



City of Vaughan

**Natural Environment Existing Conditions
Report for the Humber Bridge Trail
Bowstring Arch Bridge Class Environmental
Assessment - Draft for Discussion**

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1. Introduction

The City of Vaughan (the City) initiated the Humber Bridge Trail Bowstring Arch Bridge Class Environmental Assessment (Class EA) to identify appropriate courses of action to improve the structural integrity of, and address any potential access issues in relation to, the Humber Bridge Trail Bowstring Arch Bridge. The Humber Bridge Trail Bowstring Arch Bridge spans the Humber River along the Humber Bridge Trail (**Figure 1**). The City retained AECOM to investigate and propose alternatives to improve the structural integrity of the bridge, as well as to establish a preferred solution for the rehabilitation of the bridge.

To fully understand the potential effects of the alternative solutions, a natural environment assessment was completed as part of the Municipal Class EA study. This report presents the results of background data collection; review of secondary source information; and field investigations to identify significant terrestrial and aquatic ecological features, forms and functions within the study area.

2. Methodology

A description of the natural heritage features and functions within the study area was established through a review of secondary information sources, including:

- Ontario Ministry of Natural Resources (OMNR) Natural Resource Values Information System (NRVIS) mapping
- OMNR Natural Heritage Information Centre (NHIC) Rare Species and Natural Area Records
- Conservation Ontario 2010 Aquatic Species at Risk distribution mapping
- Digital orthoimagery
- Ontario Breeding Bird Atlas
- Toronto and Region Conservation Authority reports, including Ecological Land Classification mapping and flora and fauna records
- OMNR fisheries information
- Watershed and subwatershed studies

This investigation focused on a 1 km radius around the Humber Bridge Trail Bowstring Arch Bridge site, herein referred to as the study area (**Figure 1**).

Following the review of background information pertaining to the study area, ecologists from AECOM visited the bridge site on January 5, 2011, in order to confirm vegetation community mapping provided by the TRCA as well as survey aquatic habitat in the vicinity of the bridge.

AECOM updated TRCA vegetation community mapping using Ecological Land Classification (ELC) protocols for southern Ontario. Investigations focused on the area within a 150 m radius of the subject bridge, and the access route from Highway 27 (Humber Bridge Trail). Vegetation units were classified to the Ecosite and Vegetation Type levels, where possible, according to the second approximation of the ELC catalogue (unpublished catalogue still in progress; Lee, *pers. comm.* 2009). Data pertaining to species composition cover and structure was collected for each community unit. A flora list was compiled to represent dominant species identifiable during the winter season.

The aquatic habitat survey was conducted within the bridge right-of-way and both upstream and downstream of the bridge location (total reach length of 150 m). This survey included habitat mapping and the identification and description of key habitat features (**e.g.**, in-stream cover, substrate characteristics, etc.), channel morphological characteristics, riparian characteristics, physical in-stream barriers, and the presence of adjacent and upstream contaminant sources.

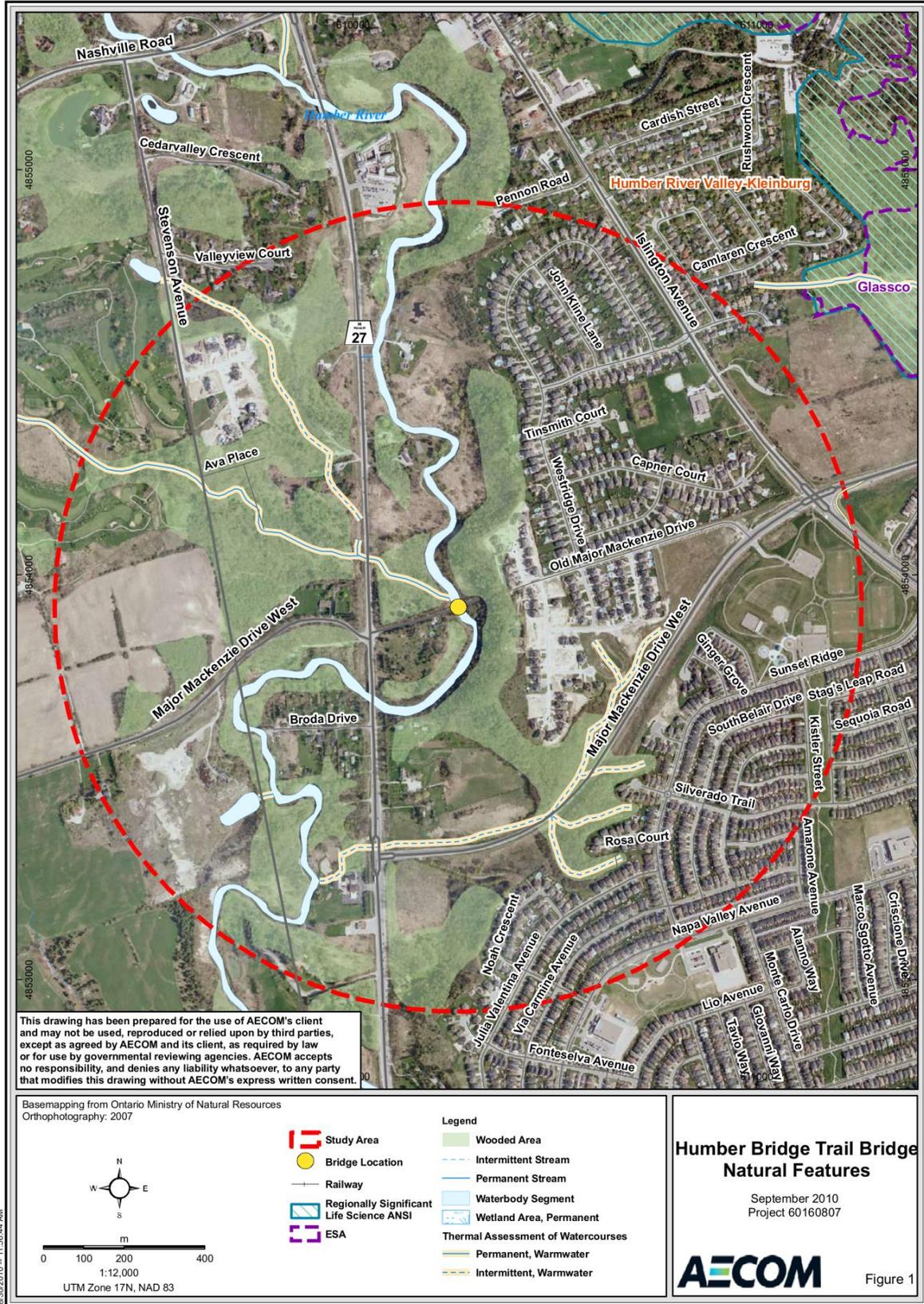


Figure 1. Humber Bridge Trail Bridge Natural Features

Through correspondence with the MNR, the provincially Endangered Butternut (*Juglans cinerea*) was identified as potentially occurring in the study area; therefore, the presence of this species on site (particularly in the immediate vicinity of the bridge and along the proposed access route) was also investigated during the site visit.

