaters	Etobicoke Creek West
	Spring Creek	Spring Creek
Humber River	West Humber River	Campbell's Cross Creek
		Salt Creek
		Lindsay Creek
		West Humber River
		Gore Road Tributary
		Clarkway Drive Tributary
	Main Humber River	Rainbow Creek
		Robinson Creek
		Main Humber River
	East Humber River	East Humber River
		Purpleville Creek

Source: Land Information Ontario (2007)

Sixteen Mile Creek Watershed

Only the east portion of the Sixteen Mile Creek watershed (which is approximately 42,000 ha in total area) is located within the Study Area. Its headwaters originate above the Niagara Escarpment; a network of small tributaries flows over the Escarpment, coalescing into larger streams which then flow through the Peel Plain and eventually into Lake Ontario as the main branch of Sixteen Mile Creek, southwest of the Study Area.

East Sixteen Mile Creek is the main watercourse of this watershed in the Study Area. A short headwater section (~1.8 km) of the Hornby Tributary to Middle Sixteen Mile Creek is also located just inside the western boundary of the Study Area. East Sixteen Mile Creek and the Hornby Tributary originate in the Town of Halton Hills, south of the Niagara Escarpment. The Main and Middle branches of Sixteen Mile Creek originate in the bedrock plain west of the Escarpment; the East and Middle branches of the Creek merge just south of the community of Hornby.

Below the Escarpment, the Sixteen Mile Creek system flows through the Peel Plain where the clay soils have much lower infiltration rates, resulting in higher surface runoff and limited groundwater recharge of the Creek (Regional Municipality of Halton 1995). Within the Study Area, the Sixteen Mile Creek

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

watershed is predominantly agricultural, but with significant portions remaining as natural area in the Town of Milton and Town of Halton Hills (Dunn 2006).

Credit River Watershed

The lower portion of the Credit River watershed is located within the Study Area; the total watershed area is approximately 100,000 ha, with the headwaters located above the Niagara Escarpment and the mouth of the river at Lake Ontario (CVC 2008). Northwest of the Study Area, numerous minor short streams drain the lower Escarpment slopes directly into the Credit River valley. Immediately below the Escarpment, the river cuts through the Peel Plain and is characterized by steep-walled valleys with floodplains of varying widths. Forest cover in this zone tends to slow runoff and increase infiltration of water into the ground. About a third of the watershed, primarily in the middle and upper sections, is covered by forests, valleylands, wetlands and meadows, while urban development dominates the lower watershed (CVC 2008). The Study Area includes the lower watershed, where agriculture and urban areas are the major land uses (MNRF & CVC 2002).

The main subwatersheds of the Credit River within the Study Area are Mullet and Levi Creeks south and west of the main stem and Huttonville and Fletcher's Creeks north and east of the main stem. The section of the main stem of the Credit River in the Study Area is located in the 'Norval to Port Credit' subwatershed. A small portion of the Glen Williams to Norval Subwatershed is present just north of Mayfield Drive, east of Winston Churchill, which flows west to join the Credit River downstream of Glen Williams. Levi and Mullet Creeks both originate to the west of the Credit River, just south of the Niagara Escarpment; Levi Creek on the South Slope, and Mullet Creek within the Peel Plain (CVC 2007). Both creeks flow through the Peel Plain. Levi Creek joins the Credit River just north of Highway 401, east of Creditview Road, and Mullet Creek joins the Credit River south of Burnhamthorpe Road, east of Mississauga Road; closer to the mouth of the river at Lake Ontario.

Huttonville and Fletcher's Creeks originate on the South Slope of the Niagara Escarpment (CVC 2007), north of the current extent of urbanization in the City of Brampton, and flow through the Peel Plain cutting valleys in the clay till in some places to the underlying bedrock (AMEC 2010). Huttonville Creek and Fletcher's Creek outlet to the Credit River just north of Highway 407 (near Queen Street West and Mississauga Road) and just south of Highway 401 (east of Creditview Road), respectively.

Etobicoke Creek Watershed

Etobicoke Creek is the most westerly watershed within the boundaries of the Toronto and Region Conservation Authority's (TRCA's) jurisdiction and encompasses a total of approximately 21,000 ha. The upper portion of the watershed is located within the Study Area, which encompasses portions of the Etobicoke Creek headwaters, flowing into Etobicoke Creek West and Spring Creek Subwatersheds. The main branch of Etobicoke Creek flows primarily through areas of urban land use, and as a result has experienced significant degradation of habitat and natural features. It is characterized by steep gradients and impermeable soils that rapidly convey surface runoff to the watercourse (TRCA 2006).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

The Etobicoke Creek headwaters originate in the Town of Caledon just south of the boundary of the Oak Ridges Moraine and flow east to form the West Branch of Etobicoke Creek, draining an area of approximately 6,300 ha. The predominant land use in the headwaters is agricultural. Spring Creek originates in the north end of the City of Brampton, within the Heart Lake Wetland Complex and flows southeast to join the Main Branch of Etobicoke Creek. The headwaters of Spring Creek flow through several natural areas, but land use becomes predominantly residential along the majority of the stream's length (TRCA 2010).

Humber River Watershed (West, Main and East Subwatersheds)

The entire Humber River watershed (including the Main, West and East Subwatersheds) encompasses approximately 90,800 ha and stretches from the Oak Ridges Moraine in the north to Lake Ontario in the south. About 25% of the watershed is developed primarily within the lower reaches in Toronto. Forty percent of the existing land use in the watershed is rural, with natural cover comprising approximately 30% (TRCA 2007). The Study Area includes the upper/middle reaches of all three (3) subwatersheds.

The total West Humber River Subwatershed begins in Caledon, on the South Slope, and flows over the Peel Plain before joining the Main Humber River in Toronto. With the majority of the subwatershed in the Peel Plain, baseflow in the West Humber River tributaries tends to be low, with even large tributaries often drying up in the summer months. The upper half of the subwatershed, within the Study Area, remains primarily agricultural, however the Brampton portion has been developed, predominantly for residential purposes. The primary watercourses of this subwatershed flowing through the Study Area are (from west to east) Campbell's Cross Creek, unnamed tributaries of the Humber River, Salt Creek, Lindsay Creek, the West Humber River, Gore Road Tributary, and Clarkway Drive Tributary.

The Main Humber River flows approximately 126 km from its source/headwaters on the Niagara Escarpment and Oak Ridges Moraine to Lake Ontario. The permeable soils and hummocky terrain of the Oak Ridges Moraine result in high recharge, high baseflow rates, and low surface runoff. The Main Humber River Subwatershed contributes over half of the baseflow in the overall Humber Watershed (TRCA 2008b).

The Main Humber River flows down the South Slope onto the Peel Plain where the clay soils have much lower permeability and reduced infiltration rates, resulting in a larger portion of precipitation becoming surface runoff under natural conditions. The portion of the Main Humber River in the Study Area is within the South Slope (TRCA 2008b). Most of the Main Humber River Subwatershed in the Study Area is agricultural, however significant natural areas remain, particularly in association with the main stem river. Urban settlements within the Study Area portions of the subwatershed include Bolton, Caledon East, Palgrave, and Kleinburg along upstream reaches, and Woodbridge downstream of the Study Area. The main watercourses of the subwatershed within the Study Area are (from west to east) Rainbow Creek, Robinson Creek and the Main Humber River.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

The East Humber River, approximately 65 km in length, also originates in the Oak Ridges Moraine. Soils in this subwatershed tend to be clay loams, with large pockets of sandy-loam, loam and silt. The East Humber Subwatershed contributes considerable baseflow to the Humber River system (about 20% of total flow), particularly from tributaries on the Oak Ridges Moraine (TRCA 2008b). Within the Study Area, land use is predominantly agricultural, although the settlements of Oak Ridges, King City, Nobleton and portions of Woodbridge are within the subwatershed. The main watercourses of this subwatershed within the Study Area are the East Humber River and Purpleville Creek.

3.3 FISH AND FISH HABITAT

The Canadian *Fisheries Act* (2013; Section 35 (1)) states that “No person shall carry out any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.” As per the federal *Fisheries Act*, ‘fish’ includes parts of fish, shellfish, crustaceans, and marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of these animals. The definition of ‘fish habitat’ includes the spawning grounds, nursery, rearing, food supply, and migration area on which fish depend directly or indirectly in order to carry out their life processes. Therefore, the fishery protection provisions of the *Fisheries Act* encompass fish that are part of a fishery, fish supporting those fish (e.g., prey species), watercourses and waterbodies that are occupied and used directly by fish as well as those that are used only seasonally, most often as a result of seasonal flow regimes, or not at all, but support fisheries indirectly through contributions of various functions (e.g., flow, food or cover materials, nutrients and allochthonous inputs).

As outlined above, the amended *Fisheries Act* (2013) expressly protects commercial, recreational and Aboriginal fisheries and fish that support such fisheries. These fisheries depend ultimately on fish habitat, both directly and indirectly. The new Act focuses on managing serious threats to the sustainability and ongoing productivity of a fishery. The degree of threat a project poses to the sustainability and productivity of a fishery will depend on the specific nature of the ‘threat’ (e.g., the extent, duration and intensity of a disturbance) and on the sensitivity, or relative tolerance, of the fish species and habitats to threats or disturbance. Some fish species and habitats are inherently much more sensitive to disturbance than others. For example, increases in suspended sediment and turbidity, degradation of water quality, changes to thermal regime, loss of instream habitat structure/diversity or cover, or loss of riparian cover would have a greater detrimental effect on the productivity of some trout species than they would on the productivity of more tolerant species like Common Carp (*Cyprinus carpio*) or many of the common cyprinid species. Species that are rare also tend to be more sensitive to disturbance, with aquatic Species at Risk (Endangered or Threatened) representing the extreme end of that scale.

Habitat features that play a predominant role in productivity are generally more sensitive to disturbance; these may include critical or specialized habitat features such as spawning and nursery habitats. Some of these habitats are more sensitive to disturbance because of their underlying functional dependencies, for example, Brook Trout (*Salvelinus fontinalis*) spawning habitat, the productivity of which is directly

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

dependent on groundwater discharge. The resilience of a habitat or its tolerance to disturbance depends on other factors such as flow and thermal regime and the nature and diversity of its substrates, bank materials and morphology. The rarity of habitat types within the watercourse system can often be important as the habitat may be 'limiting' to the productivity of the fishery; that is, loss or degradation of a rare but important habitat type would have a commensurately greater effect on productivity than if the habitat was available throughout the watercourse.

For broad area studies and when specific fish community and habitat information is not available, thermal (temperature) regimes of waterbodies are often used as a coarse measurement of habitat and fish community sensitivity. In general terms, the sensitivity of fish communities and habitats increases with decreasing temperature (i.e., warmwater communities are typically less sensitive than coldwater). The thermal and associated fish and fish habitat sensitivity is generally linked directly to groundwater.

To the extent possible, rather than infer sensitivity using temperature data, the preference is to use the actual fish community information, and specifically, the most sensitive species present as a surrogate for overall sensitivity.. That is, stream temperature may be cold, but the stream may not support coldwater fish species.

At this stage of the study, the Ministry of Natural Resources and Forestry (MNRF)'s Aquatic Resource Area (ARA) Watercourse layer from Land Information Ontario (LIO) is used to provide a preliminary classification of the thermal/fish community regime of the watercourses (or reaches thereof) within the Study Area, as illustrated on **Exhibit 3-2**. The thermal classifications from LIO are determined using a combination of available data including fish and benthic invertebrate communities, in addition to temperature profiles (LIO 2014). However, it should also be noted that the MNRF classifications are not always consistent with available fish sampling or flow information collected through other sources such as Conservation Authorities or other subwatershed studies. These inconsistencies are indicated in **Table 3-2** and explained further in **Section 3.2.1** Watercourse Summaries. The preliminary classification will be refined as more specific fish community and habitat information is collected.

Watercourse thermal classifications are defined as follows:

Coldwater:

Mean summer surface water temperature <19 °C (MNRF 2012; from Coker et al. 2001). Coldwater fish communities are comprised of an assemblage of fishes characterized by the presence of salmon, trout and sculpin species. Slimy Sculpin, Brook Trout and American Brook Lamprey are the best indicator species of a coldwater environment (MNRF 2012; adapted from Coker et al. 2001). The invertebrate community includes mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) (MNRF MNRF 2012; adapted from Kilgour and Barton 1999).

Coolwater:

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Mean summer surface water temperature 19 to 25°C (MNRF 2012; from Coker et al. 2001). Coolwater fish communities are comprised of an assemblage of fishes characterized by percids (e.g. Yellow Perch, Walleye, Iowa Darter), esocids (Northern Pike) (MNRF 2012; adapted from Coker et al. 2001). The most common Species at Risk present within the Study Area watercourses, Redside Dace, is also an indicator of coolwater habitat conditions.

Warmwater:

Mean summer surface water temperature >25°C (MNRF 2012; from Coker et al. 2001). Warmwater fish communities are comprised of an assemblage of fishes characterized by Largemouth Bass, Bluegill, Carp, Bullheads, or Bowfin (MNRF 2012; adapted from Coker et al. 2001). The invertebrate community is dominated by snails (e.g., Planorbidae, Valvatidae), glossiphoniids (leeches) and planariids (flatworms) (MNRF 2012; adapted from Kilgour and Barton 1999).

The classification of thermal regimes and fish community types of most watercourses varies along their length, depending on a variety of factors such as the physiography/hydrogeology and associated groundwater influence, size, riparian cover and anthropogenic disturbance. In the watercourse summaries (**Table 3-2**, and **Section 3.4.1**), reaches of watercourses within the Study Area are discussed in terms of available fish and habitat information and dominant thermal regime, as well as other general habitat characteristics available through background information and map sources. Dominant thermal regimes are based on MNRF Aquatic Resource Area mapping (LIO 2014), but in some cases the existing fish data in a reach indicate a different thermal regime than the MNRF classification. These discrepancies will be discussed in the watercourse summaries below.

Table 3-2 Watercourse Thermal Regimes and Fish Communities Identified for Total Length of Watercourse within Study Area

Watershed	Subwatershed	Watercourse	Total Length in Study Area (km)	Dominant Thermal Regime (MNRF)*	Fish Community**	SAR Present in Study Area (Y/N)
Sixteen Mile Creek	Middle East Branch	Hornby Tributary	2.5	Cold (warm and coolwater fish species)	Blacknose Dace Brook Stickleback (Rainbow Trout noted downstream)	N
	East Branch	East Sixteen Mile Creek	26.9	Cool	Blacknose Dace Bluntnose Minnow Creek Chub Fantail Darter Johnny Darter White Sucker Redside Dace	Y ³
Credit River	Mullet Creek	Mullet Creek	11.1	Warm	Creek Chub ¹	N

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-2 Watercourse Thermal Regimes and Fish Communities Identified for Total Length of Watercourse within Study Area

Watershed	Subwatershed	Watercourse	Total Length in Study Area (km)	Dominant Thermal Regime (MNRF)*	Fish Community**	SAR Present in Study Area (Y/N)
					Blacknose Dace ¹ Brook Stickleback ¹ Bluntnose Minnow ¹ Fathead Minnow ¹	
	Levi Creek	Levi Creek	48.8	Warm (coolwater fish species)	White Sucker Goldfish Northern Redbelly Dace Common Carp Common Shiner Bluntnose Minnow Blacknose Dace Longnose Dace Creek Chub Brook Stickleback Pumpkinseed Largemouth Bass	N
	Norval to Port Credit	Credit River	47.2	Cool	Johnny Darter White Sucker Common Shiner Bluntnose Minnow Blacknose Dace Longnose Dace Creek Chub Brook Stickleback Rock Bass	Y
	Huttonville Creek	Huttonville Creek	15.6	Cold (coolwater fish species)	Creek Chub Brook Stickleback Blacknose Dace Northern Redbelly Dace Redside Dace	Y
	Fletcher's Creek	Fletcher's Creek (headwater tributaries)	20.5	Cool	Indirect habitat only	N
Etobicoke Creek	Etobicoke Headwaters	Etobicoke Creek West	53.4	Warm (coolwater fish species)	Blacknose Dace Bluntnose Minnow Brook Stickleback Common Shiner Creek Chub Fathead Minnow	N

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-2 Watercourse Thermal Regimes and Fish Communities Identified for Total Length of Watercourse within Study Area

Watershed	Subwatershed	Watercourse	Total Length in Study Area (km)	Dominant Thermal Regime (MNRF)*	Fish Community**	SAR Present in Study Area (Y/N)
					Goldfish Johnny Darter Longnose Dace Northern Hog Sucker Rock Bass Central Stoneroller Brown Bullhead Spottail Shiner	
	Spring Creek	Spring Creek	2.3	Warm (coolwater fish species)	White Sucker Common Shiner Blacknose Shiner Bluntnose Minnow Northern Redbelly Dace Blacknose Dace Longnose Dace Creek Chub Pearl Dace Brook Stickleback Fantail Darter Johnny Darter	N
Humber River	West Humber River	Campbell's Cross Creek	6.9	Cold (coolwater fish species)	Common Shiner Blackchin Shiner Northern Redbelly Dace Bluntnose Minnow Fathead Minnow Blacknose Dace Brook Trout Creek Chub Redside Dace White Sucker Mottled Sculpin Northern Hog Sucker ² Pumpkinseed Rock Bass Fantail Darter Johnny Darter	Y ³
		Tributaries to West Humber	35.7	Warm (coolwater fish species)	Redside Dace ² Golden Shiner ² Common Shiner ² Spottail Shiner ²	Y ³

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-2 Watercourse Thermal Regimes and Fish Communities Identified for Total Length of Watercourse within Study Area

Watershed	Subwatershed	Watercourse	Total Length in Study Area (km)	Dominant Thermal Regime (MNRF)*	Fish Community**	SAR Present in Study Area (Y/N)
					Bluntnose Minnow ² Fantail Darter ² Johnny Darter ²	
		Salt Creek	15.5	Warm (coolwater fish species)	Redside Dace Common Shiner ² Blacknose Dace ² Brown Bullhead ² Rock Bass ² Largemouth Bass ²	Y ³
		Lindsay Creek	0.7	Warm (coolwater fish species)	Redside Dace	Y ³
		West Humber River	63.5	Warm (coolwater fish species)	White Sucker Northern Hog Sucker Common Shiner Blackchin Shiner Rosyface Shiner Bluntnose Minnow Fathead minnow Blacknose Dace Creek Chub Brown Bullhead Rock Bass Redside Dace Pumpkinseed Largemouth Bass Yellow Perch Rainbow Darter Johnny Darter	Y ³
		Gore Road Tributary	22.5	Warm	Baitfish community, species unknown	N
	Main Humber River	Rainbow Creek	3.9	Warm (coolwater fish species)	Blackside Darter ² Fantail Darter ² Redside Dace ²	N ³
		Robinson Creek	28.5	Warm (coolwater fish species)	Golden Shiner ² Spottail Shiner ² Fathead Minnow ² Blacknose Dace ² Creek Chub ² Pumpkinseed ²	Y ³

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-2 Watercourse Thermal Regimes and Fish Communities Identified for Total Length of Watercourse within Study Area

Watershed	Subwatershed	Watercourse	Total Length in Study Area (km)	Dominant Thermal Regime (MNRF)*	Fish Community**	SAR Present in Study Area (Y/N)
					Largemouth Bass ² Johnny Darter ² Blackside Darter ² Yellow Perch ²	
		Main Humber River	35.0	Cold (coolwater fish species)	Fantail Darter Largemouth Bass Mottled Sculpin Johnny Darter Rainbow Darter White Sucker Catfish species American Brook Lamprey Redside Dace	Y ³
	East Humber River	East Humber River	30.4	Mixed Cold / Cool	Brook Trout Brown Trout Rainbow Trout Mottled Sculpin Northern Brook Lamprey ² Redside Dace	Y ³
		Purpleville Creek	30.3	Cold (coolwater fish species)	Brook Trout ² Brown Trout ² Rainbow Trout ² Mottled Sculpin ² Redside Dace²	Y ³

Notes: 1. Fish species based on species typical of habitat classification in the Credit River Watershed (MNRF & CVC 2002)
 2. Fish species based on downstream records, outside Study Area boundaries, but closest available data to Study Area
 3. The presence and type of Species At Risk in the Study Area will be confirmed through correspondence with DFO and MNRF and field investigations to be completed as part of future phases of work for the project

Source: * MNRF Aquatic Resource Area (LIO 2014)

** Source: Amalgamated data from available subwatershed studies and monitoring reports as referenced in text

3.3.1 Watercourse Summary

The following sections provide a brief summary of the existing fish and fish habitat characteristics of the primary watercourses within the Study Area.