3. Existing Environmental Conditions

3.1 Physiography

The study area is located in the South Slope physiographic region (Chapman and Putman, 1984). The South Slope is the southern slope of the Oak Ridge Moraine, which is a gently sloping plain blanketed in glacial till soils. Both the Oak Ridge Moraine and the adjacent South Slope extend laterally from the Niagara Escarpment to the Trent River. The South Slope covers approximately 2,434 square kilometres.

The Oak Ridges Moraine is an interlobate kame moraine comprised of material ranging from gravel to clay. It was created during the last glaciation by the accumulation of ice deposited sediment in a deep lake formed between two opposing ice lobes. The Oak Ridges Moraine is a major drainage divide between the Lake Simcoe and Lake Ontario watersheds.

3.2 Terrestrial Environment

3.2.1 Vegetation and Flora

The study area occurs within Ecoregion 7E (Lake Erie – Lake Ontario Ecoregion, also called the Carolinian Forest Ecoregion). An ecoregion is a provincial OMNR term which is defined as “an area of land within which the response of vegetation to the features of landform follows a consistent pattern” and is “defined by a characteristic range and pattern of climatic variables” (OMNR, 2007). Ecoregion 7E, the southernmost ecoregion in Ontario, is generally characterized by very flat relief created by the deep, fined grained sediments from glacial and post glacial lakes that blanket the sedimentary bedrock. The limestone bedrock is rarely exposed, with the exception of the southern portion of the Niagara Escarpment. Wetlands and water are found on less than 2% of the ecoregion (OMNR, 2007). Ecoregion 7E has the greatest diversity of species in Canada, and is home to approximately 2,200 species of herbaceous plants, 70 species of trees, and 400 species of birds (OMNR, 2007).

The study area is within the Deciduous Forest Region based on Rowe’s (1972) description of the Forest Regions of Canada. The forest communities in this forest region are dominated by broadleaved trees with poor representation of needle-leaved species. The characteristic association consists primarily of Beech and Sugar Maple, together with Basswood, Red Maple, White Oak and Bur Oak (Rowe, 1972).

The Humber Bridge Trail crosses the Humber River in a forested area located east of Highway 27 and north of Major Mackenzie Drive West. Forest habitat extends for approximately 120 m from the east bank, abutting residential areas to the east. Forest habitat is also present along the western bank, where it is interspersed with patches of cultural meadow habitat and agricultural fields.

The vegetation communities in the vicinity of the bridge site (within a 150 m radius) were mapped using ELC information obtained from the Toronto and Region Conservation Authority (TRCA), which was subsequently updated through a field investigation. The following vegetation communities were present within this area (refer to **Figure 2** for the location and spatial extent of each vegetation community):

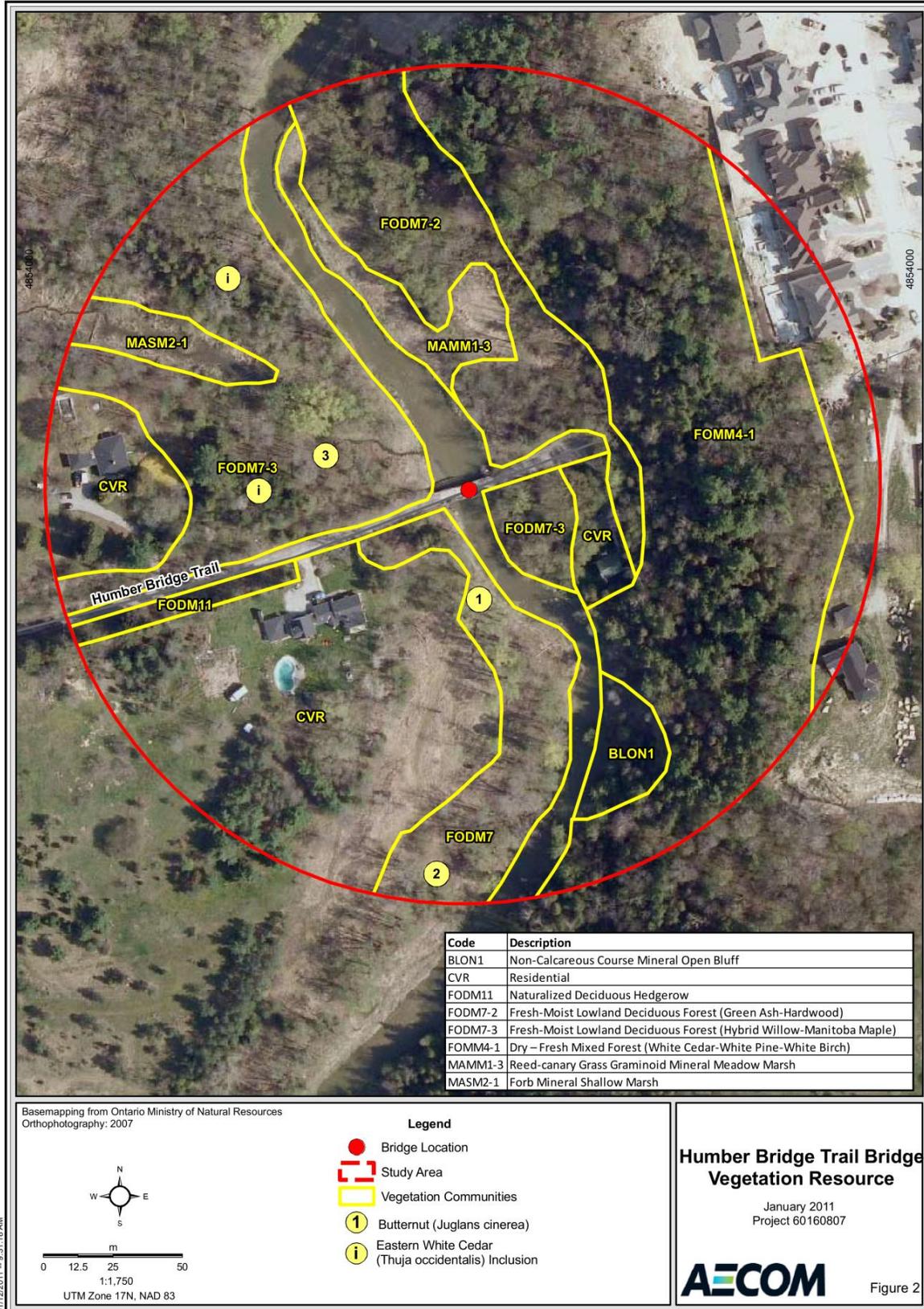


Figure 2. Vegetation Communities

Notes: **Residential (CVR):** communities resulting from, or maintained by, cultural or anthropogenic-based disturbances (e.g., manicured lawns associated with residential properties).