Sixteen Mile Creek Watershed

Hornby Tributary – A short headwater reach of this watercourse is included in the Study Area. It is classified as coldwater habitat (LIO 2014) but scored as poor quality habitat on the Index of Biotic

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Integrity (IBI)² due to runoff from surrounding agriculture, silty substrates and low gradient providing little complex fish habitat (Conservation Halton [CH] 2011). In 2011, the only fish species captured in this reach of the Hornby Tributary were Blacknose Dace (*Rhinichthys atratulus*) and Brook Stickleback (*Culaea inconstans*) (CH 2011). The station downstream of the Study Area on this tributary has more complex habitat (CH 2011) and supports a more diverse fish community including: White Sucker (*Catostomus commersonii*), Common Shiner (*Luxilus cornutus*), Bluntnose Minnow (*Pimephales notatus*), Blacknose Dace, Creek Chub (*Semotilus atromaculatus*), Brook Stickleback, Rock Bass (*Ambloplites rupestris*), Smallmouth Bass (*Micropterus dolomieu*), and Johnny Darter (*Etheostoma nigrum*) (Dillon consulting & Town of Halton Hills 2000), as well as Fantail Darter (*Etheostoma flabellare*), Rainbow Darter (*Etheostoma caeruleum*), Pumpkinseed (*Lepomis gibbosus*), and Rainbow Trout (*Oncorhynchus mykiss*) (CH 2011). No Species at Risk (SAR; designated as Endangered or Threatened) or other Species of Conservation Concern (SCC) are known from this tributary (see **Section 3.6** for details on Species at Risk).

East Sixteen Mile Creek – The branch of this watercourse within the Study Area is classified nearly entirely as coolwater habitat with small sections of coldwater habitat. Potential coldwater habitat in the vicinity of 5th Sideroad may be an indication of groundwater inputs (Dunn 2006). The reach of this watercourse within the Study Area supports Blacknose Dace, Bluntnose Minnow, Creek Chub, Fantail Darter, Johnny Darter, and White Sucker (CH 2011). Most of these species tolerate a range of thermal conditions. However, reaches of this watercourse support Redside Dace (*Clinostomus elongatus*), which does require coolwater habitat, and MNRF regulates the habitat along the reach toward the south side of the Study Area (MNRF 2014a).

Credit River Watershed

Mullet Creek – Headwater reaches of Mullet Creek are located within the Study Area. These reaches are influenced mainly by surface runoff events and are seasonally dry (Gartner Lee 1999). Based on the existing fish community, the headwaters are classified as supporting a *Small Warmwater Community* in the Credit River Fisheries Management Plan (MNRF & CVC 2002). This habitat is defined as smaller streams in clay till plains with little coarse substrate material. Common species include Creek Chub, Blacknose Dace, Brook Stickleback, Bluntnose and Fathead Minnows (*Pimephales promelas*), which can utilize streams with intermittent flow and low oxygen. No SAR or SCC are known from Mullet Creek.

Levi Creek – Small tributaries in the upper portion of the Levi Creek Subwatershed are within the Study Area. Based on the existing fish community, these reaches are classified as supporting a *Warmwater Community (dominated by Cyprinids)* in the MNRF LIO database and Credit River Fisheries Management Plan (MNRF & CVC 2002). Physiography predicts a *Mixed Community* in these reaches,

² An index of aquatic habitat quality based on aspects of the fish community including fish abundance, species richness, presence of indicator species, and trophic composition.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

and it is assumed that agriculture and in-line ponds have warmed the system to result in a warmwater fish community of cyprinids and panfish as listed in Table 3-2. The streams are managed for a *Mixed Warm / Cool Community* (MNRF & CVC 2002). In a 1995 assessment, headwater reaches of Levi Creek were characterized as choked with cattail and grasses, with ephemeral flow and limited fisheries potential, but indicators of groundwater inputs were present in the most northwesterly tributary (Gartner Lee 1999).

Credit River – The reach of the Credit River from Norval to the mouth of the river in Port Credit is classified as a *Mixed Cold / Cool Community* in the Credit River Fisheries Management Plan (MNRF & CVC 2002) but temperatures have been recorded as high as 29°C in some sections (Gartner Lee 1999). The Credit River is classified as coolwater in the MNRF LIO database with some unclassified tributaries. As a mixed cold / coolwater system, these habitat types can provide some coldwater refuge, but less trout production than in the headwaters. Currently, no Brook Trout spawning areas are known to occur.

Previous studies in the 1980s captured Johnny Darter, White Sucker, Common Shiner, Bluntnose Minnow, Blacknose Dace, Longnose Dace, Creek Chub, Brook Stickleback, and Rock Bass within the Study Area reaches (Gartner Lee 1999). Other species common in this class of habitat, but not reported from this reach, include Brown Trout (*Salmo trutta*), Rainbow Trout, Mottled Sculpin (*Cottus bairdii*), American Brook Lamprey (*Lethenteron appendix*), Rainbow Darter, Fantail Darter, Northern Hog Sucker (*Hypentelium nigricans*) and Stonecat (*Noturus flavus*) (MNRF & CVC 2002).

A short section of this reach of the Credit River is mapped on DFO's (2014) SAR mapping as potential habitat for a species under consideration for listing under SARA (see Exhibit 3-2). DFO mapping does not distinguish between the three species covered under this category: American Eel (*Anguilla rostrata*), Lake Sturgeon (*Acipenser fulvescens*) and Redside Dace. However, given the known distributions of these species, habitat conditions in the watercourse and connection to known Redside Dace habitat, the species identified on the DFO mapping is most likely Redside Dace.

A small section of headwater features within the Glen Williams to Norval Subwatershed is also present in the Study Area. These tributaries drain to the Credit River approximately 1.5 km southeast (downstream) of Glen Williams. The portions of watercourses present in the Study Area are classified as coolwater by MNRF (LIO 2014) and are mostly channelized agricultural or roadside drainage features. Information regarding fish use of these features is not available for this area.

Huttonville Creek – The headwater reaches of this watercourse that are located within the Study Area exhibit low gradients (0.4-0.7%) and meander belt widths of 10-13 m north of Highway 7 (Totten Sims Hubicki et al. 2004). The bankfull width of the most downstream reach in the Study Area was 4.5 m with a depth of 0.3 m and fine substrates based on a 2004 assessment (Totten Sims Hubicki et al. 2004). Most of the tributaries in the headwaters north of Wanless Drive were dry in mid-summer (Totten Sims Hubicki et al. 2004).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Consistent with the predicted conditions based on physiological modelling, the Huttonville Creek watercourse and tributaries are classified as coldwater in the MNRF LIO database. However, while the fish community in Huttonville Creek is classified in the Credit River Fisheries Management Plan (MNRF & CVC 2002) as a *Coldwater Community* at the south end near the confluence with the Credit River, the community is classified as a *Warmwater Community (dominated by Cyprinids)* north of Queen Street West. Fish species captured at stations located within the Study Area in 2005 include warmwater species Creek Chub and Brook Stickleback at sites in the headwaters north of Wanless Drive (AMEC 2010b). Coolwater species, Blacknose Dace, and Northern Redbelly Dace (*Phoxinus eos*), as well as Creek Chub and Brook Stickleback were captured in the reach just north of Highway 7 (AMEC 2010b). The reach of Huttonville Creek just north of Highway 7 and west of Mississauga Road is regulated as Redside Dace habitat and this species has been reported from the headwaters north of Wanless Drive (MNRF 2014a).

Fletcher's Creek – Only the headwater reaches of Fletcher's Creek are within the Study Area. They are described as intermittent with permanent flow only occurring south of Highway 7 (outside the Study Area) (Paragon Engineering et al. 1996). An update to the Fletcher's Creek Subwatershed Study (CVC 2011) describes the tributaries north of Wanless Drive as ephemeral features, mainly draining agricultural fields that may convey limited groundwater discharge, but may be plowed or cropped during agricultural seasons. These tributaries are identified as indirect fish habitat only (CVC 2011).

North of Highway 7, the fish communities in the tributaries of Fletcher's Creek were classified in the Credit River Fisheries Management Plan (MNRF & CVC 2002) as *Warmwater Communities (dominated by Cyprinids)* but updated MNRF data show the watercourses classified as coolwater (LIO 2014). The main stem of Fletcher's Creek has been identified as Redside Dace habitat beginning approximately 3 km south of the Study Area (AMEC 2010b).

[Etobicoke Creek Watershed](#)

Etobicoke Creek West Branch – Etobicoke Creek West and its headwaters flow through a large portion of the western Study Area where it receives flow from another major tributary from the north, and then joins Etobicoke Creek Main Branch. Numerous barriers to migration have been reported along this watercourse; seven barriers appear to prevent 'non-jumping' species from migrating upstream. Fish sampling in 2001, 2004 and 2007 collected: Blacknose Dace, Bluntnose Minnow, Brook Stickleback, Common Shiner, Creek Chub, Fathead Minnow, Goldfish (*Carassius auratus*), Johnny Darter, Longnose Dace, Northern Hog Sucker, Rock Bass, Central Stoneroller (*Campostoma anomalum*), Brown Bullhead (*Ameiurus nebulosus*) and Spottail Shiner (AMEC 2010a).

These species reflect a warmwater fish community, which is consistent with thermal regime information and habitat data received from the TRCA and MNRF. Riparian vegetation is sparse in the lower section of Etobicoke Creek West Branch, however good vegetative cover occurs with increasing frequency towards the headwaters upstream of the 407 ETR / 410 interchange. Erosion has been observed in the

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

lower reaches of this watercourse. The Etobicoke West Branch scored an IBI rating of “good” (TRCA 2006).

Spring Creek –Spring Creek originates in the north end of the City of Brampton in the Heart Lake Wetland Complex and flows southeast, eventually joining the Main Branch of Etobicoke Creek. Spring Creek appears to show a degraded ecological condition with heavily altered areas (straightened and concrete lined channel, etc.); with the lower reaches of the creek showing even greater signs of impact (TRCA 2006).

The fish community exhibits very limited species diversity, which is an indication of poor ecological integrity as reflected in the low IBI score. The degraded stream condition relates primarily to the historic loss of habitat quality and the elimination of specific habitat types. Spring Creek historically supported both Redside Dace and Slimy Sculpin. This watercourse appears to have flow quantity and quality problems, issues with continued channel alteration and armouring, and many instream barriers along its length that fragment and continue to degrade the aquatic habitat (TRCA 2006).

While Spring Creek exhibits a thermally unstable environment, thermal indicators indicate that the stream condition is actually reflective of a coolwater habitat system which warms up during the hottest days into the warmwater range (TRCA 2006). Fish species identified in this watercourse include White sucker, Common Shiner, Blacknose Shiner, Bluntnose Minnow, Northern Redbelly Dace, Blacknose Dace, Longnose Dace, Creek Chub, Pearl Dace (*Margariscus nachtriebi*), Brook Stickleback, Fantail Darter and Johnny Darter (TRCA 2006). While the community composition includes some coolwater indicator species, it is dominated by warmwater species.

Humber River Watershed

West Humber River

Campbell's Cross Creek – Campbell's Cross Creek is a tributary of the Humber River, with the headwaters originating outside of the Study Area, near the town of Claude. It flows southeast across Castlemore Road and Goreway Drive into Claireville Conservation Area where it joins the West Humber River north of Queen Street (Highway 7 East). Campbell's Cross Creek supports a mixed cold / coolwater fish community including Brook Trout (TRCA 2005) and Redside Dace (MNR 2014).

Other fish species identified within Campbell's Cross Creek include: Common Shiner, Blackchin Shiner, Northern Redbelly Dace, Bluntnose Minnow, Fathead Minnow, Blacknose Dace, Brook Trout, Creek Chub, Redside Dace, White Sucker, Mottled Sculpin, Northern Hog Sucker, Pumpkinseed, Rock Bass, Fantail Darter and Johnny Darter (TRCA 2005).

Tributaries to West Humber – These unnamed tributaries to the West Humber River originate just north of the Study Area and flow south joining into a main tributary at the southern limit of the Study Area and joining Campbell's Cross Creek approximately 6 km south at Castlemore Road. There appear to be no

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

identified instream barriers to fish movement between the downstream confluence and the Study Area (Clayton et al. 2004). The tributaries flow through predominately agricultural land with large portions of the watercourses lacking natural riparian vegetation (Clayton et al. 2004).

The tributaries are classified as warmwater habitat by MNRF (LIO 2014) and the TRCA (Clayton et al. 2004), although the easternmost tributary is indicated as habitat for SAR by DFO mapping (DFO 2014). A small reach at the southern end of the Study Area is regulated as Redside Dace habitat (MNRF 2014), indicating coolwater habitat. Other fish species sampled in 2001 approximately 6 km downstream of the Study Area include Golden Shiner (*Notemigonus crysoleucas*), Common Shiner, Spottail Shiner, Bluntnose Minnow, Fantail Darter, and Johnny Darter (Clayton et al. 2004). Tributaries within the Study area received an IBI score of “good” (Clayton et al. 2004).

Salt Creek – Salt Creek is a tributary of the West Humber River originating in the South Slope physiographic unit that has also been identified as supporting Redside Dace (TRCA 2005). Salt Creek is considered *Small Riverine Warmwater Habitat*, which is comprised of watercourses having drainage areas less than 10 km² and is considered moderately impaired (Aquafor Beech 1997). Salt Creek is classified as warmwater habitat by MNRF (LIO 2014), however it also supports coolwater fish species such as Redside Dace.

Other fish species identified in this watercourse approximately 6.8 km downstream of the Study Area in 2001 include Common Shiner, Blacknose Dace, Brown Bullhead, Rock Bass, and Largemouth Bass.

Lindsay Creek – Lindsay Creek is a tributary of the West Humber River originating in the South Slope physiographic unit, flowing south to join the West Humber River at the north end of the Study Area. The creek has been identified as coldwater fish habitat by MNRF (LIO 2014), however the watercourse also supports Redside Dace (TRCA 2005), a coolwater species.

West Humber River – The West Humber River originates in Caledon in the rolling hills of the South Slope physiographic unit and flows approximately 45 km before joining the Main Humber River in Toronto. The majority of the flow in the West Humber River originates from a few tributaries (Campbell’s Cross Creek, Salt Creek and Lindsay Creek) that support a mix of cold and coolwater fish communities. Fluvial geomorphology investigations conducted for the West Humber Subwatershed Study (Aquafor Beech Ltd. et al. 1997) concluded that the stream channels have been highly modified in the past through the transition from forested conditions to agricultural land uses that included construction of extensive agricultural drain systems, culvert and bridge construction, and channel re-alignments. Riparian vegetation was found to have been altered significantly in the past and generally lacks mature forest canopy cover (Aquafor Beech Ltd. et al. 1997).

The majority of the 17 fish species recorded in the available fish community data are representative of a mixed cool and warmwater fish community of high to intermediate tolerance to environmental stressors. These fish species are: White Sucker, Northern Hog Sucker, Common Shiner, Blackchin Shiner,

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Rosyface Shiner (*Notropis rubellus*), Bluntnose Minnow, Fathead Minnow, Blacknose Dace, Creek Chub, Brown Bullhead, Rock Bass, Pumpkinseed, Largemouth Bass, Yellow Perch, Rainbow Darter and Johnny Darter. Redside Dace is also identified in the watercourse (MNRF 2014) which is relatively more sensitive to disturbance.

Gore Road Tributary – The Gore Road Tributary is classified as a permanent warmwater system which supports a mixed warm / coolwater baitfish community. This tributary appears to have been affected by urban development, and although the habitat has been degraded somewhat, it continues to support a resident forage fish community. This watercourse has been identified as lacking natural riparian cover and has somewhat degraded aquatic habitat in the urban reaches (TRCA 2008b). No fisheries information is available on this tributary.

Clarkway Drive Tributary – Clarkway Drive Tributary is a tributary of the West Humber River which begins in Caledon and flows south through Brampton before joining the West Humber River. This tributary appears to be a first-order watercourse (headwaters with no tributaries) based on the mapping within the Humber River Fisheries Management Plan (TRCA 2005). No fisheries information is available on this tributary.

Main Humber River

Rainbow Creek – This watercourse is classified as *Small Riverine Warmwater* habitat in the Humber River Fisheries Management Plan, which is defined as a watercourse with catchment of less than 10 km² and low rates of groundwater discharge resulting in frequent low flow and drying; and warm, fluctuating summer water temperatures (Clayton et al. 2004). Channels in Rainbow Creek showed some of the greatest bank instability in the Humber Watershed. Most of the small tributaries to Rainbow Creek have been altered or lost due to agriculture and development (TRCA 2008a). Fisheries information within the Study Area is not available, however fish species supported further downstream in the watershed include Blackside Darter (*Percina maculate*), Fantail Darter, and Redside Dace, suggesting coolwater habitat in downstream reaches (TRCA 2008a).

Robinson Creek – Similar to Rainbow Creek, this watercourse is classified as *Small Riverine Warmwater* habitat based on its catchment of less than 10 km², low rates of groundwater discharge resulting in frequent low or discontinuous flow conditions and fluctuating summer temperatures (Clayton et al. 2004). DFO (2014) SAR mapping shows the main stem of Robinson Creek, at the south end of the Study Area and continuing downstream, as habitat for a species under consideration for listing under the SARA. Given the known distributions of the species in this category (American Eel, Lake Sturgeon, and Redside Dace), habitat in the watercourse and connection to known Redside Dace habitat, the species most likely indicated is Redside Dace. However, these reaches are not currently regulated by MNRF as Redside Dace habitat (MNRF 2014) and it is most likely that Redside Dace are not present in this watercourse.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Other fish species identified in 2001 approximately 2.5 km downstream in the watercourse, outside the Study Area, include Golden Shiner, Spottail Shiner, Fathead Minnow, Blacknose Dace, Creek Chub, Pumpkinseed, Largemouth Bass, Johnny Darter, Blackside Darter, and Yellow Perch (Clayton et al. 2004).

Main Humber River – As described in the Humber River Fisheries Management Plan, the main stem of the Humber River in the Study Area is classified as *Intermediate Riverine Coldwater* habitat being fed by headwaters with high rates of groundwater discharge. This class of fish habitat is defined as a permanent watercourse with a catchment between 10 and 300 km² with stable flows and temperatures (Clayton et al. 2004). However, later studies indicate that the middle reaches of the Main Humber (within the study Area) support either warmwater (LIO 2014) or coolwater fisheries (TRCA 2008b).

The fish community, based on sampling records, is most consistent with a mixed coolwater community classification. Common fish species found in the upper Main Humber River include Fantail Darter, Largemouth Bass, Mottled Sculpin, American Brook Lamprey and Redside Dace. The reaches at Kirby Road at the north end of the Study Area support one of the most diverse fish communities in this watershed (AECOM 2010). Other warmwater species recorded in the middle reaches of the river are White Sucker, catfish species, Johnny Darter, Rainbow Darter and other minnow species (TRCA 2008b). Almost the entire reach of the Main Humber River within the Study Area (except a short reach on the north side near Kirby Road) is regulated as Redside Dace habitat (MNRF 2014a).

East Humber River

East Humber River – The main stem of the East Humber River is a fairly low gradient, permanent watercourse flowing along a deep valley with steep valley slopes. Tributary gradients are typically 1-5% higher/steeper than those along the main stem (Clayton et al. 2004). Within the Study Area, the channel exhibits a high degree of sinuosity creating a large meander belt width within a broad floodplain. The river originates on the Oak Ridges Moraine where there is significant groundwater discharge and is classified as *Intermediate Riverine Coldwater* in the Humber River Fisheries Management Plan (Clayton et al. 2004). The reach of the East Humber River within the Study Area has a stable thermal regime (TRCA 2008a).

The reach of the East Humber River within the Study Area has been identified as sensitive fish habitat supporting a high diversity of coldwater fish species including Brook Trout, Brown Trout, Rainbow Trout, and Mottled Sculpin throughout the reach (AECOM 2010). The entire reach of the main stem East Humber River within the Study Area is also regulated as Redside Dace habitat by MNRF (2014a). Redside Dace have been captured within the Study Area prior to 1988, and more recently, just south of the Study Area. Northern Brook Lamprey (listed as Special Concern under the *Endangered Species Act*) has also been observed in the watercourse just south of the Study Area (AECOM 2010). There are two major in-stream barriers to upstream fish movement noted, one at Kirby Road and one just south of King-Vaughan Road (Clayton et al. 2004).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

The tributaries to the west of the main stem are classified as *Small Riverine Warmwater* in the Humber River Fisheries Management Plan (Clayton et al. 2004), and as coolwater systems by MNRF (LIO 2014). Specific fisheries data to support these habitat classifications is lacking in available background information, including published reports.

Purpleville Creek – This is a relatively low gradient watercourse, the headwaters of which are located within the Study Area, east of Kipling Avenue. There are high levels of groundwater recharge in the subwatershed that maintain significant levels of groundwater discharge to the headwater streams which in turn support relatively stable flows and coldwater thermal regimes downstream of the discharge areas (AECOM 2010, TRCA 2008a). The watercourse and all tributaries in the subwatershed are classified as coldwater habitat (LIO 2014), and have been identified as sensitive fish habitat (AECOM 2010). However, the tributary reaches within the Study Area between Pine Valley Drive and Weston Road are classified as supporting only intermittent flows (AECOM 2010). Therefore it is assumed that these tributaries do not support coldwater species directly (although seasonal use is possible).

The coldwater habitat in Purpleville Creek supports several sensitive species including Brook Trout, Brown Trout, Rainbow Trout, and Mottled Sculpin (AECOM 2010). Redside Dace occur south of the Study Area in major tributaries and main stem of Purpleville Creek (AECOM 2010). The headwater areas in the Study Area are not currently regulated as Redside Dace habitat although the tributary just west of Weston Road is mapped on DFO (2014) SAR mapping as potential habitat for a species under consideration for listing under SARA. Given the known distributions of the species in this category (American Eel, Lake Sturgeon, and Redside Dace), habitat in the watercourse, and connection to known Redside Dace habitat, the species mapped is most likely Redside Dace. Again, the reach is not currently regulated as Redside Dace habitat by MNRF, and it is assumed that Redside Dace is not actually present.

3.4 TERRESTRIAL ECOSYSTEMS

Terrestrial ecosystems encompass the interaction of land, air, water and biotic components (such as flora and fauna) which function as an ecological unit or community, found on landforms. There are six terrestrial ecosystems: tundra, taiga, temperate deciduous forest, tropical rain forest, grassland and desert. Terrestrial ecosystems include natural heritage systems, which are ecologically-based delineations of nature and natural function; a system of connected, or to-be connected, green and natural areas that provide ecological functions over a longer period of time and which enable movement of species (Natural Heritage Reference Manual 2010). Natural heritage systems comprise of natural features, functions and linkages (also known as corridors), and enable the linking of different landscapes.

The Study Area falls within the Huron – Ontario section of the Great Lakes – St. Lawrence Forest Region (Rowe 1972). Common species throughout this region are sugar maple and beech, as well as basswood, white and red ashes, yellow birch, red maple, and red, white and bur oaks (*ibid*). Species

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

frequently associated with these are eastern white pine, eastern hemlock, balsam fir, plus scattered large-tooth aspen, butternut, bitternut hickory, hop-hornbeam, black cherry, sycamore, black oak.

3.4.1 Wetlands

Wetlands are natural heritage features which are defined by the PPS (2014) as, “lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface favouring the dominance of either hydrophytic plants or water tolerant plants”.

These features are generally classified as swamps, bogs, fens, marshes, mires, sloughs and peatlands and provide a multitude of ecosystem functions. The NHRM (MNRF 2010) outlines many of the natural functions that wetlands provide including but not limited to:

- Groundwater recharge/discharge;
- Flood attenuation through water storage;
- Wildlife movement corridors;
- Habitat for flora and fauna;
- Shoreline stabilization and erosion reduction; and
- Water filtration.

As defined by the PPS (2014), significant wetlands are referred to as Provincially Significant Wetlands (PSW) when identified, and mapped and scored as such using the Ontario Wetland Evaluation System (OWES). The OWES identifies individual wetlands and wetland complexes, and measures wetland functions and values, providing a framework for evaluating the relative importance of wetlands. This system generates a numerical ranking which determines wetland significance. Wetlands with a total ranking of 600 points or more, or 200 or more in either the biological component or special features component, meet the criteria for PSW.

The Study Area contains PSWs, Locally/Regionally Significant Wetlands (LSW) and wetlands which have yet to be evaluated.

As detailed in **Exhibit 3-3**, there are 11 evaluated wetlands (approximately 264 ha) and 171 unevaluated wetlands (approximately 98 ha) listed in the provincial databases within the Study Area. Generally, the wetlands are found along riparian systems, as isolated blocks, or as components of wetland complexes. The evaluated wetlands within the Study Area and their significance status are listed in **Table 3-3**.

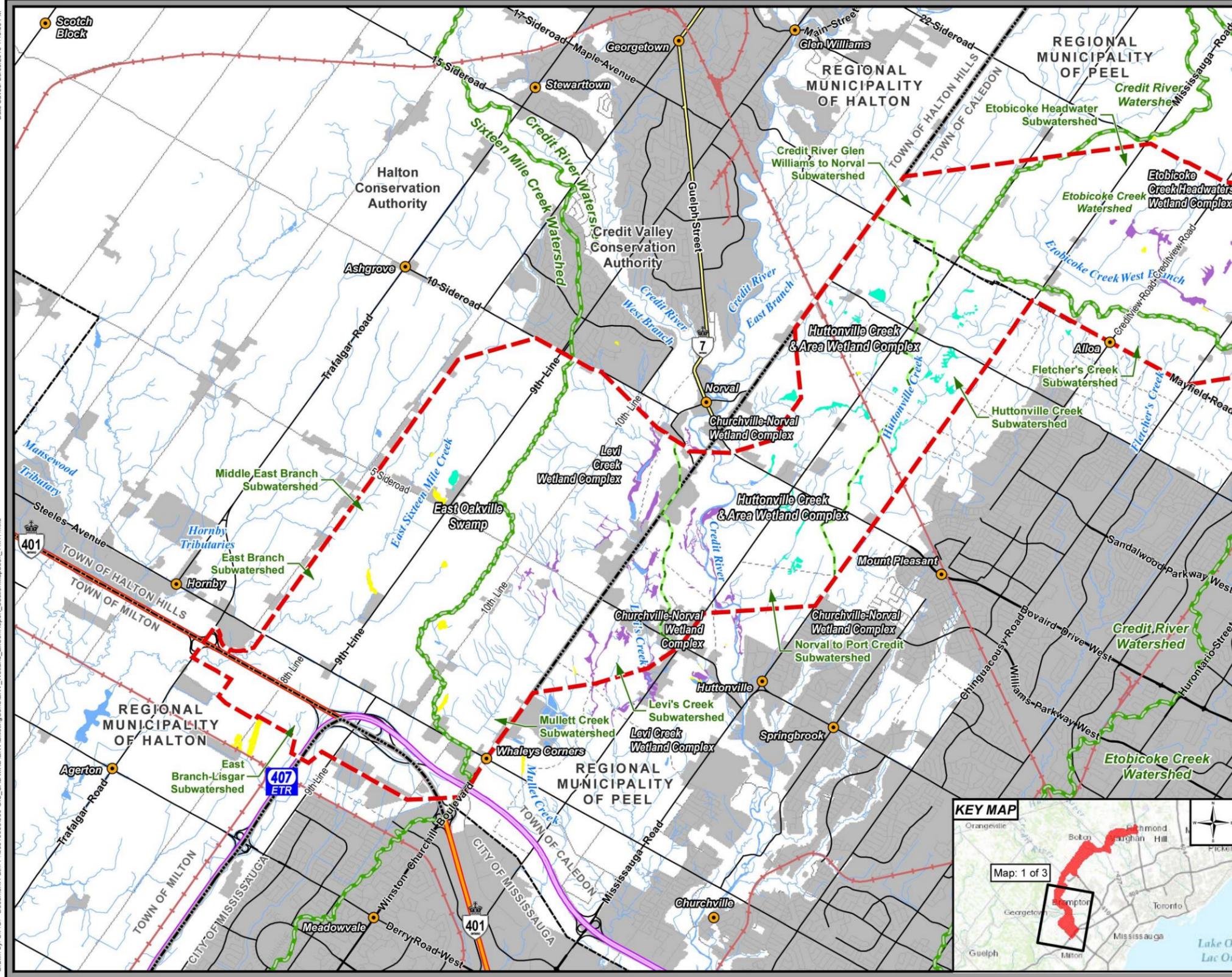
GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-3 Summary of Evaluated Wetlands within the Study Area

Watershed	Subwatershed	Wetland Name	Status	Total Area of Wetland Complex (ha)	No. of Unevaluated Wetlands Type(s)
Sixteen Mile Creek	East Sixteen Mile Creek	East Oakville Swamp	Locally Significant Wetland	2.70	4
	Middle Sixteen Mile Creek	-	-	0	1
Credit River	Norval to Port Credit	Huttonville Creek and Area Wetland Complex	Locally Significant Wetland	16.85	3
		Churchville-Norval Wetland Complex	Provincially Significant Wetlands	15.57	
		Norval Wetland	Locally Significant Wetland Complex	1.88	
	Glen Williams to Norval	-	-	0	0
	Levi Creek	Levi Creek Wetland Complex	Provincially Significant Wetlands	37.71	1
	Mullet Creek	-	-	-	2
	Huttonville Creek	Huttonville Creek and Area Wetland Complex	Locally Significant Wetland	11.65	0
	Fletcher's Creek	Upper Fletcher's Creek Wetland Complex		Provincially Significant Wetland	1.72
			Provincially Significant Wetland	4.04	
			Status To Be Determined.	0.45	
Etobicoke Creek	Etobicoke Headwaters	Etobicoke Creek Headwaters Wetland Complex	Provincially Significant Wetlands	70.00 3.48(Status to be determined)	2
	Spring Creek	Heart Lake Wetland Complex	Provincially Significant Wetland	10.45	0
Humber River	West Humber River	Campbell's Cross Wetland Complex	Provincially Significant Wetland	2.20	129
		Heart Lake Wetland Complex	Provincially Significant Wetland	6.17	
		Sandhill Wetland Complex	Locally Significant Wetland	7	
	Main Humber River	Tormore Wetland Complex	Locally Significant Wetland	1.85	58
	East Humber River	East Humber River Wetland Complex	Provincially Significant Wetland	62.39	6

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

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LEGEND

- Town or Community
- Study Area
- Upper Tier Municipal Boundary
- Lower Tier Municipal Boundary
- Watershed Boundary
- Sub-Watershed Boundary
- Developed Area
- Watercourse
- Waterbody

Roads

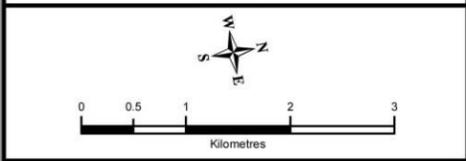
- Freeway
- 407 ETR
- Highway
- Arterial Road
- Local Road
- Proposed Road
- Railway

Wetlands by Significance

- Provincially Significant Wetland
- Regionally Significant Wetland
- Unevaluated Wetland

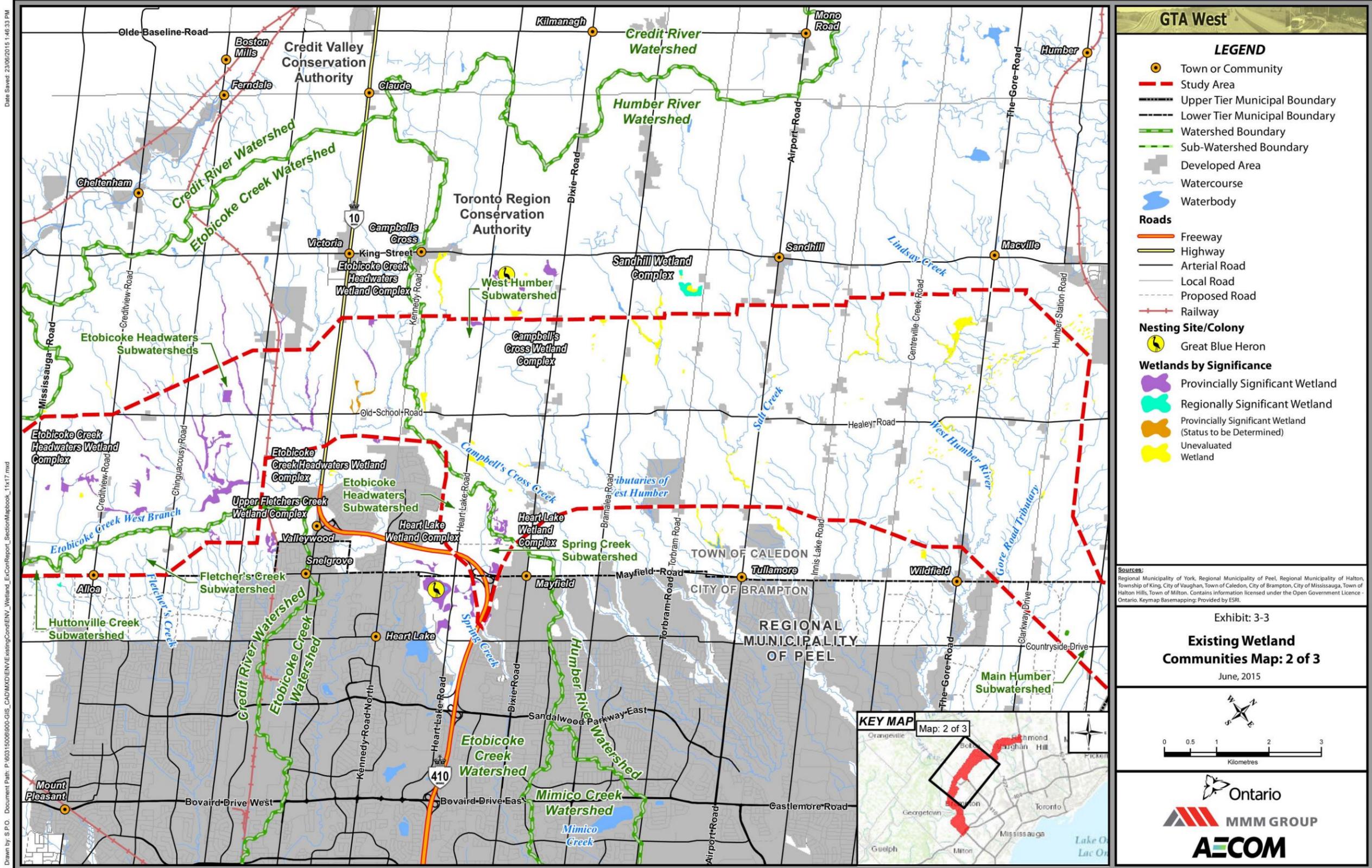
Sources:
 Regional Municipality of York, Regional Municipality of Peel, Regional Municipality of Halton, Township of King, City of Vaughan, Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Milton. Contains information licensed under the Open Government Licence - Ontario. Keymap Basemapping: Provided by ESRI.

Exhibit: 3-3
Existing Wetland Communities Map: 1 of 3
 June, 2015



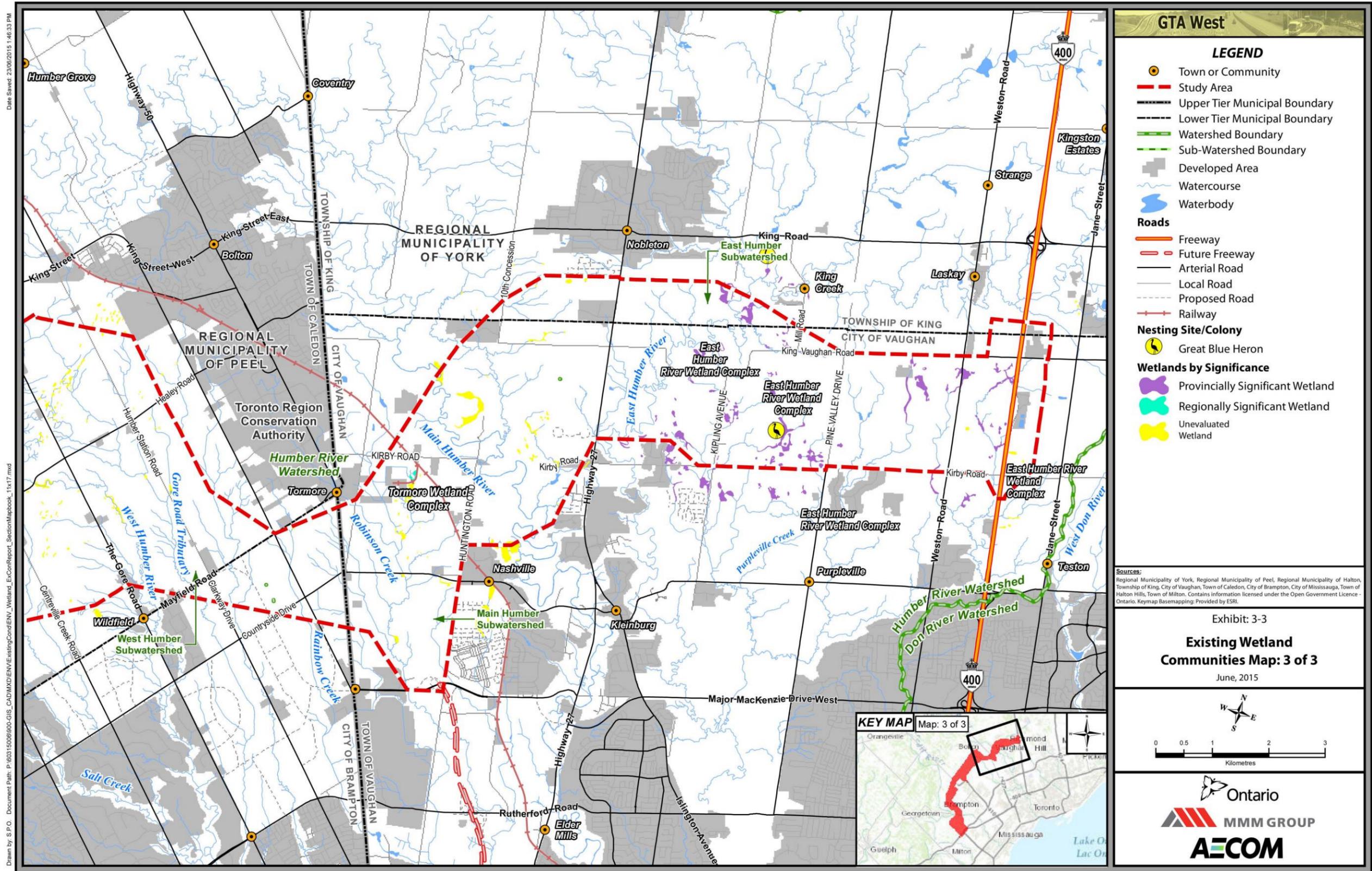


GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

The following is a summary of wetland communities present within the Study Area by watershed.

[Sixteen Mile Creek Watershed](#)

Geographic Information System (GIS) analysis of MNR secondary source data identifies one Locally Significant Wetland complex. The East Oakville Wetland is present within the portion of the Sixteen Mile Creek Subwatershed, and includes two (2) swamp communities. Additionally, the background review identified the presence of five (5) unevaluated wetlands; one (1) of which has been identified as Marsh (approximately 5.7 ha). The other four (4) wetlands are less than 3 ha in area.

[Credit River Watershed](#)

Mullet Creek – There are no PSWs or LSWs identified within the portion of Mullet Creek Subwatershed that falls within the Study Area. However, three (3) unevaluated wetlands were identified within Mullet Creek Subwatershed, two (2) of which fall within the Study Area. These wetlands are approximately 1.7 ha and 1.8 ha, respectively in size, and require identification and assessment of significance using the OWES.