Deciduous Forest (FOD): communities with tree cover greater than 60% in which deciduous tree species account for greater than 75% of the canopy cover. Deciduous forest communities occurring in the vicinity of the bridge site include Fresh-Moist Lowland Deciduous Forest (Hybrid Willow- Manitoba Maple; FODM7-3) and Fresh-Moist Lowland Deciduous Forest (Green Ash-Hardwood; FODM7-2).

Mixed Forest (FOM): communities with tree cover greater than 60% in which coniferous and deciduous tree species both account for greater than 25% of the canopy cover. Mixed forest communities occurring in the vicinity of the bridge site include Dry-Fresh Mix Forest (White Cedar-White Pine-White Birch; FOMM4-1).

Shallow Marsh (MAS): communities with tree and shrub cover less than 25%, hydrophytic emergent macrophyte cover greater than 25%, water up to 2 m deep and standing or flowing water for much or all of the growing season. Shallow marsh communities occurring in the vicinity of the bridge site include Forb Mineral Shallow Marsh (MASM2-1).

Meadow Marsh (MAM): communities with tree and shrub cover less than 25%, dominated by emergent hydrophytic macrophytes, water less than 2 m deep and variable flooding regimes. Meadow marsh communities occurring in the vicinity of the bridge site include Reed-canary Grass Graminoid Mineral Meadow Marsh (MAMM1-3).

Open Bluff (BLO): communities with tree and shrub cover less than 25%, substrate recently disturbed and subject to ongoing erosional processes. Open bluff communities occurring in the vicinity of the bridge site include Non-Calcareous Course Mineral Open Bluff (BLON1).

3.2.2 Wildlife

Common mammal species of southern Ontario include White-tailed Deer (*Odocoileus virginianus*), Coyote (*Canis latrans*), Red Squirrel (*Tamiasciurus hudsonicus*), Eastern Gray Squirrel (*Sciurus carolinensis*), Eastern Chipmunk (*Tamias striatus*), Meadow Vole (*Microtus pennsylvanicus*), Red Fox (*Vulpes vulpes*), Striped Skunk (*Mephitis mephitis*) and Eastern Cottontail (*Sylvilagus floridanus*). All of these species and other common mammals are expected to occur in the study area.

Ontario Breeding Bird Atlas (2001-2005) point count data was obtained from Bird Studies Canada and used to generate a list of bird species recently recorded in the vicinity of the Humber Bridge Trail Bridge (**Table 1**). These species include a number of birds commonly found in southern Ontario, such as American Robin, American Goldfinch, Common Grackle, House Sparrow, Mourning Dove, Song Sparrow and Red-winged Blackbird. Many of these birds are associated with human-modified landscapes, such as urban or suburban areas or agricultural fields, whereas the Chipping Sparrow and Rose-breasted Grosbeak are typically found in woodland and forest habitats (Freemark, 1999). None of these birds are Species At Risk or considered rare in the province of Ontario (NHIC, 2010).

Table 1. Bird Species Recently Recorded Near the Humber Bridge Trail Bridge

Scientific Name	Common Name	Habitat Association
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	Wetlands
<i>Cardinalis cardinalis</i>	Cardinal	Shrubs and Early Successional
<i>Carduelis tristis</i>	American Goldfinch	Shrubs and Early Successional
<i>Corvus brachyrhynchos</i>	American Crow	Urban and Suburban
<i>Melospiza melodia</i>	Song Sparrow	Shrubs and Early Successional
<i>Passer domesticus</i>	House Sparrow	Urban and Suburban
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	Woods and Forests
<i>Poecile atricapillus</i>	Black-capped Chickadee	Urban and Suburban
<i>Quiscalus quiscula</i>	Common Grackle	Grassland, Agricultural, Open
<i>Spizella passerina</i>	Chipping Sparrow	Woods and Forests
<i>Tachycineta bicolor</i>	Tree Swallow	Grassland, Agricultural, Open
<i>Turdus migratorius</i>	American Robin	Urban and Suburban
<i>Zenaida macroura</i>	Mourning Dove	Urban and suburban

There were no records of locally rare wildlife species occurring in the vicinity of the bridge site (within a 150 m radius).

3.3 Aquatic Environment

3.3.1 Humber River Watershed

The Humber River flows for approximately 100 km from its headwaters in the Niagara Escarpment and Oak Ridges Moraine to Lake Ontario. The Humber River watershed is the largest watershed in the Toronto region, covering an area of 908 km². It includes portions of the City of Toronto, the Regional Municipalities of York, Peel and Dufferin, and the County of Simcoe. The watershed is dominated by human land uses; urban areas cover approximately 26% of the total land area and agricultural and rural land uses account for an additional 40% (TRCA, 2008a). The headwaters and middle reaches of the Humber River generally support healthy aquatic habitats, while the lower, more urbanized reaches contain lower quality, more degraded aquatic habitats (TRCA, 2008a).

The Humber Bridge Trail Bridge is located within the Main Humber subwatershed. Land use in this subwatershed is predominantly agricultural (41% of total area) (TRCA, 2008a). Urban areas, which cover 12% of the total land area, are generally concentrated in the southern portion of the watershed and in Bolton, Caledon East, Palgrave and Mono Mills (TRCA, 2008a). Natural areas make up approximately 46% of lands in the Main Humber subwatershed. These include forest (28%), meadow (13%) successional (3%) and wetland (2%) habitats (TRCA, 2008a).

Water quality in the less developed areas of the Upper Main Humber River subwatershed is relatively good, due to the lack of urbanization, groundwater inputs, and the abundance of well-vegetated natural areas that buffer runoff from lands under human land uses (OMNR and TRCA, 2005). The main causes of water quality impairment in this section of the Humber River watershed are runoff from agricultural and urban areas, streambank erosion, livestock access to streams, and point sources such as storm sewers, which increase the concentrations of suspended solids, bacteria and nutrients (OMNR and TRCA, 2005).

3.3.2 Fish and Fish Habitat

The section of the Humber River flowing through the study area is classified as intermediate riverine coldwater habitat by the TRCA (TRCA, 2008b). Watercourses falling into this habitat category are characterized by headwaters draining the Oak Ridges Moraine and Niagara Escarpment, a proportionately high percentage of groundwater inputs, relatively high baseflow ratios, and relatively stable flows and water temperatures. Based on an Index of Biotic Integrity (IBI), calculated from fish community composition at a sampling station located within the study area, the general health of the aquatic ecosystem at this location is "fair" or intermediate (TRCA, 2008b).