Levi Creek – Levi Creek Wetland Complex was identified during the background review within the Levi Creek Subwatershed. This PSW complex consists of 106 wetland communities within the subwatershed including 40 marsh communities, 19 open water communities and 47 swamp communities. These communities range in size from 0.5 ha to 3.12 ha in area, and are largely associated with the riparian zone of Levi Creek.

Marsh communities within the subwatershed are predominately Reed Canary Grass (*Phalaris arundinacea*) dominated communities. Other marsh communities present within the subwatershed include communities dominated by Common Beaked Sedge (*Carex utriculata*), Common Horsetail (*Equisetum arvense*), Spotted Jewelweed (*Impatiens capensis*), Rice Cutgrass (*Leersia oryzoides*), Narrowleaf Cattail (*Typha angustifolia*) and White Panicle Aster (*Symphotrichum lanceolatum* ssp. *lanceolatum*).

Open water communities present within the subwatershed include species such as Lesser Duckweed (*Lemna minor*), Common Bladderwort (*Utricularia vulgaris*), Greater Duckweed (*Spirodela polyrrhiza*), Leafy pondweed (*Potamogeton foliosus*) and Curled Pondweed (*Potamogeton crispus*).

Swamp communities identified within the subwatershed include Black Ash (*Fraxinus nigra*), Green Ash (*Fraxinus pennsylvanica*), White Cedar (*Thuja occidentalis*), Yellow Birch (*Betula alleghaniensis*) Freeman's Maple (*Acer x freemanii*) and Trembling Aspen (*Populus tremuloides*).

In addition to the Levi Creek Wetland Complex, two (2) unevaluated wetland communities were identified within the Study Area during the background review. These communities are small in size; 0.22 ha and 0.28 ha respectively in size.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Norval to Port Credit – Wetlands within the Norval to Port Credit Subwatershed include PSWs, LSWs, unevaluated wetlands, as well as evaluated wetlands with status ‘yet to be determined’ by the MNRF. The Churchill-Norval Wetland Complex is a Provincially Significant Wetland complex found within the Norval to Port Credit Subwatershed. The complex consists of 48 evaluated communities most of which are associated with riparian areas of the Credit River. Of these communities, there are 26 marshes, 3 open water and 19 swamps varying in size from 0.017 ha to 3.02 ha.

Huttonville Creek and Area Wetland Complex consists of 41 wetland communities within the Norval to Port Credit Subwatershed. Some wetland communities within the complex have been evaluated by the MNRF, but have yet to receive official status. The Huttonville Creek and Area Wetland Complex includes 23 marsh communities, 3 open water communities and 15 swamp communities. Wetland size varies between 0.015 ha and 3.44 ha and includes riparian zones of Credit River tributaries, and forested communities with the agricultural landscape north of the Credit River.

Additionally, there are ten (10) unevaluated wetlands within the Norval to Port Credit Subwatershed. All ten (10) wetlands are small in size (<0.5 ha).

Glen Williams to Norval – The Glen Williams to Norval Subwatershed is located north of the Norval to Port Credit Subwatershed. A small portion of the Glen Williams to Norval subwatershed falls within the north end of the Study Area. There were no wetlands identified within the subwatershed during the background review.

Huttonville Creek – A total of 34 evaluated wetlands were identified within the Huttonville Creek Subwatershed during the background review. Some wetland communities within the complex have been evaluated, however their inclusion into the complex has yet to be determined. Wetlands delineated as a part of the Huttonville Creek and Area Wetland Complex include 16 marsh communities, 2 open water communities and 16 swamp communities. Sizes of wetlands within the Huttonville Creek Subwatershed vary between 0.017 ha and 1.7 ha. Additionally, two (2) unevaluated wetlands both <0.5 ha in size were identified within the Huttonville Creek Subwatershed during the background review.

Fletcher’s Creek – Two (2) Provincially Significant Wetlands are present within the Fletcher’s Creek Subwatershed – Upper Fletcher’s Creek Wetland Complex and Etobicoke Creek Headwaters Wetland Complex.

The Upper Fletcher’s Creek Wetland Complex was identified within the north portion of the Fletcher’s Creek Subwatershed. Wetland communities identified within the subwatershed include two (2) swamp communities (1.25 ha and 0.42 ha) and one (1) marsh community (0.04 ha).

The Etobicoke Creek Headwaters Wetland Complex includes one (1) deciduous swamp community (3.9 ha) and one (1) narrow-leaved emergent marsh community (0.14 ha).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

An additional swamp community is present within the southwest portion of the Fletcher's Creek Subwatershed. The evaluated swamp community (0.46 ha) has been identified as a part of the Huttonville Creek and Area Wetland Complex. Status of this wetland has yet to be determined by the MNRF. There are no known unevaluated wetlands within the Fletcher's Creek Subwatershed.

Etobicoke Creek Watershed

Etobicoke Creek Headwaters – The Etobicoke Creek Headwaters Subwatershed is located northwest of the Fletcher's Creek Subwatershed and includes the Etobicoke Creek Headwaters Wetland Complex which is considered to be provincially significant. The complex consists of a total of 63 wetland communities including 30 marsh communities (0.07 ha to 9.88 ha), 3 open water communities (0.04 ha to 0.23 ha) and 30 swamp communities (0.03 ha to 7.9 ha). Four (4) wetland communities within the complex have been evaluated, however their inclusion into the complex has yet to be determined.

There are eight (8) unevaluated wetlands within the Etobicoke Creek Headwaters Subwatershed. All unevaluated wetlands within the subwatershed are small in size with the largest identified as approximately 0.51 ha and the smallest at 0.25 ha.

Spring Creek – According to data layers provided by the MNRF, the Heart Lake Wetland Complex exists within the Spring Creek Subwatershed. The wetland complex consists of 1 fen (0.18 ha), 22 marsh communities (0.02 ha to 1.32 ha), 5 open water communities (0.1 ha to 0.75 ha), and 22 swamp communities (0.03 ha to 8.13 ha).

Additionally, one (1) unevaluated wetland, approximately 0.15 ha in size, is present within the Spring Creek Subwatershed.

Humber River Watershed

West Humber River – Wetlands identified during the GIS analysis within the West Humber River Subwatershed include PSWs, LSWs and unevaluated wetlands. Portions of two (2) Provincially Significant Wetlands were identified within the West Humber River Subwatershed, including Heart Lake Wetland Complex and Campbell's Cross Wetland Complex. The Heart Lake Wetland Complex consists of three (3) swamp and two (2) open water communities. Campbell's Cross Wetland communities are present at the northwest portion of the subwatershed and consist of one (1) open water community, two (2) marsh communities and five (5) swamp communities. One (1) Locally Significant Wetland Complex, the Sandhill Wetland Complex, was also identified during the background review exercise. The Sandhill Wetland Complex consists of two (2) swamp communities located at the west end of the subwatershed. In addition to the evaluated wetlands mentioned above, there are 160 unevaluated wetlands within the West Humber Subwatershed varying in size from 0.007 ha to 5.19 ha.

Main Humber – According to data layers provided by the MNRF, there are approximately 23.3 ha of known wetlands within the Study Area in the Main Humber watershed, the majority of which are

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

unevaluated. One (1) Locally Significant Wetland Complex is present – the Tormore Wetland Complex, which consists of deciduous tree and tall shrub swamp types.

East Humber – GIS analysis of MNRF secondary source data maps indicate there are approximately 57.7 ha of wetlands within the Study Area in the East Humber watershed. The majority (~56 ha) are components of the East Humber River Provincially Significant Wetland Complex. This is a large complex of many individual wetlands, often associated with tributaries spread across the subwatershed. Identified wetland types in MNRF data include swamp, marsh and open water. Additionally, there are five (5) small unevaluated wetlands within the East Humber Subwatershed varying in size from 0.11 ha to 0.6 ha.

3.4.2 Significant Woodlands

Woodlands are defined in the PPS (2014) as, “Treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels.”

A ‘Significant Woodland’ is an “area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history. These are to be identified using criteria established by the Ontario Ministry of Natural Resources [and Forestry]”.

The identification and evaluation of significant woodlands is the responsibility of the local planning authority. Various municipalities may have their own additional criteria for defining Significant Woodlands. Woodlands may be identified within ‘open space’, ‘greenspace’, or ‘environmental protection area’ designations in local/regional Official Plans. Woodlands may also vary in significance at the local, regional and provincial levels. Policies within the York Region Official Plan (2010, June 2013 modified version) defer to the Greenbelt Plan for lands within the Greenbelt Natural Heritage System, and provide several other criteria for determining significance outside of the Greenbelt, such as a 4 ha size threshold on lands south of the Oak Ridges Moraine (refer to the OP for additional detail).

The MNRF’s Natural Heritage Reference Manual (‘NHRM’, March 2010) provides a number of criteria recommended for evaluating woodland significance. These criteria include woodland size, ecological functions, uncommon characteristics and economic and social functional values. Criteria used for the assessment of potential significance for this study included those which could be gleaned from secondary sources. Therefore, for the purposes of this report, the assessment of potential significance was determined based on woodland size and ecological function.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

3.4.2.1 Woodland Size

Estimates of forest cover within each watershed were determined using background reports such as watershed report cards. These estimates were then used to categorize woodlands either Potentially Significant Woodlands or Woodlands. Potentially Significant Woodlands are woodlands that meet the size requirements for significance based on the presence of land cover.

For example, estimates of forest cover in the Humber River watershed are 18 to 19% (TRCA 2008a, TRCA 2008b). In accordance with the NHRM, in planning areas containing 15-30% forest cover, woodlands greater than 20 ha in size would meet the size threshold for significance. GIS analysis of available desktop secondary source information indicates a total of 718.22 ha of woodlands 20 ha or greater are present within the Study Area. Potentially Significant Woodlands based on size thresholds, as well as Woodlands which do not meet the size criterion, are shown on **Exhibit 3-4. Table 3-4**, summarizes the watershed forest covers and criteria used to determine significance

Table 3-4 Summary of Woodland Significance by Watershed – Size Criterion

Watershed	Forest Cover Estimate within Watershed	Criterion for Significance
Sixteen Mile Creek	<20%	20 ha
Credit River	21%	20 ha
Etobicoke Creek	<5%	2 ha
Humber River	17%	20 ha

3.4.2.1 Ecological Function

Interior forest habitat refers to the sheltered environment away from the influence of forest edges and open habitats. The presence of forest interior is directly related to the woodland’s size and shape. Large woodlands with round or square outlines have the greatest amount of forest interior, while narrow, linear woodlands are less likely to support interior forest habitat.

Certain forest wildlife species are edge-intolerant or area sensitive, and require the conditions found in interior forest to survive and maintain viable populations; although tolerance of edge disturbance should be considered on a species by species basis. Interior forest has been classified as being 100 m from the forest edge and deep interior forest as being 200 m from the forest edge (Environment Canada, 2004). Forest interior habitat is sensitive to creation of openings and fragmentation, including road crossings, which creates new edges and reduces or eliminates the interior habitat.

Estimates of interior and deep interior forest habitat within the Study Area were identified by delineating the 100 m and 200 m perimeters from woodlands edges. Interior forest habitat is shown on **Exhibit 3-4. Table 3-5** provides the size criterion for interior habitat within each watershed.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-5 Summary of Woodland Significance by Watershed - Interior Habitat Criterion

Watershed	Forest Cover Estimate	Criteria for Significance
Sixteen Mile Creek	<20%	2 ha
Credit River	21%	2 ha
Etobicoke Creek	<5%	Any interior habitat
Humber River	17%	2 ha

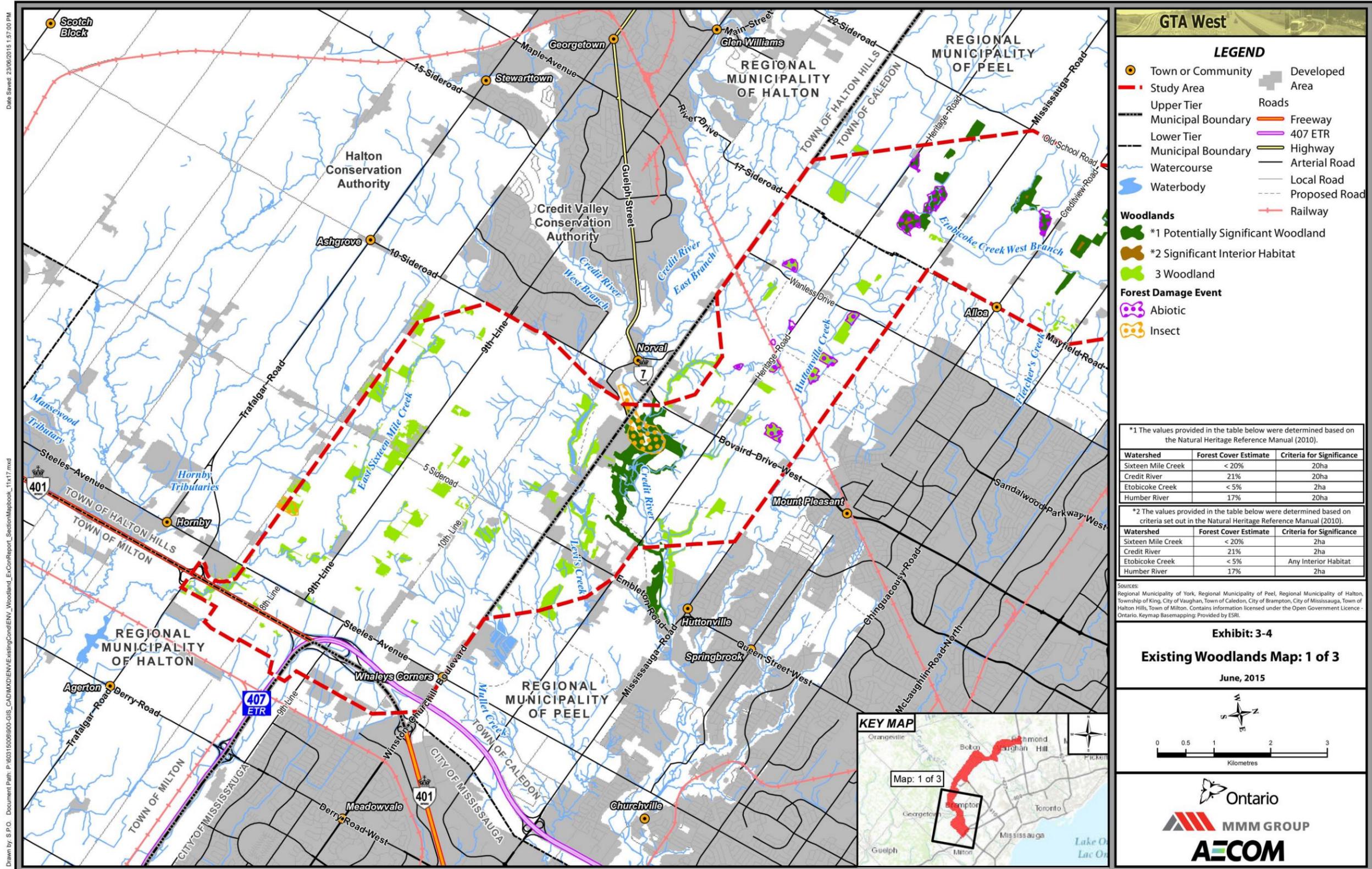
Similarly, overlap with and proximity to other natural heritage features such as wetlands and watercourses can be a factor determining woodland significance; woodlands that overlap or abut other significant features may be considered more valuable than woodlands that do not (all else being equal). Approximately 104.09 ha of the wooded areas identified through secondary source data overlaps with Environmentally Significant Areas (ESAs) within the Study Area. Additionally, another 1186.58 ha of wooded areas identified overlap with Areas of Natural and Scientific Interest (ANSIs) within the Study Area. These features are discussed in more detail in **Section 3.7** and can be seen on **Exhibit 3-5**.

Linkages to other woodlands and significant features should also be considered in evaluating woodland significance. These linkages allow for movement of plants and animals, supporting more robust gene pools and animals that require a diversity of habitat types. The NHRM recommends that woodlands which are part of a defined natural heritage system or provide a connecting link to other significant features should be considered significant. Large portions of the woodlands within the Study Area are part of The Greenbelt Natural Heritage System.

It is important to note that there are several other recommended criteria for determining significance, many of which can only be evaluated in light of information arising from detailed field surveys. Woodlands that do not meet size criteria, for example, may be significant due to other ecological factors. Woodland significance must be evaluated through a detailed consideration of multiple criteria, including relevant regional and municipal policies and information obtained in the field.

The following table summarizes the number and size of woodlands within each subwatershed, as well as the number of woodlands with interior habitat.

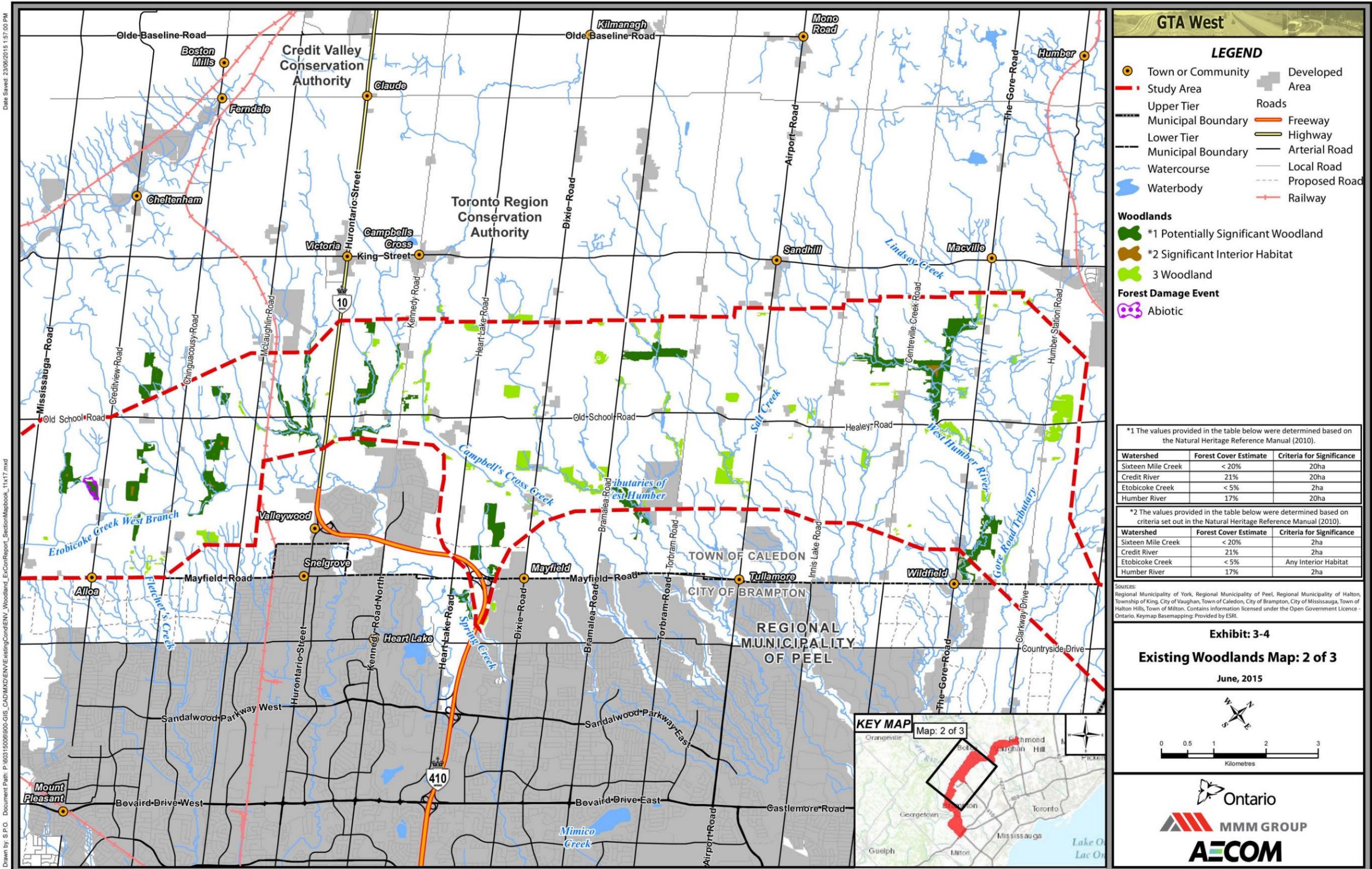
GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