Aquatic habitat features in the vicinity of the bridge (*i.e.*, from approximately 75 m upstream to 75 m downstream of the bridge) were mapped during the field investigation. This section of the Humber River generally exhibits a good pool-riffle sequence, with riffle, run and pool habitats present. The river bed material, where visible, consisted predominantly of silt with overlying boulders and cobble, with the rocky substrates being generally concentrated in the riffle habitats. There is evidence of stream bank erosion both upstream and downstream of the bridge, where areas of undercut banks and exposed roots are present. Woody debris in the watercourse and submergent vegetation, together with the rocky substrates and undercut banks, contribute to in-stream cover in this section of the watercourse. Riparian vegetation consists of grasses and trees, including overhanging trees on the downstream portion of the watercourse, which provide a low to moderate amount of cover and shade. No barriers to fish migration were present at the time of the field survey. Possible sources of pollution include the road right-of-way (*e.g.*, road salt) and manicured lawns associated with two residential properties on the downstream portion of the watercourse. A small creek discharges to the river on the left bank, approximately 15 m upstream of the bridge. The creek bed material, where visible, consisted of cobble with abundant detritus. A photographic log documenting channel morphological and riparian characteristics of the aquatic habitat in the vicinity of the bridge site is provided in Appendix B.

Fish collection records for the study area were obtained from the OMNR. According to the OMNR fish collection records, a total of 28 species have been recorded in the section of the Humber River located within study area (a complete list of species is provided in Appendix A). In general, these species are representative of an intermediately tolerant, coolwater fish community. These records include several records of a provincially Endangered species, Redside Dace (*Clinostomus elongatus*), which was recorded in the study area in 1972, 1988, 1993 and 1995. Redside Dace is a coolwater species generally found in pools and slow flowing areas of small headwater streams with a moderate to high gradient (Department of Fisheries and Oceans Canada, 2010). Overhanging grasses and shrubs, as well as undercut banks, are an important part of their habitat, as are in-stream boulders and large woody debris (Fisheries and Oceans Canada, 2009).

A request has been made to the TRCA for information regarding fish species collected within the study area. This information will be incorporated into the Class EA study as it becomes available.

4. Natural Heritage Features and Functions

The following sections provide a general description of the natural heritage features and functions within the study area.

4.1 Designated Natural Areas

According to the OMNR NRVIS mapping, there are no Environmentally Significant Areas (ESAs), provincially or locally significant wetlands (PSWs or LSWs), or Areas of Natural and Scientific Interest (ANSI) present within the study area.

The regionally significant Humber River Valley Life Science ANSI is located approximately 1.15 km northeast of the study area, east of Islington Avenue and north of Major Mackenzie Drive West. The Glassco ESA is located approximately 1.15 km northeast of the bridge site, its boundary corresponding roughly with the Humber River Valley Life Science ANSI boundary described above. Lands designated as Regional Greenlands System occur within the study area, as does the Humber River, which is designated a Canadian Heritage River. A description of each of these designated areas is provided below.

4.1.1 Regional Greenlands System

The Humber Bridge Trail Bridge site is located within the Regional Greenlands System defined in the York Region Official Plan (Office Consolidation, June 1, 2008). The Greenlands System is the remnant of an historical forested natural system that once covered most of York Region. The York Region Official Plan states that “each part of the Greenlands system has unique *functions, attributes and linkages* which must be recognized” (Office Consolidation, June 1, 2008). Development within the Greenlands System may require measures to maintain these functions, such as measures to maintain vegetative canopy cover, the permeability of soils and wildlife corridors.

4.1.2 Humber River Valley Life Science ANSI

According to the OMNR NHIC Natural Areas Report (2010), the Humber River Life Science ANSI contains a flat bottomed section of the Humber River north of Boyd Conservation Area, and extends 4.5 km to MacMichael Collection east of Kleinburg. This area contains Willow-Balsam Poplar-Ash-Elm floodplain, wet meadow, goldenrod fields, reforested areas and upland sugar maple mixed woods (Hanna, 1984).

4.1.3 Glassco Environmentally Significant Area

According to the OMNR NHIC Natural Areas Report (2010), the Glassco area contains high quality plant communities, including mature mixed forests of Sugar Maple (*Acer saccharum*) and Eastern Hemlock (*Tsuga canadensis*), which dominate the mostly forested valley walls. This area also contains a forested area dominated by the Carolinian species, Black Cherry (*Prunus serotina*), which is unusual to find as a dominant canopy species (NHIC, 2010).

4.1.4 Humber River

The Humber River was designated a Canadian Heritage River in 1999. This designation was made on the basis of its outstanding human heritage and recreational values, as well as its importance in the history and development of Canada (Canadian Heritage Rivers System, 2010).

4.2 Rare Species

According to the OMNR NHIC Rare Species database, a total of seven rare species have been recorded in the vicinity of the project area (i.e., within approximately 1 km of the bridge), including one bird species, one insect species, one plant species, one fish species, and three reptile and amphibian species (**Table 2**). Rare species include species with designations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), species listed as Species at Risk in Ontario (SARO), as well as Provincially Ranked S1 to S3 species.

Table 2. Rare Species Records

Taxonomic Group	Common Name	Scientific Name	S Rank	COSEWIC	SARO
Birds	Cerulean Warbler	<i>Dendroica cerulea</i>	S3B	Special Concern	Special Concern
Insects	Rapids Clubtail	<i>Gomphus quadricolor</i>	S1	Endangered	Endangered
Plants	Scarlet Beebalm	<i>Monarda didyma</i>	S3		
Fish	Redside Dace	<i>Clinostomus elongatus</i>	S2	Endangered	Endangered
Reptiles and Amphibians	Blanding's Turtle	<i>Emydoidea blandingii</i>	S3	Threatened	Threatened
	Eastern Ribbon Snake	<i>Thamnophis sauritus</i>	S3	Special Concern	Special Concern
	Jefferson X Blue-spotted Salamander	<i>Ambystoma hybrid pop. 1</i>	S2		

Two of these species are designated as Endangered both provincially and nationally. These are the Rapids Clubtail (*Gomphus quadricolor*), recorded in the study area in 2005, and Redside Dace (*Clinostomus elongatus*), most recently recorded in the study area in 1999. The Rapids Clubtail is a relatively small (42 to 45 mm long) and brightly coloured dragonfly species that is typically found in clear, cool medium-to-large rivers with gravel shallows and muddy pools (OMNR, 2009). Redside Dace is a coolwater species generally found in pools and slow flowing areas of small headwater streams with a moderate to high gradient (Department of Fisheries and Oceans Canada, 2010). Overhanging grasses and shrubs, as well as undercut banks, are an important part of their habitat, as are in-stream boulders and large woody debris (Fisheries and Oceans Canada, 2009).

One species designated as Threatened both provincially and nationally, Blanding's Turtle (*Emydoidea blandingii*), was recorded in the study area in 1986. Blanding's Turtle is a medium-sized, highly mobile turtle that inhabits a network of lakes, streams, and wetlands, especially shallow wetland areas with abundant vegetation (ROM and OMNR, 2010). A highly mobile species known to travel up to 7 km, it may also spend considerable amounts of time in upland areas moving between wetlands (ROM and OMNR, 2010).

The NHIC also identified historical records of two species designated as Special Concern both provincially and nationally, the Cerulean Warbler (*Dendroica cerulea*) and Eastern Ribbon Snake (*Thamnophis sauritus*), dating from 1962 and 1928, respectively. The Cerulean Warbler is an interior forest bird species that inhabits large, relatively undisturbed tracts of mature, semi-open deciduous forest (ROM and OMNR, 2010). The Eastern Ribbon Snake is usually found near water, particularly in marshes, where it feeds on frogs and small fishes (ROM and OMNR, 2010).

In addition, two provincially rare species were recorded in the study area. These include an amphibian species, the Jefferson x Blue-spotted Salamander hybrid (*Ambystoma* hybrid pop. 1), recorded in 1978, and a plant species, Scarlet Beebalm (*Monarda didyma*), recorded in 1948.

According to TRCA 2010 Aquatic Species at Risk mapping (Conservation Ontario, 2010), watercourses within the study area do not contain fish or mussel species protected under the federal *Species At Risk Act* (SARA), neither do they contain species designated as Special Concern (Schedules 1, 3 and newly listed) or species expected to be listed within the next year.

A request was made to the OMNR for information regarding the presence of species at risk occurring at or adjacent to the bridge site. The response received from the OMNR (on September 28, 2010) indicated that Butternut (*Juglans cinerea*) may be present at this location. Butternut, a tree species listed as Endangered both federally and provincially, receives protection under the *Endangered Species Act* (2007). Therefore, a permit may be required if the proposed undertaking could cause harm to this species.

Information regarding locally rare species recorded in the vicinity of the bridge site (within a 150 m radius) was obtained from the TRCA. According to this information, two flora species ranked as L3, Northern Beech Fern (*Phegopteris connectilis*) and Butternut (*Juglans cinerea*), have been recorded in this area. Northern Beech Fern commonly occurs both globally (G5) and in the province of Ontario (S5). Butternut is designated as Endangered both federally and provincially.

In a subsequent field investigation, three Butternut specimens were identified within a 150 m radius of the bridge (**Figure 2**). A general description of each Butternut specimen is provided in **Table 3** below. All three specimens exhibited signs of Butternut canker disease.

Table 3. Description of the Butternut Specimens Occurring Within 150 m of the Bridge

Specimen No. (Refer to Figure 2)	Description
1	Less than 10 cm diameter at breast height (dbh); sooty canker present; well-developed buds.
2	Two trunks; 40 cm dbh and 20 cm dbh; large cankers present.
3	35 cm dbh; most canopy branches appear dead; some signs of sooty canker present.

5. Impact Assessment

The following table (**Table 4**) summarizes the important natural environment features and functions of the study area, including their significance and sensitivity.

Table 4. Natural Environment Features and Functions

Feature	Function	Significance/Sensitivity	Location
Regional Greenlands System			
Butternut			Occurring within 150 m of bridge site
Forest Habitat (other wooded areas)	Provides some habitat for forest wildlife	Moderate to low significance; sensitive to forest removal	
Coldwater fish habitat	Supports sensitive fish species		
Redside Dace			

5.1 Recommendations

Based on the review of background information regarding natural heritage features and function in the study area provided herein, it is recommended that the following field investigations be undertaken:

- **Fisheries and Aquatic Habitat Assessment:** habitat mapping and the identification and description of key habitat features (e.g., in-stream cover, substrate characteristics, etc), critical habitat areas (e.g., spawning, nursery, and feeding areas and migration routes), physical in-stream barriers, the presence of adjacent and upstream contaminant sources, and potential habitat enhancement/compensation opportunities, within the bridge Right-of-Way plus a distance of 150 m both upstream and downstream of the bridge location.
- **Terrestrial Habitat Site Visit:** to characterize the vegetation and assess potential wildlife use of the area, with a focus on locating species of conservation concern (e.g., Butternut) that may be positioned within the study area. Co-ordinates of all species or specimens of interest will be recorded using a Geographic Positioning System (GPS) for input into the evaluation of alternatives.

The information gathered during these field investigations will be incorporated during subsequent project phases as more detailed plans regarding alternatives become available.

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Appendix A

List of Fish Species Recorded in the Study Area

Appendix A. List of Fish Species Recorded in the Study Area

Common Name	Scientific Name	Thermal Regime	Tolerance	COSEWIC Status	COSSARO Status	G Rank	N Rank	S Rank
American Brook Lamprey	<i>Lampetra appendix</i>	coldwater	intolerant	-	-	G4	N4	S3
Banded Killifish	<i>Fundulus diaphanus</i>	coolwater	tolerant	-	-	G5	N5	S5
Blacknose Dace	<i>Rhinichthys atratulus</i>	coolwater	intermediate	-	-	G5	N5	S5
Bluntnose Minnow	<i>Pimephales notatus</i>	warmwater	intermediate	-	-	G5	N5	S5
Brassy Minnow	<i>Hybognathus hankinsoni</i>	coolwater	intermediate	-	-	G5	N5	S5
Brook Stickleback	<i>Culaea inconstans</i>	coolwater	intermediate	-	-	G5	N5	S5
Brown Bullhead	<i>Ameiurus nebulosus</i>	warmwater	intermediate	-	-	G5	N5	S5
Brown Trout	<i>Salmo trutta</i>	coldwater	intolerant	-	-	G5	NNA	SNA
Common Shiner	<i>Luxilus cornutus</i>	coolwater	intermediate	-	-	G5	N5	S5
Creek Chub	<i>Semotilus atromaculatus</i>	coolwater	intermediate	-	-	G5	N5	S5
Fantail Darter	<i>Etheostoma flabellare</i>	coolwater	intolerant	-	-	G5	N3N4	S4
Fathead Minnow	<i>Pimephales promelas</i>	warmwater	tolerant	-	-	G5	N5	S5
Golden Shiner	<i>Notemigonus crysoleucas</i>	coolwater	intermediate	-	-	G5	N5	S5
Hornyhead Chub	<i>Nocomis biguttatus</i>	coolwater	intermediate	-	-	G5	N4	S4
Johnny Darter	<i>Etheostoma nigrum</i>	coolwater	tolerant	-	-	G5	N5	S5
Longnose Dace	<i>Rhinichthys cataractae</i>	coolwater	intermediate	-	-	G5	N5	S5
Mimic Shiner	<i>Notropis volucellus</i>	warmwater	intermediate	-	-	G5	N5	S4
Mottled Sculpin	<i>Cottus bairdi</i>	coldwater	intermediate	-	-	G5	N5	S5
Northern Hog Sucker	<i>Hypentelium nigricans</i>	warmwater	intermediate	-	-	G5	N3?	S4
Pumpkinseed	<i>Lepomis gibbosus</i>	warmwater	intermediate	-	-	G5	N5	S5
Rainbow Darter	<i>Etheostoma caeruleum</i>	coolwater	intolerant	-	-	G5	N3	S4
Rainbow Trout	<i>Oncorhynchus mykiss</i>	coldwater	intolerant	-	-	G5	N4	SNA
Redside Dace	<i>Clinostomus elongatus</i>	coolwater	intolerant	Endangered	Endangered	G3G4	N3	S2
River Chub	<i>Nocomis micropogon</i>	coolwater	intermediate	-	-	G5	N4	S4
Rock Bass	<i>Ambloplites rupestris</i>	coolwater	intermediate	-	-	G5	N5	S5
Rosyface Shiner	<i>Notropis rubellus</i>	warmwater	intermediate	-	-	G5	N5	S4
Stonecat	<i>Noturus flavus</i>	warmwater	tolerant	-	-	G5	N4	S4
White Sucker	<i>Catostomus commersoni</i>	coolwater	tolerant	-	-	G5	N5	S5