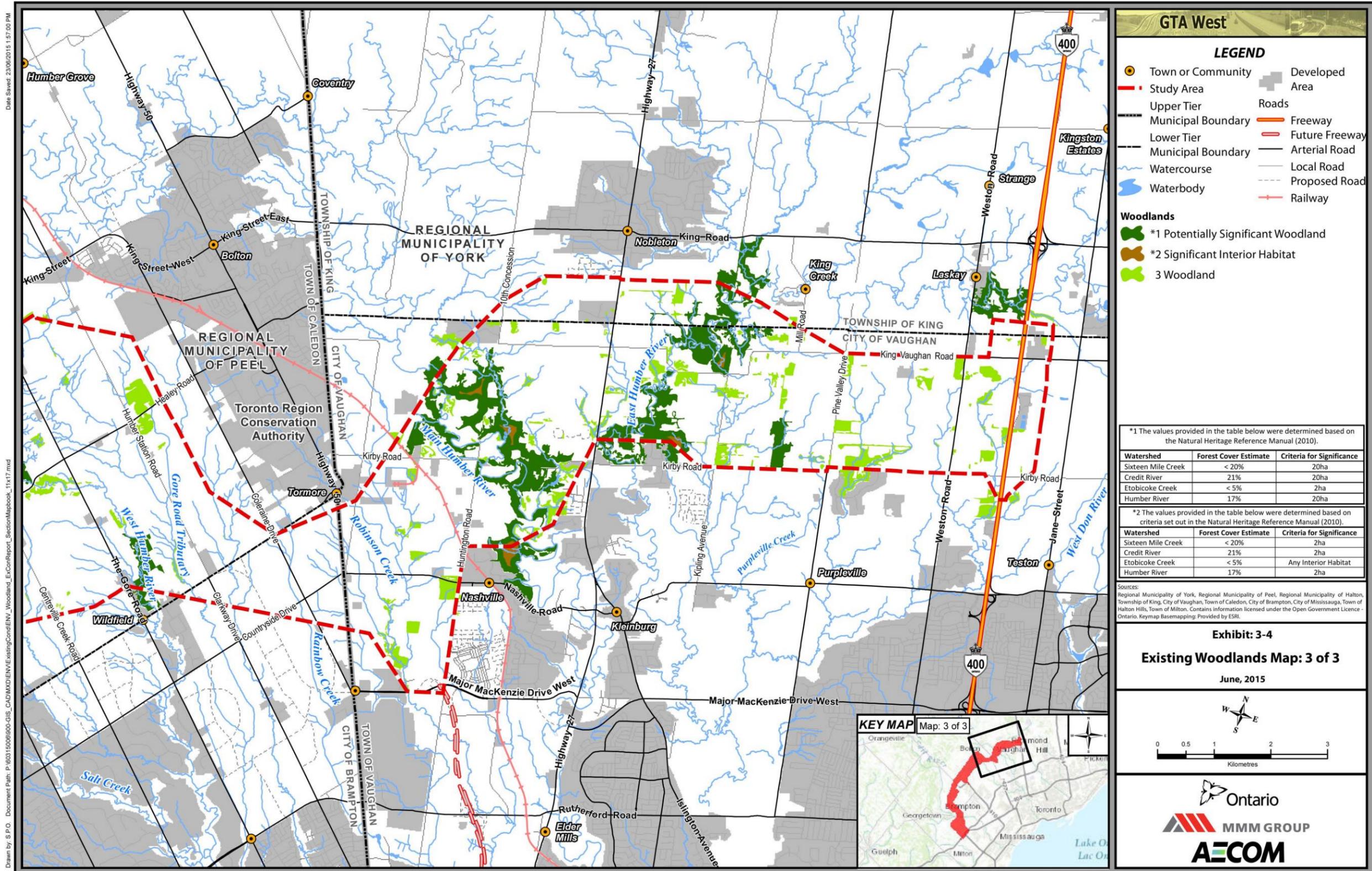
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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-6 Significant Woodland Areas in the Study Area by Watershed

Watershed	Subwatershed	No. of Woodlands Meeting NHRM Minimum Size Criteria	No. of Woodlands with Interior Habitat	Total Area of Woodlands Meeting NHRM Size Criteria (ha)
Sixteen Mile Creek	East Sixteen Mile Creek	0	0	0
	Middle Sixteen Mile Creek	0	0	0
Credit River	Norval to Port Credit	3	0	120.34
	Glen Williams to Norval	0	0	0
	Levi Creek	0	0	0
	Mullet Creek	0	0	0
	Huttonville Creek	0	0	0
	Fletcher's Creek	0	0	0
Etobicoke Creek	Etobicoke Headwaters	25	15	221.60
	Spring Creek	2	0	8.78
Humber River	West Humber River	6	1	166.84
	Main Humber River	4	3	259.62
	East Humber River	4	2	285.66

3.4.2.1 Woodland Summary

The following is a summary of woodlands present within the Study Area by watershed based on the criteria outlined previously (**Table 3-5** and **Table 3-6**). As mentioned in **Section 1.5.2**, the MNRF's Natural Heritage Reference Manual ('NHRM', March 2010) provides a number of criteria recommended for evaluating woodland significance. These criteria include woodland size, ecological functions, uncommon characteristics and economic and social functional values. Criteria used for the assessment of potential significance for this study included those which could be gleaned from secondary sources. Therefore, for the purposes of this report, the assessment of potential significance was determined based on woodland size and ecological function, where known.

Information from MNRF includes known woodland areas, as well as evidence of biotic or abiotic damage. Abiotic damage includes evidence of damage due to inclement weather such as ice storms or high winds. Biotic damage includes evidence of invertebrate infestations, such as Emerald Ash Borer (*Agrilus planipennis*). Woodlands with recorded abiotic and biotic damage can be viewed on **Exhibit 3-4**.

Sixteen Mile Creek Watershed

Land use within the portion of Sixteen Mile Creek present within the Study Area is primarily agricultural. Based on the size requirement criterion outlined above in **Table 3-4**, none of the woodlands within the watershed meet the size criterion for significance (>20 ha). However, many woodlands within the

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

subwatershed area may still provide ecological functions which meet other criteria for provincial significance as outlined in the Natural Heritage Reference Manual. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Credit River Watershed

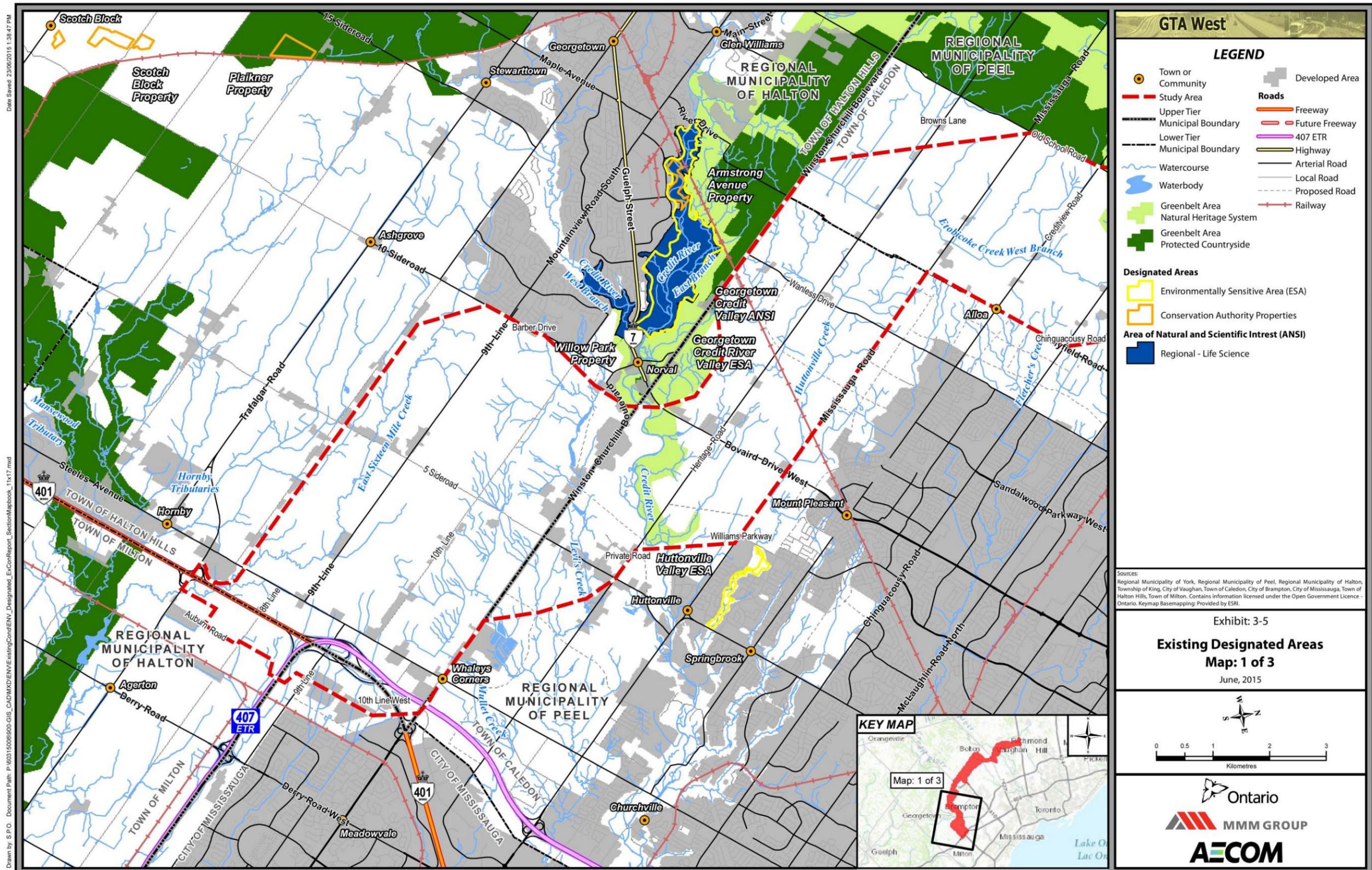
Mullet Creek – Land use within the Mullet Creek Subwatershed consists primarily of urban development and agricultural development. As such, woodlands within the Study Area portion of the Mullet Creek subwatershed are limited in number and relatively small in size (< 5 ha). Three (3) woodlands were identified in the western portion of Mullet Creek Subwatershed. These woodlands do not meet the criterion for significance based on size, as outlined in **Table 3-4**. However, these woodlands have potential to provide ecological functions which meet other criteria for provincial significance. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Levi Creek – The Levi Creek Subwatershed consists primarily of agricultural land use with some urban development within the southeast portion of the subwatershed. Woodlands within the subwatershed vary in size and are largely associated with Levi Creek drainage features and associated wetland complex. None of the woodlands within the subwatershed meet the size requirements for significance. However, woodlands included within the Levi Creek Wetland Complex are considered to be part of the PSW, and therefore are afforded protection under the PPS. Similarly, woodlands that do not meet the size criterion for significance may provide important ecological functions which require protection. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Norval to Port Credit – Woodlands found through the Norval to Port Credit Subwatershed are mostly associated with habitat adjacent to the Credit River. Woodlands associated with the Credit River are contiguous and meet the size requirements for significance within the Credit River Watershed (>20 ha). Portions of these woodlands include swamp communities within the Churchill-Norval Wetland Complex. Other woodlands within the subwatershed do not meet the size criterion for significance but may provide ecological functions that meet other criteria for provincial significance. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Glen Williams to Norval – Land use within the Glen Williams to Norval Subwatershed consists predominately of agricultural use. Woodlands within the Study Area portion of the subwatershed are limited in number including one (1) 9.9 ha woodland and a portion of a 3.73 ha woodland. Neither woodland meets the size requirement for significance, however further investigation would be needed to determine if ecological functions meet other criteria for significance. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

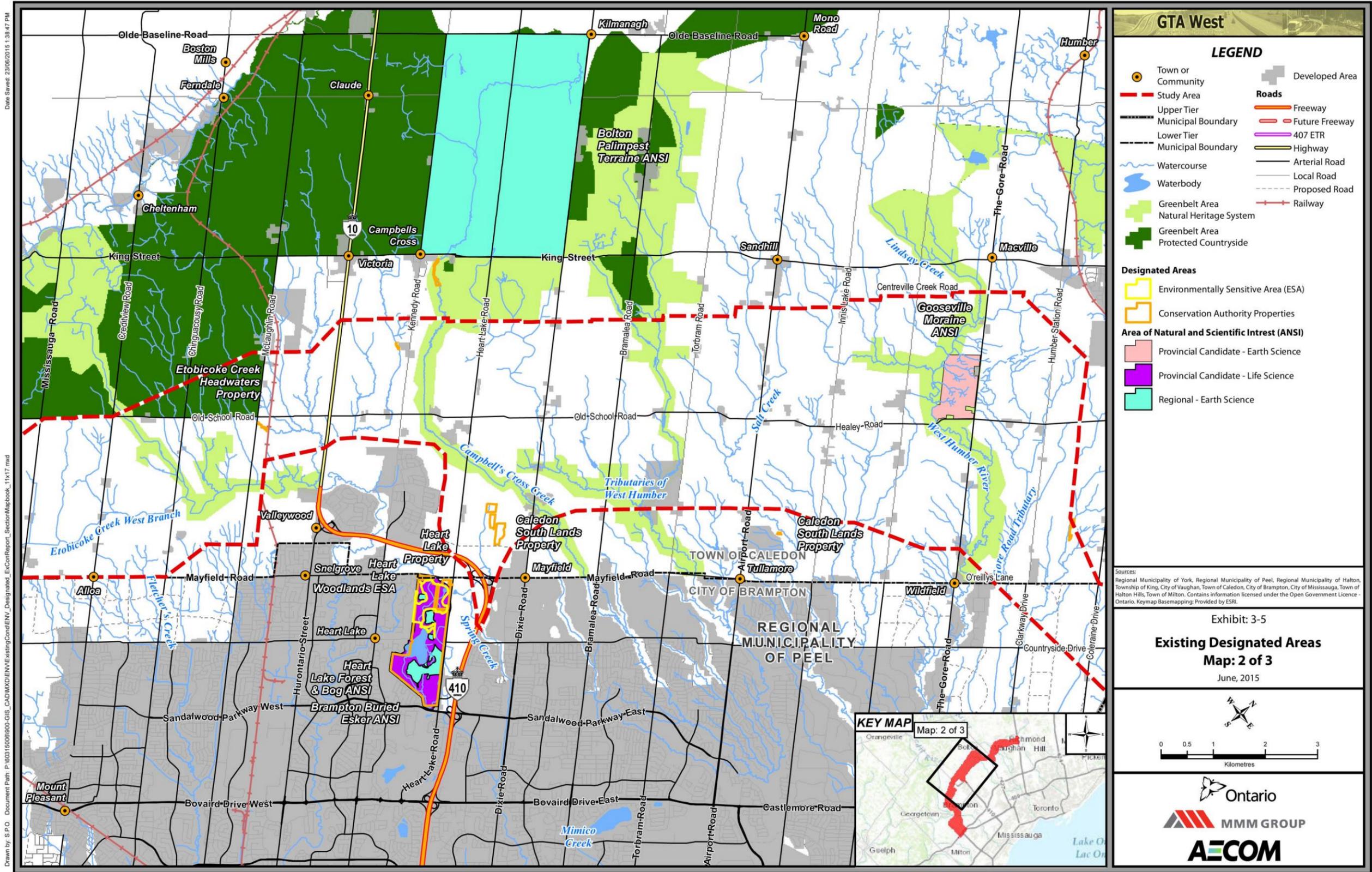
GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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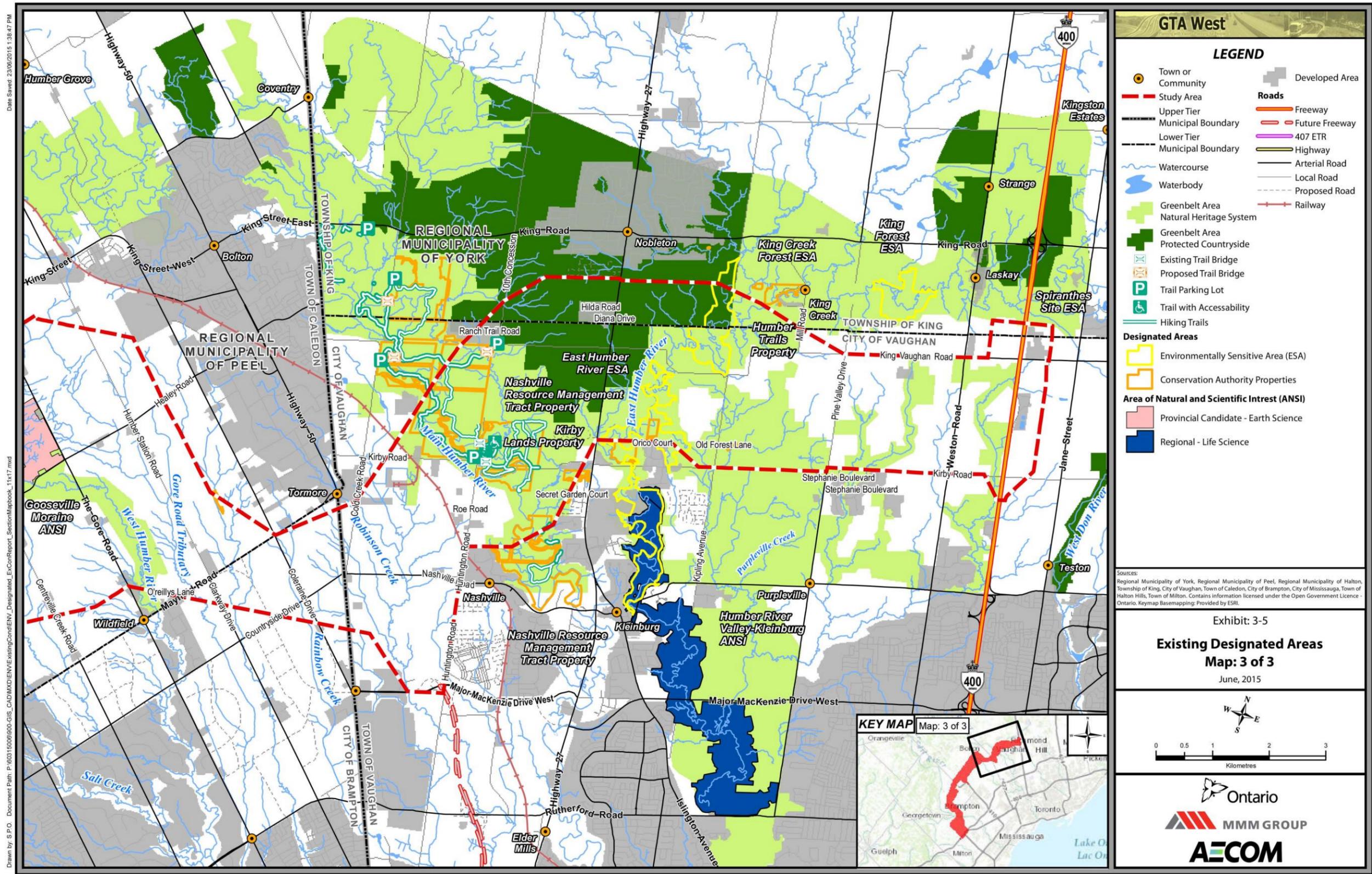
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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015



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GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Huttonville Creek – The Huttonville Creek Subwatershed consists primarily of agricultural land use. Woodlands present within the watershed are fragmented, and do not meet the size criterion for provincial significance. However, some woodlands are associated with swamp communities of the Huttonville and Area Wetland Complex and may provide ecological functions that meet criteria for provincial significance. Further investigation would be required to determine ecosystem functions of these woodlands. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Fletcher's Creek – Land use within Fletcher's Creek Subwatershed is predominately agricultural with some residential development. Woodlands within the subwatershed are highly fragmented, and do not meet the size requirements for significance (>20 ha). Portions of woodlands are included within the Upper Fletcher's Creek Wetland Complex swamp communities, and therefore are afforded protection under the PPS (2014). An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

[Etobicoke Creek Watershed](#)

Etobicoke Creek Headwaters – Land use within Etobicoke Creek Headwaters Subwatershed is primarily agricultural. Woodlands present throughout the subwatershed are fragmented and small in size. Due to the low percent forest cover within the greater watershed (<5%), many of the woodlands meet the size requirements for significance (>20 ha). Portions of these woodlands include provincially significant swamps (Etobicoke Creek Headwaters Wetland Complex). An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

Spring Creek – The Spring Creek Subwatershed is small in size and is bisected by Highway 410. Land use within the subwatershed is predominately agricultural. The majority of woodlands within the subwatershed are small in size and adjacent to wetland communities included within the Heart Lake Wetland Complex. Two (2) woodlands within the subwatershed are greater than 5 ha, and therefore meet the size criterion for significance as outlined in Table 3-4. An assessment of ecological functions will be completed within potentially affected woodland areas during future field investigations.