Table created using data from The Ontario Freshwater Fish Life History Database (<http://www.fishdb.ca/home.htm>) accessed Sept 28, 2010.

COSEWIC Status:

Species designation assigned by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

- Extinct (X): A wildlife species that no longer exists.
- Extirpated (XT): A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
- Endangered (E): A wildlife species facing imminent extirpation or extinction.
- Threatened (T): A wildlife species likely to become endangered if limiting factors are not reversed.
- Special Concern (SC): A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

COSSARO Status:

Species designation assigned by the Committee on the Status of Species at Risk in Ontario (COSSARO).

- Extinct (X): A wildlife species that no longer exists.
- Extirpated (XT): A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
- Endangered (E): A wildlife species facing imminent extirpation or extinction.
- Threatened (T): A wildlife species likely to become endangered if limiting factors are not reversed.
- Special Concern (SC): A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

G Rank (Global Rank)

Global conservation status ranks are assigned by NatureServe scientists with input from relevant natural heritage member programs and experts on particular taxonomic groups. These ranks reflect an assessment of the condition of the species across its entire range.

- G1: Critically Imperiled; at very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
- G2: Imperiled; at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
- G3: Vulnerable; at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
- G4: Apparently Secure; uncommon but not rare; some cause for long-term concern due to declines or other factors.
- G5: Secure; common, widespread, and abundant.
- G#G#: Range Rank; a numeric range rank is used to indicate the range of uncertainty in the status of a species.
- ?: Inexact Numeric Rank; denotes inexact numeric rank (e.g., G2?).

N Rank (National Rank):

National conservation status ranks in Canada are assigned similar to global ranks. The condition of a species can vary from one country to another, and national conservation status ranks document its condition in a particular country.

- N1: Critically Imperiled; critically imperiled in the nation 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.
- N2: Imperiled; imperiled in the nation 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.
- N3: Vulnerable; vulnerable in the nation due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
- N4: Apparently Secure; uncommon but not rare; some cause for long-term concern due to declines or other factors.
- N5: Secure; common, widespread and abundant in the nation.
- NNA: Not Applicable; a conservation status rank is not applicable because the species is not a suitable target for conservation activities (i.e., exotic or hybrid).
- N#N#: Range Rank; a numeric rank is used to indicate the range of uncertainty about the status of the species.
- ?: Inexact or Uncertain; denotes inexact or uncertain numeric rank.

S Rank (Subnational Rank):

Subnational conservation status ranks are assigned for Ontario by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species.

- S1: Critically Imperiled; critically imperiled in the 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.
- S2: Imperiled; imperiled in the 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.
- S3: Vulnerable; vulnerable in the 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.
- S5: Secure; common, widespread and abundant in the province.
- SNA: Not Applicable; a conservation status rank is not applicable because the species is not a suitable target for conservation activities (i.e., exotic or hybrid).
- S#S#: Range Rank; a numeric rank is used to indicate the range of uncertainty about the status of the species.
- ?: Inexact or Uncertain; denotes inexact or uncertain numeric rank.

Appendix B

Aquatic Habitat Photographic Log

Appendix B. Aquatic Habitat Photographic Log

- Visited January 4, 2011 by Jessica MacKay Ward
- In-stream habitat features include riffles, runs and pools, and the watercourse generally exhibits a good pool-riffle sequence.
- A small creek discharges to the river on the left bank, approximately 15 metres upstream of the bridge (Photograph 5). Within the creek, flowing water was present under a layer of ice and was approximately 0.2 metres deep. In-stream substrates, where visible, consisted of cobble and abundant detritus. Beaver activity was present upstream.
- Possible sources of pollution include the road right-of way (e.g., road salt) and manicured lawns associated with residential properties.
- No barriers to fish migration/passage were present.
- Upstream of the bridge:
 - River bed material was obscured by ice and highly turbid water; however it appeared to consist predominantly of silt (~90%) with overlying boulders (~10%). The boulders are generally concentrated in the riffle habitat.
 - There is evidence of stream bank erosion on the right bank: areas of undercut banks and exposed roots were present (Photograph 2).
 - Riparian vegetation consists of grasses and trees, which provide a low amount of cover and shade.
 - Woody debris in the watercourse and submergent vegetation, together with the rocky substrates and undercut banks, contribute to in-stream cover in this section of the watercourse.
- Downstream of the bridge:
 - River bed material was obscured by ice and highly turbid water; however, it appeared to consist of silt (~70%), boulders (~20%), and cobble (~10%). The rocky substrates are generally concentrated in the riffle habitat.
 - There is evidence of stream bank erosion on both the left and right banks, undercutting present along the right bank, and exposed roots on the steeply sloping right bank at the downstream end of the reach (Photograph 11).
 - Riparian vegetation consists of grasses (including mowed lawns associated with residential properties on both banks) and trees, including overhanging trees on the right bank (Photograph 7), provide a moderate amount of cover and shade.
 - Woody debris in the watercourse, together with the rocky substrates and undercut banks, contribute to in-stream cover in this section of the watercourse.



Photograph 1 ↑

Section of Humber River upstream of bridge,
looking upstream from bridge



Photograph 2 ↑

Section of Humber River upstream of bridge,
looking across from left bank at downstream end



Photograph 3 ↑

Section of Humber River upstream of bridge,
looking across from right bank at downstream end



Photograph 4 ↑

Section of Humber River upstream of bridge,
looking across from right bank at upstream end



Photograph 5 ↑

Section of Humber River upstream of bridge,
looking at left bank from bridge



Photograph 6 ↑

Creek on left bank of Humber River upstream of
bridge, looking upstream



Photograph 7 ↑

Section of Humber River downstream of bridge,
looking downstream from bridge



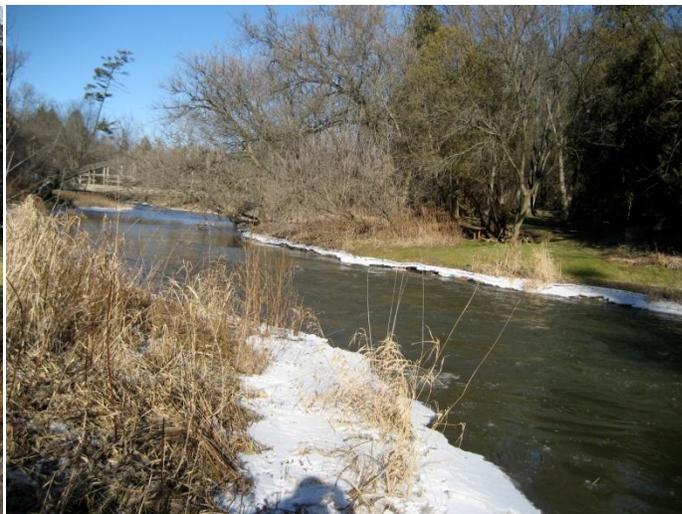
Photograph 8 ↑

Section of Humber River downstream of bridge,
looking across from left bank at upstream end



Photograph 9 ↑

Section of Humber River downstream of bridge,
looking at left bank from bridge



Photograph 10 ↑

Section of Humber River downstream of the bridge,
looking upstream from left bank at downstream end



Photograph 11 ↑

Section of Humber River downstream of bridge,
looking across from left bank at downstream end



City of Vaughan

Hydrogeology Existing Conditions Report for the Humber Bridge Trail Bowstring Arch Bridge Class Environmental Assessment – Draft for Discussion

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1. Methods

Hydrogeological investigations focused on a 500 m radius around the Humber Bridge Trail Bridge site (herein referred to as ‘the study area’).

Hydrogeological investigations were completed through a review of existing secondary source information, including:

- Regional Municipality of York, 2008.
Official Plan – Office Consolidation, June 1, 2008
- Chapman, L.J., and Putnam, D.F., 1984.
The Physiography of southern Ontario. Geological Survey, Special Volume 2, 270 p. (third edition)
- Sharpe, D.R., 1980.
Quaternary Geology of Toronto and Surrounding Area; Ontario Geological Survey Preliminary Map P. 2204, Geological Series. Scale 1:100,000
- Sharpe, D.R., Barnett, P.J., Brennand, T.A., Finley, D., Gorrell, G., Russell, H.A.J., and Stacy, P., 1997.
Surficial Geology of the Greater Toronto and Oak Ridges Moraine Area, Southern Ontario; Geological Survey of Canada, Open File 3062, Scale 1:200,000.

A site visit was conducted by a qualified hydrogeologist on September 1st, 2010 to visually assess and document significant hydrogeological features such as springs, seeps, and private water wells. Using a hand auger, soil materials on both the eastern and western sides of the bridge, and within the stream bed, were characterized to a depth of ~1.0 m below ground surface, to confirm regional geological mapping and existing surficial soil conditions.

2. Existing Conditions

2.1 Physiography

The Humber Bridge Trail Bridge site is located on the southern flank of the Oak Ridges Moraine (ORM), within the South Slope physiographic region (Chapman and Putman, 1984). The South Slope physiographic region begins at a sharp break-in-slope on the south side of the ORM and slopes downward towards Lake Ontario. The South Slope is a gently rolling till plain, characterized by numerous drumlins oriented upslope. Upon deglaciation, about 12,000 years ago, meltwater streams cut sharp valleys in the till, sometimes exposing the underlying ORM aquifer materials within major river valleys (i.e., the Humber River valley). Where exposed, the ORM aquifer materials generally contribute cold groundwater discharge to the surface water system.

2.2 Geology

Regional mapping by Sharpe (1980) and Sharpe *et al.* (1997) is presented in **Figure 1**. Generally, the shallow subsurface stratigraphy within the study area, in descending order, is made up of:

- Approximately 1 to 2 m of modern alluvial deposits of silt, sand and gravel; and
- Approximately 10 to 20 m of clayey silt till from the Halton Till Formation.