[Humber River](#)

West Humber River – The West Humber Subwatershed primarily consists of agricultural land use. Woodland habitats within the subwatershed vary in size and continuity. Portions of woodlands within the subwatershed are greater than 20 ha in size, and therefore meet the size requirements for provincially significant woodlands. Additionally, larger woodlands within the subwatershed that meet the size requirements for significance also provide opportunities for interior habitat, as shown on **Exhibit 3-4**.

Main Humber – Woodlands within the Main Humber Subwatershed in the Study Area are concentrated in a wide band running northwest to southeast in association with the main branch of the Humber River. Large patches contain interior forest habitat, as shown on **Exhibit 3-4**.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

TRCA Ecological Land Classification data indicates that rare vegetation community types are present within woodlands in this subwatershed (AECOM 2010).

Records for area sensitive birds, breeding amphibians, and rare insects are present within several of the woodlands in the Study Area (AECOM 2010).

East Humber – Woodland patches are present across the Study Area in the East Humber Subwatershed, with the two (2) largest concentrations occurring in association with the King Creek Forest ESA and the East Humber River ESA; several patches provide interior forest habitat (**Exhibit 3-4**).

Records for bird Species at Risk (SAR), area sensitive birds, and breeding amphibians (including regionally rare amphibians) are present within several of the woodlands within the Study Area (AECOM 2010).

3.4.3 Significant Valleylands

Significant Valleylands are identified through municipal planning authorities and mapping in schedules of their respective Official Plans. The PPS (2014) indicates that development and site alteration shall not be permitted in significant valleylands south and east of the Canadian Shield unless it can be demonstrated that there will be no negative impacts on these natural features, or their ecological functions. Valleylands are natural areas that occur in a valley or other landform depression which have water flowing through, or standing, for some period of the year (NHRM 2010). Valleylands are often associated with areas regulated under the *Conservation Authorities Act*, and are typically designated as “Hazard Lands” in Official Plans.

Valleylands provide important ecological and cultural functions, and in highly urbanized or fragmented landscapes, are often one of the few remaining natural areas which establish connectivity for a natural heritage system. The significance of valleylands is determined through a set of evaluation criteria provided by the PPS (2014) and in the NHRM (MNRF 2010) by three (3) categories:

- Landform-related functions and attributes (e.g., surface water or groundwater functions);
- Ecological features (e.g., linkage function, unique communities and species); and,
- Restored ecological function (restoration potential and value).

Currently no Significant Valleylands are identified within the Study Area, as determined through the secondary source review. Significant Valleylands may, however be identified in subsequent evaluations based on detailed field investigations.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

3.4.4 Significant Wildlife Habitat

Biological diversity has ecological, social, economic, cultural and intrinsic value. It makes many essential contributions to human life and is an important part of sustainable social and economic development. Protection for many declining or sensitive species, as well as their habitats, is provided depending on their provincial or federal status. The following summarizes significant species and habitats that are known to occur within the Study Area.

Significant Wildlife Habitat (SWH) is identified for consideration in the PPS and is defined as

“Areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle, and areas that are important to migratory or non-migratory species.”

The Province provides guidance on the identification of Significant Wildlife Habitat through the NHRM (MNRF 2010) and the Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF 2000). The SWHTG provides detail on the techniques and approaches to identify and prioritize Significant Wildlife Habitat. The identification and evaluation of SWH is a planning authority (e.g., municipality's) responsibility under the PPS, and the SWHTG has been developed to assist with this assessment.

Criteria for assessing SWH are outlined within the ecoregions criterion schedules. The Study Area is found within Ecoregion 7E. There are four (4) categories of SWH. Each category, along with SWH Types is summarized below:

- **Habitats of Seasonal Concentrations of Animals**
 - Waterfowl Stopover and Staging Areas (Terrestrial)
 - Waterfowl Stopover and Staging Areas (Aquatic)
 - Shorebird Migratory Stopover Area
 - Raptor Wintering Area
 - Bat Hibernacula
 - Bat Maternity Colonies
 - Bat Migratory Stopover Area
 - Turtle Wintering Areas
 - Snake Hibernaculum
 - Colonially -Nesting Bird Breeding Habitat (Bank and Cliff)
 - Colonially -Nesting Bird Breeding Habitat Breeding Habitat (Tree/Shrubs)
 - Colonially -Nesting Bird Breeding Habitat (Ground)
 - Migratory Butterfly Stopover Areas
 - Landbird Migratory Stopover Areas

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

- Deer Winter Congregation Areas
- **Rare Vegetation communities or Specialized Habitats for Wildlife**
 - Cliffs and Talus Slopes
 - Sand Barren
 - Alvar
 - Old Growth Forest
 - Savannah
 - Tallgrass Prairie
 - Other Rare Vegetation Communities
- **Specialized Habitat for Wildlife**
 - Waterfowl Nesting Area
 - Bald Eagle and Osprey Nesting, Foraging and Perching Habitat
 - Woodland Raptor Nesting Habitat
 - Turtle Nesting Areas
 - Seeps and Springs
 - Amphibian Breeding Habitat (Woodland)
 - Amphibian Breeding Habitat (Wetlands)
- **Habitats of Species of Conservation Concern**
 - Marsh Bird Breeding Habitat
 - Woodland Area-Sensitive Bird Breeding Habitat
 - Open Country Bird Breeding Habitat
 - Shrub/Early Successional Bird Breeding Habitat
 - Terrestrial Crayfish
 - Special Concern and Rare Wildlife Species
- **Animal Movement Corridors**
 - Amphibian Movement Corridors

Wildlife habitat information from the LIO database for the Study Area includes seasonal concentration areas (winter deer yards) and specialized habitats for wildlife (raptor nesting areas). The presence of Heronry Colonies was the only data received from the agencies and LIO concerning SWH. This information is summarized in the following paragraph, and is shown on **Exhibit 3-3**.

One (1) Heronry Colony was identified and is located within the East Humber Subwatershed. Heronry colonies are considered colonial bird nesting sites under the SWHTG (MNRF 2000); herons will nest in trees found in swamps and along large bodies of water and have strong nesting site fidelity.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

3.5 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

3.5.1 Species at Risk

For the purpose of this report the term Species at Risk (SAR) is used to describe species that are designated as Endangered or Threatened provincially and are afforded protection under the *Endangered Species Act* (ESA) (2007), as well as those that are designated federally as Endangered or Threatened, and listed under the *Species At Risk Act* (SARA). For many species, the federal and provincial designations are the same, however there are some differences.

A background review was conducted using available sources, and augmented with information provided directly from agency staff to determine SAR that may be present in the Study Area. Sources included records obtained from the MNRF SAR database, MNRF Natural Heritage Information Centre (NHIC), Fisheries and Oceans Canada's SAR mapping (which is set up by Conservation Authority jurisdictional areas), as well as general sources such as the Atlas of Breeding Birds of Ontario and Ontario Reptile and Amphibian Atlas. These sources were used to supplement agency records to create, as complete as possible, a list of potential SAR present within the Study Area.

Based on background information compiled, a total of 36 SAR were determined to potentially occur within the regions overlapping the Study Area. Of these species, 21 are listed as provincially Endangered (END) and 12 are listed as provincially Threatened (THR). **Table 3-7** provides a list of Species at Risk that are potentially present within the Study Area.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-7 List of Species at Risk Potentially Occurring within the Study Area

Common Name	Scientific Name	SARA/COSEWIC ¹	ESA/COSSARO ²	S-Rank ³
Vegetation				
American Chestnut	<i>Castanea dentate</i>	END/END	END	S2
American Columbo	<i>Frasera caroliniensis</i>	END/END	END	S2
American Hart's-tongue Fern	<i>Asplenium scolopendrium americanum</i>	THR/No Status	SC	S3
Butternut	<i>Juglans cinerea</i>	END/END	END	S3?
Dense Blazing Star	<i>Liatris spicata</i>	THR/THR	THR	S2
Eastern Flowering Dogwood	<i>Cornus florida</i>	END/END	END	S2?
Eastern Prairie Fringed-orchid	<i>Platanthera leucophaea</i>	END/END	END	S2
Hoary Mountain Mint	<i>Pycnanthemum incanum</i>	END/END	END	S1
Purple Tawnyblade	<i>Liparis lilifolia</i>	No Status	THR	S2
Red Mulberry	<i>Morus rubra</i>	END/END	END	S2
Birds				
Barn Swallow	<i>Hirundo rustica</i>	No Status/THR	THR	S4B
Bobolink	<i>Dolichonyx oryzivorus</i>	No Status/THR	THR	S4B
Cerulean Warbler	<i>Dendroica cerulean</i>	SC/END	THR	S3B
Eastern Meadowlark	<i>Sturnella magna</i>	No Status/THR	THR	S4B
Henslow's Sparrow	<i>Ammodramus henslowii</i>	END/END	END	SHB
King Rail	<i>Rallus elegans</i>	END/END	END	S2B
Least Bittern	<i>Ixobrychus exilis</i>	THR/THR	THR	S4B
Loggerhead Shrike	<i>Lanius ludovicianus</i>	END/END	END	S2B
Prothonotary Warbler	<i>Protonotaria citrea</i>	END/END	END	S1B
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	THR/THR	SC	S4B
Yellow-Breasted Chat	<i>Icteria virens</i>	SC/END	END	S2B
Herpetofauna				
Blanding's Turtle	<i>Emydoidea blandingii</i>	THR/THR	THR	S3
Five-lined Skink	<i>Plestiodon fasciatus</i>	END/END	END	S1
Eastern Musk Turtle	<i>Sternotherus odoratus</i>	THR/SC	THR	S3
Jefferson Salamander	<i>Ambystoma jeffersonianum</i>	THR/END	END	S2
Spiny Softshell	<i>Apalone spinifera</i>	THR/THR	THR	S3
Mammals				
Eastern Small-footed Myotis	<i>Myotis leibii</i>	No Status/END	END	S2S3
Little Brown Myotis	<i>Myotis lucifugus</i>	No Status/END	END	S4
Northern Myotis	<i>Myotis septentrionalis</i>	No Status/END	END	S3
Fish				
Atlantic Salmon (L.Ont. pop.)	<i>Salmo salar</i>	EXT	EXP	SX
Redside Dace	<i>Clinostomus elongatus</i>	No Status/END	END	S2
Silver Shiner	<i>Notropis photogenis</i>	No Status	THR	S2S3
Lake Sturgeon	<i>Acipenser fulvescens</i>	No Status/THR	THR	S2

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-7 List of Species at Risk Potentially Occurring within the Study Area

Common Name	Scientific Name	SARA/COSEWIC ¹	ESA/COSSARO ²	S-Rank ³
American Eel	<i>Anguilla rostrata</i>	No Status/THR	END	S1
Invertebrates				
Rusty-patched Bumblebee	<i>Bombus affinis</i>	END/END	END	S1
Rapids clubtail	<i>Gomphus quadricolor</i>	END/END	END	S!

Notes: 1. Federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC status from COSEWIC list (September 2007) as shown on DFO's Species at Risk mapping.

- END Endangered - A wildlife species facing imminent extirpation or extinction.
- SC Special Concern - A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
- THR Threatened - A wildlife species likely to become endangered if limiting factors are not reversed.
- EXT Extinct - A species no longer exists

2. Provincial MNRF/Committee on the Status of Species at Risk in Ontario (COSSARO) status from Species at Risk in Ontario List (June 2006).

- END Endangered- Lives in the wild in Ontario but is facing imminent extinction or extirpation.
- EXP Extirpated - A species that no longer exists in the wild in Ontario but still occurs elsewhere.
- EXT Extinct - A species that no longer exists anywhere.
- SC Special Concern - A species with characteristics that make it sensitive to human activities or natural events.
- THR Threatened - A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

3. Provincial S-Ranks from NHIC (2006).

- S1 Critically Imperiled - Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
- S2 Imperiled - often < 20 occurrences
- S3 Vulnerable - Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer, recent and widespread declines, or other factors making it vulnerable to extirpation.
- S4 Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
- SX Presumed Extirpated - Species or community is believed to be extirpated from the Province.
- SZB Breeding migrants/vagrants.

3.5.1.1 Aquatic SAR Summary

Within the Study Area, many reaches and watercourses are identified as potentially supporting Species at Risk. DFO SAR mapping identifies numerous reaches of the watercourses within the Study Area as potentially supporting species pending listing under the SARA (Endangered and Threatened). In most cases, this is likely Redside Dace, however in a few locations (mainly the large rivers in the Study Area), Lake Sturgeon or American eel may be present. This may be the case for watercourses mapped by DFO for potential SAR habitat, but not regulated by MNRF as Redside Dace habitat. The NHIC database reports on several watercourses within the Study Area where Redside Dace is known to occur, and MNRF has mapped reaches of streams regulated as protected Redside Dace habitat. The Fish and Fish Habitat Watercourse Summaries (**Section 3.4**) provide more detail on the known locations of Species at Risk and their habitat within the Study Area.

Based on DFO mapping, and the NHIC database, as well as preliminary information collected from MNRF and Conservation Authorities, a brief summary of each aquatic SAR is provided below.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Atlantic Salmon (*Salmo salar*) – Atlantic Salmon is listed as Extirpated federally and provincially and is, therefore afforded protection within Ontario under the ESA. Atlantic Salmon rivers are generally clear, cool and well oxygenated, with low to moderate gradient, and possessing bottom substrates of gravel, cobble and boulder (COSEWIC 2006). The native Lake Ontario population of this species is extirpated, however it has been stocked in the Credit River and tributaries (among others) since 2006, and future stocking is planned for the Humber River (Bring Back the Salmon 2013).

Redside Dace (*Clinostomus elongatus*) – Redside Dace is listed as Endangered provincially and is, therefore afforded protection under the ESA. This species is also listed as No Status under the *Species at Risk Act* (SARA) but is listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Redside Dace are found in pools and slow-moving areas of small streams and headwaters with a gravel bottom. They are generally found in areas with overhanging grasses and shrubs, and can leap up to 10 cm out of the water to catch insects (MNR 2014b). Redside Dace are known from several watercourses within the Study Area including East Sixteen Mile Creek, Huttonville Creek, and all three branches of the Humber River. Refer to the Fish and Fish Habitat Watercourse Summaries in **Section 3.4** for details on the location of Redside Dace habitat within these watercourses.

Silver Shiner (*Notropis photogenis*) – Silver Shiner is listed as Threatened provincially and is, therefore afforded protection under the ESA. This species has no status federally. Silver Shiners prefer moderate to large size streams with swift currents that are free of weeds and have clean gravel or boulder bottoms (MNR 2014b). The species is known from the Sixteen Mile Creek watershed.

Lake Sturgeon (*Acipenser fulvescens*) – The Great Lakes/St. Lawrence population of Lake Sturgeon is listed as Threatened provincially and is therefore afforded protection under the ESA. This species is also listed as No Status under SARA but is listed as Endangered by COSEWIC. Lake Sturgeon live almost exclusively in freshwater lakes and rivers with soft bottoms of mud, sand or gravel. They are usually found at depths of 5 to 20 m and spawn in relatively shallow, fast-flowing water (usually below waterfalls, rapids, or dams) with gravel and boulders at the bottom (MNR 2014b). There are no records of Lake Sturgeon within watercourses in the Study Area, however, DFO mapping includes potential for this species in the watersheds discussed and suitable habitat is present in some of the large, main-stem rivers.

American Eel (*Anguilla rostrata*) – American Eel is listed as Endangered provincially and is, therefore afforded protection under the ESA. This species is also listed as No Status under SARA, but is listed as Endangered by the COSEWIC. The species occurs in the Great Lakes basin and is considered to have the broadest diversity of habitats of any fish species (MNR 2014b). There are no records of this species within the Study Area, however DFO mapping includes potential for this species in the watersheds discussed.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

3.5.1.2 Terrestrial SAR Summary

Specific locations of terrestrial SAR have not been identified, however, based on background records and the presence of potentially suitable habitat, it is predicted that some of these species could be present within the Study Area. The following is a summary of terrestrial SAR that have the potential to occur within the Study Area.

American Chestnut (*Castanea dentate*) – American Chestnut is listed as Endangered federally and provincially and is afforded protection under the ESA. This species 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. The species grows alongside Red Oak, Black Cherry, Sugar Maple, American Beech and other deciduous tree species (MNRF 2014b).

American Columbo (*Frasera caroliniensis*) – American Columbo is listed as Endangered federally and provincially and is, therefore afforded protection under the ESA. This species grows primarily in open deciduous forests, and to a lesser extent along open forest edges and dense shrub thickets in Ontario. It is most commonly found in dry upland woods, but in parts of its range it has been found in grasslands, moist woods and swampy habitats (MNRF 2014b#).

American Hart's-tongue Fern (*Asplenium scolopendrium americanum*) – This species is listed as Threatened under SARA but is listed as Special Concern under the ESA. Therefore, this species is considered a Species of Conservation Concern and will be addressed in **Section 3.6.2**.

Barn Swallow (*Hirundo rustica*) – Barn Swallow is listed as Threatened provincially and is afforded protection under the ESA. This species is listed as No Status under SARA, but is listed as Threatened by the COSEWIC. Habitat for this species is associated with human-made structures such as open barns, under bridges and in culverts. The species is attracted to open structures that include ledges where they can build their nests, which are often re-used from year to year (MNRF 2014b).

Blanding's Turtle (*Emydoidea blandingii*) – Blanding's Turtle is listed as Threatened federally and provincially and is afforded protection under the ESA. Blanding's Turtles live in shallow water, usually in large wetlands and shallow lakes with lots of water plants. It is not unusual to find them hundreds of metres from the nearest water body, especially while they are searching for a mate or traveling to a nesting site. Blanding's Turtles hibernate in the mud at the bottom of permanent water bodies from late October until the end of April (MNRF 2014b).

Bobolink (*Dolichonyx oryzivorus*) – Bobolink are listed as Threatened provincially and are afforded protection under the ESA. This species is also listed as No Status under SARA, but is listed as Threatened by the COSEWIC. Habitat for bobolink historically consisted of American tallgrass prairie and other open meadows. With the clearing of native prairies, Bobolinks have moved to living in hayfields. Bobolinks often build their small nests on the ground in dense grasses (MNRF 2014b).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Butternut (*Juglans cinerea*) – Butternut is listed as Endangered federally and provincially. Protection for this species and its habitat is afforded under the ESA. In Ontario, Butternut usually grows alone or in small groups in deciduous forests. It prefers moist, well-drained soil and is often found along streams. It is also found on well-drained gravel sites and rarely on dry rocky soil. This species does not do well in the shade, and often grows in sunny openings and near forest edges (MNR 2014b).

Cerulean Warbler (*Dendroica cerulean*) – Cerulean Warbler is listed as Threatened provincially and Endangered federally. Protection for this species and its habitat is afforded under the ESA. This species is also listed as Special Concern under SARA, but is listed as Endangered by the COSEWIC. Cerulean Warblers spend their summers (breeding seasons) in mature, deciduous forests with large, tall trees and an open understorey. In late summer, they begin their long migration to wintering grounds in the Andes Mountains in South America (MNR 2014b).

Dense Blazing Star (*Liatris spicata*) – This species is listed as Threatened provincially and federally and is afforded protection under the ESA. In Ontario, Dense Blazing Star grows in moist prairies, grassland savannahs, wet areas between sand dunes, and abandoned fields (MNR 2014b).

Eastern Flowering Dogwood (*Cornus florida*) – Eastern Flowering Dogwood is listed as Endangered both provincially and federally. Protection for this species is afforded under the ESA. This species grows under taller trees in mid-age to mature deciduous or mixed forests. It most commonly grows on floodplains, slopes, bluffs and in ravines, and is also sometimes found along roadsides and fencerows (MNR 2014b).

Eastern Meadowlark (*Sturnella magna*) – This species is listed as Threatened both provincially and federally and is afforded protection under the ESA. This species is listed as No Status under SARA, but is listed as Threatened by the COSEWIC. Habitat for Eastern Meadowlark consists of moderately tall grasslands, such as pastures and hayfields. It can also be found in alfalfa fields, weedy borders of croplands, roadsides, orchards, airports, shrubby overgrown fields, or other open areas (MNR 2014b).

Eastern Musk Turtle (*Sternotherus odoratus*) – The Eastern Musk Turtle is listed as Threatened provincially. This species is listed as Threatened under SARA, but is listed as Special Concern by the COSEWIC. This species and its habitat are afforded protection under the ESA. Habitat for Eastern Musk Turtle consist of ponds, lakes, marshes and rivers that are generally slow-moving and have abundant emergent vegetation and muddy bottoms that they burrow into for winter hibernation. Nesting habitat is variable, but it must be close to the water and exposed to direct sunlight (MNR 2014b).

Eastern Prairie Fringed Orchid (*Platanthera leucophaea*) – This species is listed as Endangered both federally and provincially. Eastern Prairie Fringed Orchid grows in wetlands, fens, swamps and tallgrass prairie. It has been found in ditches and railroad rights of way (MNR 2014b).

Eastern Small-footed Bat (*Myotis leibii*) – This species is listed as Endangered provincially, as well as federally under COSEWIC. In the spring and summer, eastern small-footed bats will roost in a variety of

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. These bats often change their roosting locations every day. In the winter, these bats hibernate, most often in caves and abandoned mines. They seem to choose colder and drier sites than similar bats and will return to the same spot each year (MNRF 2014b).

Five-lined Skink (*Pleestiodon fasciatus*) – This species is listed as Endangered provincially (Carolinian population), as well as federally under COSEWIC. The Carolinian population can be found under woody debris in clearings with sand dunes, open forested areas, and wetlands. Common Five-lined Skinks like to bask on sunny rocks and logs to maintain a preferred body temperature (28-36°C). During the winter, they hibernate in crevices among rocks or buried in the soil (MNRF 2014b).

Henslow's Sparrow (*Ammodramus henslowii*) – This species is listed as Endangered both provincially and federally and is afforded protection under the ESA. In Ontario, the Henslow's Sparrow lives in open fields with tall grasses, flowering plants, and a few scattered shrubs. It has also been found in abandoned farm fields, pastures, and wet meadows. It tends to avoid fields that have been grazed or are crowded with trees and shrubs. It prefers extensive, dense, tall grasslands where it can more easily conceal its small ground nest (MNRF 2014b).

Hoary Mountain-mint (*Pycnanthemum incanum*) – This species is listed as Endangered provincially and federally and is afforded protection under the ESA. In Ontario, Hoary Mountain-mint mostly occurs in dry, oak woodland habitat, on steep, warmer-than-normal slopes. The species does best in open areas with ample sunlight, in habitats that depend on disturbance such as fire to maintain these conditions (MNRF 2014b).

Jefferson Salamander (*Ambystoma jeffersonianum*) – This species is listed as Endangered provincially and federally and is afforded protection under the ESA. This species is also listed as Threatened under SARA, but is listed as Endangered by the COSEWIC. Adults live in moist, loose soil, under logs or in leaf litter. The best chance of spotting a Jefferson salamander is in early spring when they travel to woodland ponds to breed. They lay their eggs in clumps attached to underwater vegetation. By midsummer, the larvae lose their gills and leave the pond and head into the surrounding forest. Once in the forest, Jefferson salamanders spend much of their time underground in rodent burrows, and under rocks and stumps (MNRF 2014b).

King Rail (*Rallus elegans*) - This species is listed as Endangered provincially and federally and is afforded protection under the ESA. King Rails are found in densely vegetated freshwater marshes with open shallow water that merges with shrubby areas. They are sometimes found in smaller isolated marshes but most seem to prefer larger, coastal wetlands. The King Rails nest is a dinner-plate sized platform made of plant material, placed just above the water in shrubs or clumps of other marsh plants (MNRF 2014b).

Least Bittern (*Ixobrychus exilis*) – The Least Bittern is listed as Threatened provincially and federally. Protection for this species is afforded under the ESA. In Ontario, the Least Bittern is found in a variety of wetland habitats, but strongly prefers cattail marshes with a mix of open pools and channels. This bird

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

builds its nest above the marsh water in stands of dense vegetation, hidden among the cattails. The nests are almost always built near open water, which is needed for foraging (MNRF 2014b).

Little Brown Myotis (*Myotis lucifugus*) – Little Brown Myotis is listed as Endangered provincially, as well as federally under COSEWIC. This species roost in trees and buildings and often select attics, abandoned buildings and barns for summer colonies where they can raise their young. Little brown bats hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing (MNRF 2014b).

Loggerhead Shrike (*Lanius ludovicianus*) - The Loggerhead Shrike is listed as Endangered provincially and federally. Protection for this species is afforded under the ESA. In Ontario, the Loggerhead Shrike prefers pasture or other grasslands with scattered low trees and shrubs in which to build nests. It lives in fields or alvars (areas of exposed bedrock) with short grass, which makes it easier to spot prey which consists of large insects such as grasshoppers. Loggerhead Shrikes also require spiny, multi-branched shrubs where they can impale prey before eating it (MNRF 2014b).

Northern Myotis (*Myotis septentrionalis*) – Northern Myotis is listed as Endangered provincially, as well as federally under COSEWIC. This species is associated with boreal forests; choosing to roost under loose bark and tree cavities. Similar to other bat species, Northern Myotis overwinters in caves and abandoned mines.

Prothonotary Warbler (*Protonotaria citrea*) – This species is listed as Endangered provincially and federally. Protection for this species is afforded under the ESA. In Ontario, the Prothonotary Warbler is found in the warmer climate of the Carolinian deciduous forests. It nests in small, shallow holes, found low in the trunks of dead or dying trees standing in or near flooded woodlands or swamps. They will also readily use properly placed artificial nest boxes. Silver maple, ash, and yellow birch are common trees in these habitats (MNRF 2014b).

Purple Twayblade (*Liparis liliifolia*) – Purple Twayblade is listed as Threatened provincially and is afforded protection under the ESA. This species is listed as No Status under SARA. In Ontario, Purple Twayblade is found in a variety of habitats including open oak woodland and savannah, mixed deciduous forest, shrub thicket, shrub alvar, deciduous swamp, and even conifer plantations (MNRF 2014b).

Rapids Clubtail (*Gomphus quadricolor*) – This species is listed as Threatened provincially and is afforded protection under the ESA. The Rapids Clubtail is typically found in clear, cool medium-to-large rivers with gravel shallows and muddy pools. Larvae occupy quiet muddy pools. Adult males perch on exposed rocks and other projections in the rapids. Males are quite territorial and make short flights over the water, repeatedly returning to the same perch. Adult females typically inhabit forests along riverbanks, and only visit shallows and pools when they are ready to mate and lay eggs (MNRF 2014b).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Red-headed Woodpecker (*Melanerpes erythrocephalus*) – Red-headed Woodpecker is listed as Threatened federally and Special Concern provincially. Therefore, this species is considered a Species of Conservation Concern and will be discussed in more detail in **Section 3.6.2**.

Red Mulberry (*Morus rubra*) – Red Mulberry is listed as Endangered federally and provincially and is afforded protection under the ESA. In Ontario, Red Mulberry grows in moist, forested habitats and on both sandy and limestone-based loamy soils. It is often found in areas where the forest canopy is quite open and allows lots of sunlight to reach the forest floor, but it will tolerate some shade (MNRF 2014b).

Rusty-patched Bumble Bee (*Bombus affinis*) – Rusty-patched Bumble Bee is listed as Endangered provincially and federally, and is afforded protection under the ESA. This species, like other bumble bees, can be found in open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings have been in oak savannah, which contains both woodland and grassland flora and fauna (MNRF 2014b).

Spiny Softshell (*Apalone spinifera*) – This species is listed as Threatened both provincially and federally and is afforded protection under the ESA. Spiny Softshells are highly aquatic turtles that rarely travel far from water. They are found primarily in rivers and lakes but also in creeks and even ditches and ponds near rivers. Key habitat requirements are open sand or gravel nesting areas, shallow muddy or sandy areas to bury in, deep pools for hibernation, areas for basking, and suitable habitat for crayfish and other food species (MNRF 2014b).

Yellow-breasted Chat (*Icteria virens*) – This species is listed as Endangered provincially; it is listed as Special Concern under SARA and Endangered under COSEWIC. Protection for this species and its habitat is afforded under the ESA. Yellow-breasted Chats live in thickets and scrub, especially locations where clearings have become overgrown. These birds spend their winters in coastal marshes (MNRF 2014b).

3.5.2 Species of Conservation Concern

Both the ESA and SARA list and designate species as Special Concern (SC). Although the species listed as SC are not legally protected under the ESA or the SARA, it is important to have regard for these species and their habitats due to their conservation status and to avoid future implications should the species status change. A total of 15 SC species were identified during the background review.

Species listed as SC provincially are also considered Species of Conservation Concern (SCC), as per the PPS. Species listed as SCC are not afforded protection under the ESA (or SARA), however habitat for these species is considered Significant Wildlife Habitat, which is afforded protection under the PPS (2014). SCC is discussed further in the Significant Wildlife Habitat section above (**Section 3.5.4**).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

According to the Significant Wildlife Habitat Technical Guide (SWHG) (MNR 2000), species that can be considered SCC include:

- Species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected in regulation under Ontario’s *Endangered Species Act*;
- Species identified as provincially vulnerable based on lists of Vulnerable, Threatened, Endangered, Extirpated, or Extinct Species of Ontario that are updated periodically by the MNRF;
- Species that are listed as rare or historical in Ontario based on records kept by the Natural Heritage Information Centre in Peterborough (S1 is extremely rare, S2 is very rare, S3 is rare to uncommon);
- Species whose populations are known to be experiencing substantial declines in Ontario;
- Species that have a high percentage of their global population in Ontario, and are rare or uncommon in the planning area;
- Species that are rare within the planning area, even though they may not be provincially rare;
- Species that are subjects of recovery programs (e.g., the Black Duck Joint Venture of the North American Waterfowl Management Plan); and
- Species considered important to the municipality, based on recommendations from the Conservation Advisory Committee.

Habitat for these species is exclusive of those habitats for species covered under the Habitat of Endangered and Threatened Species of the Natural Heritage Component of the PPS (2014).

The federal and provincial Species of Conservation Concern and their designations within the Study Area are listed in **Table 3-8**. The list is developed from the provincial Natural Heritage Information Centre (NHIC) database and the Species at Risk maps from DFO.

Table 3-8 Species of Conservation Concern Recorded within the Study Area

Common Name	Scientific Name	S-RANK	COSEWIC Status	MNRF Status
Vegetation				
A Moss	<i>Helodium paludosum</i>	S1?		
American Hart’s-tongue Fern	<i>Asplenium scolopendrium americanum</i>	S3		SC
Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	S3	SC	SC
Hill’s Pondweed	<i>Potamogeton hillii</i>	S2	SC	SC
Honey-locust	<i>Gleditsia triacanthos</i>	S2		
Mühlenberg’s Weissia	<i>Weissia muhlenbergiana</i>	S2		
Northern Hawthorn	<i>Crataegus pruinosa var. dissona</i>	S3		

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-8 Species of Conservation Concern Recorded within the Study Area

Common Name	Scientific Name	S-RANK	COSEWIC Status	MNRF Status
Scarlet Beebalm	<i>Monarda didyma</i>	S3		
Tapered Vertigo	<i>Vertigo elatior</i>	S2S3		
Twisted Sedge	<i>Carex torta</i>	SX		
Virginia Lungwort	<i>Mertensia virginica</i>	S3		
Woodland Pinedrops	<i>Pterospora andromedea</i>	S2		
Insects				
Amber-winged Spreadwing	<i>Lestes eurinus</i>	S3		
Clamp-tipped Emerald	<i>Somatochlora tenebrosa</i>	S2S3		
Lilypad Clubtail	<i>Argomphus furcifer</i>	S3		
Birds				
Black Tern	<i>Chlidonias niger</i>	S3B	NAR	SC
Louisiana Waterthrush	<i>Parkesia motacilla</i>	S3B	SC	SC
Peregrine Falcon	<i>Falco peregrines</i>	S3B	SC	SC
Yellow Rail	<i>Coturnicops noveboracensis</i>	S4B	SC	SC
Reptiles and Amphibians				
Common Five-lined Skink (Southern Shield population)	<i>Plestiodon fasciatus</i>	S2	SC	SC
Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	S3	SC	SC
Jefferson X Blue-spotted Salamander, Jefferson genome dominates	<i>Ambystoma hybrid pop. 1</i>	S2		
Milksnake	<i>Lampropeltis triangulum</i>	S3	SC	SC
Northern Map Turtle	<i>Graptemys geographica</i>	S3	SC	SC
Snapping Turtle	<i>Chelydra serpentine</i>	S3	SC	SC
Mammals				
Woodland Vole	<i>Microtus pinetorum</i>	S3?	SC	SC
Fish				
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	S3	SC	SC

Note: S1, S2, S3. Provincial S-Ranks from NHIC (2006).

- S1 Critically Imperiled - Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
- S2 Imperiled - Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
- S3 Vulnerable - Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
- S#S# Range Rank - A numeric range rank (e.g., S2, S3) is used to indicate any range of uncertainty about the status of the species or community.
- SZB Breeding migrants/vagrants.
- SX Presumed Extirpated - Species or community is believed to be extirpated from the Province

Federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC status from COSEWIC list (September 2007) as shown on DFO's Species at Risk mapping.

- SC Special Concern - A species that may become a threatened or an endangered species because of a combination

Provincial MNRF/Committee on the Status of Species at Risk in Ontario (COSSARO) status from Species at Risk in Ontario List (June 2006).

- SC Special Concern - A species with characteristics that make it sensitive to human activities or natural events.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

A total of 28 SCC were identified within the Study Area based on the background review, specifically, 12 plants, 5 birds, 3 insects, 6 herpetofauna, 1 fish and 1 mammal.

3.5.3 Data Limitations

It should be noted that there are some limitations associated with the SAR data available from background sources and compiled herein:

- The NHIC database contains information on natural species, plant communities and SCC in Ontario. Records should be considered preliminary as many rare species are designated ‘historic’ (i.e., older than 20-years) and may not reflect current conditions. Also, the database uses “Element Occurrences” to show locations of species. An Element Occurrence is defined as an area of land and/or water on/in which an element (e.g., species or ecological community) is or was present. For protection purposes, exact locations are not provided. Also, NHIC contains 35 Elemental Occurrences designated only as “sensitive species”. Species names are not provided for protection purposes. Therefore, aquatic species, in addition to those listed, may occur in the Study Area.
- DFO Species at Risk maps colour-code watercourse segments and waterbody areas to indicate presence of the three (3) groups of SAR/SCC very broadly. There is no differentiation of the individual species in a particular waterbody (i.e., only a list of END, THR and SC species is provided in the map legends):
 - Protected under SARA: The known and potential distributions of fish and/or mussels designated as Extirpated, Endangered, or Threatened on Schedule 1 of the federal SARA;
 - To be listed in 1 yr+: Those species that are not currently on Schedule 1, but are anticipated to be listed in Schedule 1 from May 2009 onwards; and
 - All Special Concern Species: (Schedule 1 and 3, and newly listed) Species of Concern, but not protected under SARA.

Furthermore, the reaches and areas mapped for SAR/SCC presence can be very extensive, extending well beyond the actual location of a species. The mapping uses a broad geographic system to classify reaches that basically extends the colour coding up and downstream of a record until distinct changes in habitat characteristics or barriers occur (which can encompass many kilometres). There could also be discrepancies between the MNRF SAR information and DFO mapping.

3.6 DESIGNATED AREAS

As defined by MTO in its *Environmental Protection Requirements for Transportation Planning and Highway Design, Construction, Operation and Maintenance* (2014), Designated Areas are geographic

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

areas with a special or unique value which various government departments/ministries (federal, provincial, municipal, conservation authorities and other) have protected through legislation, policies, or approved land-use plans. Such areas may have a variety of ecological, recreational, and/or aesthetic features and functions that are highly valued.

Within the Study area, Designated Areas related to the natural environment include:

- Greenbelt;
- Areas of Natural and Scientific Interest (ANSIs) - provincially or regionally significant Life and Earth Science;
- Environmentally Sensitive Areas (ESAs); and
- Open Space lands/Conservation Authority parks.

There is frequent overlap of designations in a single area. In addition, there are different policy frameworks for provincially significant features and locally/regionally significant features. These natural areas are summarized below.

3.6.1 Greenbelt

As discussed in **Section 2.1**, the *Greenbelt Plan* is a plan established by the Ontario Government to protect environmentally sensitive and agricultural land in the GGH from urban development and sprawl. Within the Greenbelt, the Natural System policy area is made up of a Natural Heritage System and a Water Resource System that often coincide, given ecological linkages between terrestrial and water-based functions.

The Natural Heritage System includes areas with the highest concentration of the most sensitive and/or significant natural features and functions (Key Natural Heritage Features). These areas are managed as a connected and integrated natural heritage system with functional inter-relationships and builds on the natural systems contained in the *Niagara Escarpment Plan* and the *Oak Ridges Moraine Conservation Plan*. Together with the landscape surrounding the Greenbelt, these systems currently comprise and function as a connected natural heritage system. The Key Natural Heritage Features within the Study Area include:

- Significant habitat of endangered species, threatened species, and special concern species (**Section 3.6.1** and **3.6.2**);
- Watercourses -fish habitat (**Section 3.4.1**);
- Wetlands (**Section 3.5.1**);
- ANSI-Life Science (**Section 3.7.2**);

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

- Significant woodlands (**Section 3.5.2**);
- Significant valleylands (**Section 3.5.3**); and
- Significant wildlife habitat (**Section 3.5.4**).

The Water Resource System is made up of both ground and surface water features and their associated functions.

Key Hydrologic Features within the Study Area include:

- Permanent and intermittent streams (**Section 3.4.1**);
- Wetlands (**Section 3.5.1**).

3.6.2 Areas of Natural and Scientific Interest

According to the PPS, Areas of Natural and Scientific Interest (ANSIs) are, “areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education”.

The ANSI program designates natural features in two (2) broad biophysical categories: Earth Science (geological) or Life Science (biological) depending on the features present. Life Science ANSIs are dynamic ecosystems that are representative examples of the biodiversity and natural landscapes in Ontario (e.g., valleys, wetlands, forests, native flora and fauna). Earth Science ANSIs are representative examples of geological processes in Ontario (e.g., exposed bedrock on road cuts, fossils and landforms) (MNRF, 1999).

There are two (2) levels of ANSI significance: Provincially or Regionally Significant. In the PPS, only provincially ranked ANSIs are considered ‘significant’ and are offered protection under the PPS. However, Regionally Significant ANSIs have local importance, though they may not receive protection at the provincial level.

There is one (1) ANSI within the Study Area. This provincial candidate ANSI is referred to as the Gooseville Moraine ANSI and measures approximately 80.72 ha in area.

3.6.3 Environmentally Significant Areas

Environmentally Significant Areas (ESAs) are areas defined by municipalities through designations in their Official Plans. Starting in 1978, ESA planning was applied across Ontario. As detailed in **Exhibit 3-5**, ESAs are, (with the exception of York Region), incorporated into most municipal Greenlands Systems. ESAs are typically established to capture locally or regionally significant terrestrial or aquatic natural areas within a municipality’s natural heritage system. General boundaries are documented in the Official

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Plans and associated ESA mapping, however precise boundaries are established through ground-truthing during supporting studies (e.g., Environmental Impact Assessments). Municipalities have selection criteria against which natural areas are evaluated to determine suitability as an ESA. Criteria may be an area containing: significant earth science feature (e.g. unique landforms); significant hydrological function (e.g., seeps, springs, contribution to groundwater discharge areas); or significant ecological function (e.g., habitat for threatened or endangered species and linkage between natural systems).

Two (2) ESAs were identified within the Study Area during the background review. These include the King Creek Forest ESA (94.67 ha) and the East Humber ESA (96.76 ha).

3.6.4 Open Space Lands/Conservation Authority Parks

Each upper tier municipality has its own approach to identifying and protecting natural environmental features (i.e., open space lands) and areas, as set out in their Official Plans. As such, the set of features and areas, and their designations vary across the Study Area. **Table 3-9** lists the locally/regionally designated features and areas for each upper tier municipality, as they relate to the natural environmental factors (such as fish and fish habitat) discussed in previous sub-sections.

Table 3-9 Details of Locally/Regionally Designated Features and Areas from the Official Plans of Upper Tier Municipalities

Factor	Details
HALTON REGION	
General	<p>The Natural Heritage System is a group of connected natural areas and open space designated in an effort to preserve the more sensitive parts of Halton Region's natural environment.</p> <p>The Greenlands System consists of the designations of:</p> <ul style="list-style-type: none"> • Niagara Escarpment Natural Area and; • Regional Waterfront Parks; <p>The Greenlands A and B include the following Designated Areas:</p> <ul style="list-style-type: none"> • Public Open Space as identified in The Parkway Belt West Plan; • Provincially and Regionally Significant Wetlands; and • ESAs. <p>The Key Features are identified in policy and protected.</p>
Groundwater	<ul style="list-style-type: none"> • To maintain, protect and enhance the quality and quantity of groundwater and surface water.
Surface Water	<ul style="list-style-type: none"> • Areas included in the Regulatory Flood Plains. • The shoreline along Lake Ontario and Burlington.
Fish and Fish Habitat	<p>Key Features:</p> <ul style="list-style-type: none"> • Significant portions of the habitat of Endangered and Threatened species, as determined by the MNRF. • Encourage the MNRF to develop management programs for the regeneration of fisheries and wildlife resources along the shoreline of Lake Ontario, Burlington Bay and their tributaries.
Terrestrial Ecosystems	<p>Wildlife, Habitats, and Movements:</p> <ul style="list-style-type: none"> • Significant portions of the habitat of Endangered and Threatened species, as determined by the

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-9 Details of Locally/Regionally Designated Features and Areas from the Official Plans of Upper Tier Municipalities

Factor	Details
	MNRF. <ul style="list-style-type: none"> • PSWs. • LSWs. Woodlands and Other Vegetated Areas: <ul style="list-style-type: none"> • Significant Woodlands; • Carolinian Canada sites; and • Halton Regional Forests.
PEEL REGION	
General	The Greenlands System supports and expresses the Region's vision for the protection of the natural environment. The Greenlands System consists of: <ul style="list-style-type: none"> • Core Areas; • Natural Areas and Corridors; and • Potential Natural Areas and Corridors. The Greenlands System includes the following Designated Areas: <ul style="list-style-type: none"> • Core Areas: <ul style="list-style-type: none"> - ESAs; - Provincial Life ANSIs; and - Niagara Escarpment Plan - Natural Areas. • Natural Areas and Corridors: <ul style="list-style-type: none"> - Escarpment Protection Areas of the Niagara Escarpment Plan. • Potential Natural Areas and Corridors: <ul style="list-style-type: none"> - Provincial Earth Science ANSIs; - Open space portions of the Parkway Belt West Plan Area; and - Potential ESAs identified as such by the Conservation Authorities.
Groundwater	Potential Natural Areas and Corridors: <ul style="list-style-type: none"> • Sensitive groundwater recharge areas. See Section 3.2 Groundwater for discussion of WHPAs and Aquifer Vulnerability which are designated by the municipality.
Surface Water	Core Areas - selected valley and stream corridors (e.g., main branches of the Credit River, Etobicoke Creek, Mimico Creek, West Humber River, and the Humber River). Natural Areas and Corridors: <ul style="list-style-type: none"> • Natural lakes and their shorelines; • Valley and stream corridors that have a drainage area of 125 ha or greater which have not been defined as part of the Core Areas; and • Headwater source and discharge areas. Potential Natural Areas and Corridors of the Greenlands: <ul style="list-style-type: none"> • Valley and stream corridors that have a drainage area of less than 125 ha.
Fish and Fish Habitat	Core Areas: <ul style="list-style-type: none"> • Habitats of Vulnerable*, Threatened, or Endangered species; and • See Surface Water (above).
Terrestrial Ecosystems	Wildlife, Habitats, and Movements: <ul style="list-style-type: none"> • Core Areas: <ul style="list-style-type: none"> - Habitats of Vulnerable, Threatened, or Endangered species; and - Selected valley and stream corridors (e.g., main branches of the Credit River, Etobicoke Creek, Mimico Creek, West Humber River, and the Humber River).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-9 Details of Locally/Regionally Designated Features and Areas from the Official Plans of Upper Tier Municipalities

Factor	Details
	<ul style="list-style-type: none"> • Natural Areas and Corridors: <ul style="list-style-type: none"> - Natural lakes and their shorelines; and - Valley and stream corridors that have a drainage area of 125 ha or greater which have not been defined as part of the Core Areas. • Potential Natural Areas and Corridors of the Greenlands: <ul style="list-style-type: none"> - Valley and stream corridors that have a drainage area of less than 125 ha; and - Open space portions of the <i>Parkway Belt West Plan Area</i>. <p>Wetlands:</p> <ul style="list-style-type: none"> • Core Areas: <ul style="list-style-type: none"> - PSWs (Class 1-3). • Natural Areas and Corridors: <ul style="list-style-type: none"> - LSWs (Class 4-7). • Potential Natural Areas and Corridors of the Greenlands: <ul style="list-style-type: none"> - Unevaluated wetlands. <p>Woodlands and Other Vegetated Areas:</p> <ul style="list-style-type: none"> • Core Areas: <ul style="list-style-type: none"> - Woodlands that are a minimum of 30 ha in area; and - Selected valley and stream corridors (e.g., main branches of the Credit River, Etobicoke Creek, Mimico Creek, West Humber River, and the Humber River). • Natural Areas and Corridors: <ul style="list-style-type: none"> - Woodlands that are greater than 3 ha in area, up to 30 ha. • Potential Natural Areas and Corridors of the Greenlands: <ul style="list-style-type: none"> - All other woodlands > 0.5ha; and - Open space portions of the <i>Parkway Belt West Plan Area</i>.
YORK REGION	
General	<p>The policies of the Official Plan identify, protect and help restore definable natural areas and functions such as Environmental Policy Areas, Regionally Significant Forests and Wetland Areas. Most of these areas form part of the Greenlands System which links together natural areas and corridors.</p> <p>Significant Natural Areas include the following Designated Areas:</p> <ul style="list-style-type: none"> • Environmental Policy Areas: <ul style="list-style-type: none"> - Environmentally Significant Areas; - Life Science ANSIs; and - Habitats of Vulnerable*, Threatened, or Endangered Species. • Wetlands (PSWs). <p>Forest Resources:</p> <ul style="list-style-type: none"> • Regional Forests (forested areas that are owned and managed by the Regional Corporation for multiple benefits, including wood production, recreation, and wildlife habitat); and • Regionally Significant Forests (including Regional Forest), not including those areas such as Christmas tree farms that are greater than 20 ha in area. <p>A Greenlands System is natural areas (wetlands, forests, lakes, river systems, and landscape features) and corridors linked together. It includes:</p> <ul style="list-style-type: none"> • Environmental Policy Areas (most but not all); • Regionally Significant Forests (most but not all); • Significant landscapes (e.g., many portions of the Oak Ridges Moraine, the former Lake Algonquin shoreline); and • Overlaps Natural Core Areas, Natural Linkage Areas and Countryside Areas of the Oak Ridges

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Table 3-9 Details of Locally/Regionally Designated Features and Areas from the Official Plans of Upper Tier Municipalities

Factor	Details
	Moraine.
Groundwater	See Section 3.2 Groundwater for discussion of WHPAs and Aquifer Vulnerability which are designated by the municipality.
Surface Water	Greenlands System: <ul style="list-style-type: none"> • Lakes and river systems.
Fish and Fish Habitat	Significant Natural Areas: <ul style="list-style-type: none"> • Environmental Policy Areas: <ul style="list-style-type: none"> - Environmentally Significant Areas, contain distinctive or unusual features, perform a key ecological function and/or provide habitat for significant plant and/or animal species; and - Habitats of Vulnerable*, Threatened, or Endangered Species Greenlands System. • Lakes and river systems.
Terrestrial Ecosystems	Wildlife, Habitats, and Movements: <ul style="list-style-type: none"> • Significant Natural Areas: <ul style="list-style-type: none"> - Environmental Policy Areas: <ul style="list-style-type: none"> ▪ ESAs, contain distinctive or unusual features, perform a key ecological function and/or provide habitat for significant plant and/or animal species; and ▪ Habitats of Vulnerable*, Threatened, or Endangered Species. • Greenlands System: linked natural areas (wetlands, forests, lakes, river systems, and landscape features) and corridors. • Forest Resources: <ul style="list-style-type: none"> - Regional Forests; and - Regionally Significant Forests. Wetlands: <ul style="list-style-type: none"> • Significant Natural Areas: <ul style="list-style-type: none"> - Wetlands (PSWs). Woodlands and Other Vegetated Areas: <ul style="list-style-type: none"> • Significant Natural Areas: <ul style="list-style-type: none"> - Environmental Policy Areas: <ul style="list-style-type: none"> ▪ Environmentally Significant Areas. • Forest Resources: <ul style="list-style-type: none"> - Regional Forests; and - Regionally Significant Forests. • Greenlands System - linked natural areas (wetlands, forests, lakes, river systems, and landscape features) and corridors.

*Note: * Ministry of Natural Resources has recently replaced the term Vulnerable with Special Concern.*

A total of 31 Conservation Authorities (CAs) operate in southern Ontario. Conservation Authorities are responsible for the conservation, restoration and responsible management of Ontario's water, land and natural habitats through programs that balance human, environmental and economic needs. Conservation Areas are natural lands that are owned and managed by CAs and include all types of habitat features including lakes, rivers, and streams, as well as, wetlands, sand dunes, beaches, caves and forests. A total of six (6) Conservation Areas consisting of 30 properties are found within the Study Area as seen on **Exhibit 3-5**.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

3.6.5 Designated Areas Summary

Two (2) ESA's were identified within the Study Area during the background review, which include the King Creek Forest ESA and the East Humber River ESA. Both ESAs are located within the eastern portion of the Study Area in the East Humber Subwatershed. Additionally, one (1) ANSI, the Gooseville Moraine was identified within the West Humber Subwatershed. Furthermore, the Greenbelt is present within the Port Credit to Norval subwatershed, as well as the East Humber, Main Humber, West Humber and Etobicoke Creek Headwaters Subwatersheds. The following provides a summary of currently identified Designated Areas within the Study Area.

There are no Greenbelt, ANSI or ESA areas identified within Sixteen Mile Creek Watershed, Levi Creek, Huttonville Creek, Fletcher's Creek, Mullet Creek or Glen Williams to Norval Subwatersheds. All Designated Areas are identified as Greenlands or Open Space lands within each respective municipality within the Study Area. Therefore, these summaries do not include a description of Open Space lands

Credit River

Norval to Port Credit – Designated natural features within the Norval to Port Credit Subwatershed include portions of the Greenbelt Natural Heritage System area. Greenbelt within the subwatershed is largely associated with the Credit River's riparian lands.

Etobicoke Creek

Etobicoke Creek Headwaters – Designated natural features within the Etobicoke Creek Headwaters Subwatershed include portions of the Greenbelt Natural Heritage System area. Greenbelt within the subwatershed is largely associated with the Etobicoke Creek West Branch watercourse.

Humber River

West Humber River – The Gooseville Moraine ANSI is a Provincially Significant Earth Science ANSI located within the West Humber Subwatershed. The moraine is a low-relief clay-rich till, underlain by a bedrock valley (Hoffman and Richards 1953). The ANSI is approximately 80.72 ha and contains a large patch of contiguous woodland. This feature is shown on **Exhibit 3-5**.

Additional designated features within the Humber West Subwatershed include portions of the Greenbelt. These areas are associated with watercourses within the subwatershed including Campbell's Cross Creek, Lindsay Creek and Tributaries of the West Humber. The Caledon South Lands Conservation Area is also present within the Humber West Subwatershed north of Highway 410. These lands are comprised of upland woodlands and wetland communities identified as part of the Heart Lake Wetland Complex.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

Main Humber – Designated Areas within the Study Area in the Main Humber Subwatershed include: Nashville Resource Management Tract Conservation Area (also known as Nashville Conservation Reserve) and portions of the Greenbelt Natural Heritage System and Protected Countryside. These features are shown on **Exhibit 3-5**.

The Nashville Resource Management Tract is an approximately 820 ha parcel of land which contains upland and lowland forest habitats, river valleys, meadows, former agricultural land, as well as a recreational trail network (TRCA 2014).

East Humber – Designated Areas within the Study Area in the East Humber Subwatershed include: East Humber River ESA, King Creek Forest ESA, Kirby Lands Conservation Area, Humber Trails Conservation Area, and portions of the Greenbelt Natural Heritage System and Protected Countryside. These features are mapped on **Exhibit 3-5**.

The King Creek Forest ESA is known to support Eastern Ribbonsnake (Special Concern) and Pickerel Frog (regionally rare), and contains mature Hemlock – Sugar Maple forests (AECOM 2010).

3.7 SUMMARY OF SIGNIFICANCE/SENSITIVITY OF NATURAL ENVIRONMENTAL CONDITIONS

The following is a summary of the broad natural environment features and functions within the Study Area based on relevant, regional-level secondary source information. The information collected will be carried forward to subsequent stages of the process, where it will be refined and augmented with the more detailed information from municipalities, First Nation and Métis communities, agencies, and stakeholders, as well as fieldwork during the study.

3.7.1 Legislative and Policy Protection

In the previous sections, legislation and policy were discussed for the various environmental features and functions identified for the Study Area. **Table 3-10** provides a summary of the environmental features and functions for the Study Area and their associated legislative and policy protection. Included in the table is reference to the MTO Environmental Protection Requirement.

3.7.2 Surface Water

The Study Area encompasses portions of four (4) watersheds, specifically, Sixteen Mile Creek, Credit River, Etobicoke Creek, and Humber River.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015

3.7.3 Fish and Fish Habitat

Within the Study Area, there is one known fish SAR. Coldwater streams and their fish communities are considered the most sensitive aquatic resource in the Study Area. Coldwater fish and their communities are considered intolerant to disturbances such as changes in water chemistry or changes in thermal regime, particularly when related to the loss of, or change in, the quality of groundwater discharging to the streams. Coldwater fish species are typically found where forested riparian cover is intact, water quality is good, and baseflow is sufficient to maintain flow rates and moderate stream temperatures. The absence or impairment of these conditions can undermine the viability of fish populations. In particular, coldwater fish, such as Brook Trout, are dependent on groundwater direct discharge for successful egg incubation. Therefore, groundwater discharge that contributes functionally to these fish communities must be protected.

Warmwater streams and many warmwater species may also be sensitive. However they typically support fish species that are more tolerant to environmental disturbance. Common warmwater fish species, particularly in urbanized areas, can usually withstand changes to habitat and fluctuating environmental conditions without any significant influence on the community.

3.7.4 Terrestrial Ecosystems

Wildlife in the Study Area is generally characteristic of southern Ontario and the Great Lakes – St. Lawrence Lowlands forest region. A total of 36 Species at Risk and 15 Species of Conservation Concern were identified as potentially occurring within the Study Area during the background review. Within the Study Area, there are 44 Significant Wooded Areas totalling approximately 1,063 ha, 21 of which have interior habitat. Approximately 250.75 ha of evaluated wetlands, including provincially and locally significant wetlands, have been identified within the Study Area. A total of 206 unevaluated wetlands were also identified within the Study Area during the background review. Significant Wildlife Habitat for nesting Great Blue Herons was also identified within the eastern portion of the Study Area. The proximity to infrastructure of any of these features may affect the feature/species, habitat, or their functions and is recognized as a high constraint to transportation development. For example, reductions in surface water or groundwater contribution to wetlands would potentially compromise the biodiversity of both wildlife and vegetation. Fragmentation of interior forest habitat would potentially compromise the ability of certain birds and wildlife species to carry out life processes. The removal of their habitat would lead to a reduction in abundance and biodiversity at a broader level.

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-10 Summary of the Environmental Features and Functions Identified For the Preliminary Study Area and their Associated Legislative and Policy Protection

Feature and/or Function	Legislative and Policy Protection*
Groundwater	<i>Ontario Water Resources Act</i> <i>Safe Drinking Water Act</i> <i>Environmental Protection Requirement GW-1 to GW-6</i> Provincial Policy Statement
Surface Water	<i>Canada Water Act</i> <i>Conservation Authorities Act</i> <i>Planning Act</i> Provincial Policy Statement <i>Lakes and Rivers Improvement Act</i> <i>Canada Water Act</i> <i>Canadian Environmental Protection Act</i> <i>Ontario Environmental Protection Act</i> <i>Ontario Water Resources Act</i> <i>Environmental Protection Requirement SW-1 to SW-10</i>
Fish and Fish Habitat	<i>Fisheries Act</i> <i>Species At Risk Act</i> <i>Environmental Protection Requirement FISH-1 to FISH-12</i> <i>Endangered Species Act</i> Provincial Policy Statement
Fish and Fish Habitat Sensitivity	
Fish Species of Conservation Concern	<i>Canadian Fisheries Act</i>
TERRESTRIAL ECOSYSTEMS	
Wetlands	Federal Policy on Wetland Conservation Provincial Policy Statement <i>Environmental Protection Requirement WET-1 to WET-2</i> <i>Conservation Authorities Act</i> <i>Greenbelt Plan</i>
Wildlife, Habitats, and Movements	<i>Canada Wildlife Act</i> s.1-19 <i>Migratory Birds Convention Act</i> Provincial Policy Statement <i>Fish and Wildlife Conservation Act</i> <i>Environmental Protection Requirement WLD-1 to WLD 6</i> <i>Endangered Species Act</i>
Woodlands and Other Vegetated Areas	PPS s.2.1.2, 2.1.3 (b), 2.1.4 (d) <i>Forestry Act</i> <i>Environmental Protection Requirement VEG-3 to VEG-8</i> York Region Official Plan Peel Region Official Plan Halton Region Official Plan
Terrestrial Species of Conservation Concern	<i>Species At Risk Act</i> <i>Endangered Species Act</i> <i>Environmental Protection Requirement WLD-1 to WLD-6 and VEG-1 to VEG-7</i> Provincial Policy Statement
DESIGNATED AREAS	
Greenbelt	<i>Greenbelt Act</i> <i>Environmental Protection Requirement GB-1 to GB-8</i>
ANSIs	<i>Environmental Protection Requirement DA-1 to DA-5</i> Provincial Policy Statement Greenbelt Plan York Region Official Plan Peel Region Official Plan

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
 June 2015

Table 3-10 Summary of the Environmental Features and Functions Identified For the Preliminary Study Area and their Associated Legislative and Policy Protection

Feature and/or Function	Legislative and Policy Protection*
	Halton Region Official Plan
ESAs	<i>Environmental Protection Requirement DA-1 to DA-5</i> York Region Official Plan Peel Region Official Plan Halton Region Official Plan
PSWs	Federal Policy on Wetland Conservation Provincial Policy Statement <i>Environmental Protection Requirement WET-1 to WET-2</i> <i>Conservation Authorities Act</i> <i>Greenbelt Plan</i>

Note: * The information is provided as a convenience only and should not be relied on as authoritative. The letters and number in brackets, for example (FISH -1), are the reference to a specific Environmental Protection Requirement (see Section 2.1.5).

GTA West Transportation Corridor Planning and Environmental Assessment Study
Draft Overview of Environmental Conditions and Constraints
Working Paper Update
June 2015