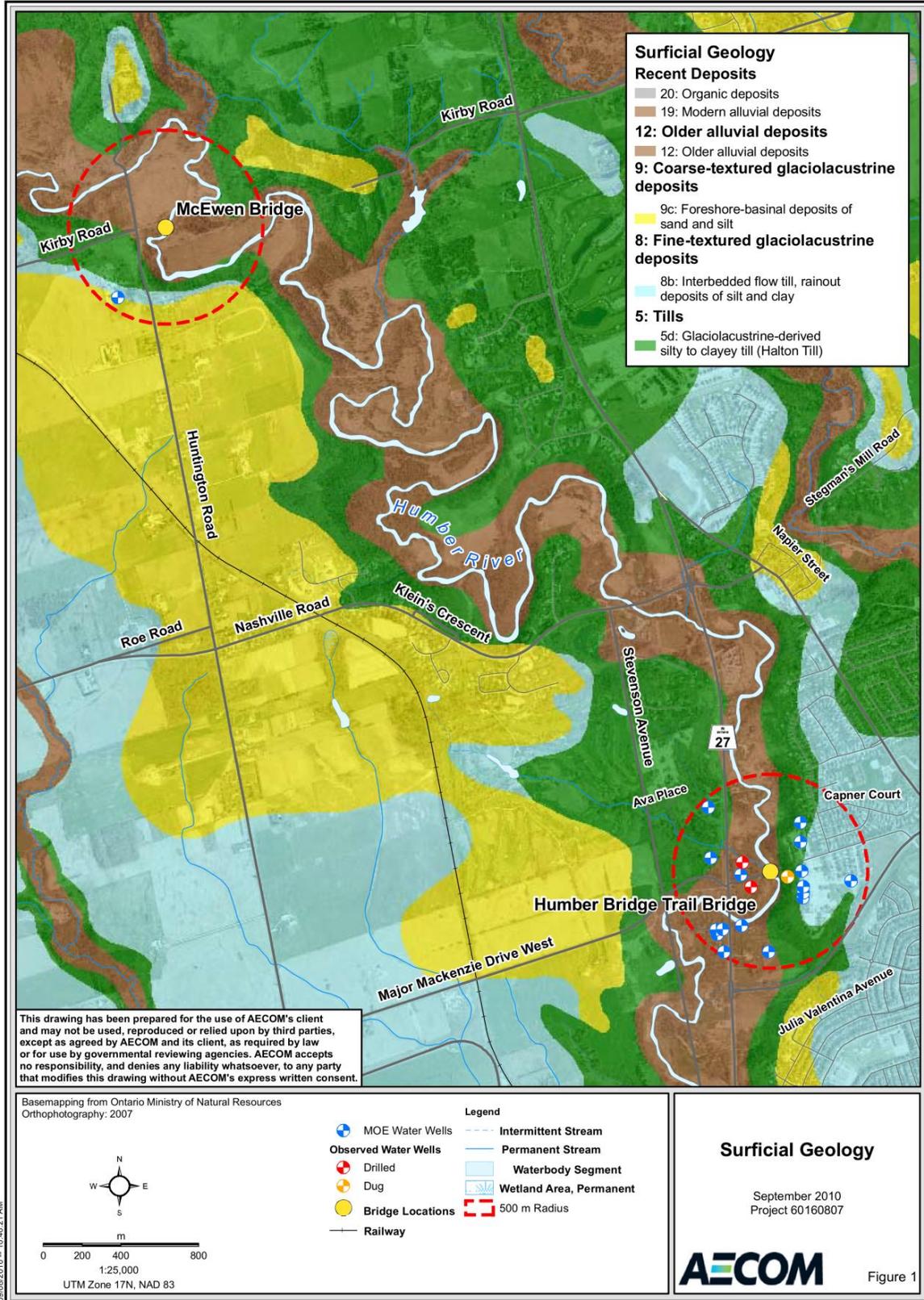


Figure 1. Surficial Geology

Till deposits generally underlie the modern alluvium within the Humber River Valley and are present at surface in the outside of the river valley. Minor deposits of glaciolacustrine silt and clay are shown to be present at surface in the eastern portion of the 500 m study area boundary. Deeper units, such as the ORM and the Thorncliffe Formation, may be present below the Halton Till.

Through visual observations along cut banks, scour pools and by hand-auguring shallow test holes, it can be confirmed that:

- Surficial soils on the east bank consist of Halton Till materials at surface;
- Surficial soils on the west bank consist of modern alluvium; and
- The Humber River rests on Halton Till in the vicinity of the Humber Bridge Trail Bridge.

2.3 Hydrogeology

Regional groundwater flow is southwards towards Lake Ontario. Locally, shallow groundwater flow paths bend towards discharge areas in major river valleys. It is expected that local, shallow groundwater flow is towards the Humber River. In the vicinity of the Humber Bridge Trail Bridge, the groundwater table is anticipated to be at a similar elevation as the Humber River.

The Halton Till is a major, regional aquitard, meaning that it restricts groundwater flow and infiltration. This unit is estimated to have a hydraulic conductivity (K) of between 10^{-10} and 10^{-6} m/s. Differences in hydraulic conductivity are due to spatial differences in matrix composition, interstitial lenses of sand, and degree of weathering. Overall, this unit acts as a surficial aquitard, inhibiting local groundwater recharge and reducing the exposure of underlying aquifers to contamination. Due to its low hydraulic conductivity, the Halton Till provides little groundwater baseflow (i.e., groundwater discharge) to the Humber River in the vicinity of the Humber Bridge Trail Bridge.

Modern alluvial deposits are generally too thin and too small in lateral extent to constitute a significant aquifer. However, given their relatively high hydraulic conductivity (estimated to be between 10^{-7} and 10^{-4} m/s) and the presence of a high water table in the Humber River valley, these deposits locally contribute to baseflow of the Humber River. Excavations within these materials are anticipated to require groundwater control. A Permit To Take Water (PTTW) from the Ministry of the Environment (MOE) may also be required if dewatering rates exceed 50,000 L/day.

The MOE water well record database shows sixteen (16) wells to be present within 500 m of the Humber Bridge Trail Bridge. There are seven (7) MOE wells that are shown on the eastern side of the Humber River that are anticipated to no longer be in use, due to the presence of municipal water in that area. A road-side well survey was conducted along Humber Bridge Trail that identified three (3) active water wells (referred to as “observed wells” on

Figure 1):

- #5789 Humber Bridge Trail – a 0.61 m diameter dug well, likely less than 10 m deep.
- #5840 Humber Bridge Trail – a 0.15 m diameter drilled well.
- #5821 Humber Bridge Trail – a 0.15 m diameter drilled well.

MOE water well records could only confidently be matched to the well at #5840 Humber Bridge Trail, due to positional errors and omissions from the MOE water well database. This well is believed to obtain potable water from a sand and gravel aquifer that is found at approximately 12 m below ground surface. The well record shows that this aquifer is confined below a clay till aquitard (Halton Till), which fits the geological model for the area. Due to its shallow depth, it is likely that the dug well at #5789 Humber Bridge Trail, obtains water from a sand lens within the Halton Till.

No significant groundwater recharge or discharge areas were identified within 500 m of the Humber Bridge Trail Bridge.

No obvious groundwater springs were observed during the site visit. Sidebank seepage was occurring from the alluvial deposits on the west side of the Humber River, to the north of the bridge.

No significant surficial or shallow aquifers or wellhead protection areas were identified within the study area.

2.4 Surface Water Features

The flow (Q) of the Humber River, as measured at the Elder Mills station located at Rutherford Road, approximately 2 km downstream of the Humber Bridge Trail Bridge, is 2.44 m³/s (TRCA – Humber River State of the Watershed Report, 2008).

As mentioned previously, the base of the Humber River, in the vicinity of the Humber Bridge Trail Bridge rests on Halton Till materials. Therefore, is not expected that significant groundwater inputs are occurring into the river in this area.

3. Impact Assessment

3.1 Potential Effects of Construction

Although the potential for an adverse impact is low, temporary water takings related to construction dewatering have the potential to impact nearby water wells. The shallow dug well at #5789 Humber Bridge Trail is the most susceptible to potential impacts due to its shallow depth and proximity to the construction area. All three wells along Humber Bridge Trail (#5789, #5821 and #5840) should be monitored before, during, and following construction, for both groundwater quality (chemistry) and groundwater quantity (level).

The area within 500 m of the bridge is not a significant groundwater recharge or discharge area, and the presence of the Halton Till aquitard at surface, significantly reduces the potential of spills during construction from impacting deeper aquifers. Spills during construction still have the potential to impact surface water features and will require mitigation during construction.

If excavations occur within saturated alluvial materials, especially on the west bank of the Humber River, temporary groundwater control and a PTTW may be required for construction. The small volumes of water related to dewatering are anticipated to be small in comparison to the flow of the Humber River. Therefore, temporary dewatering in the vicinity of the Humber Bridge Trail Bridge is not anticipated to have a significant effect on flow in the Humber River.

3.2 Mitigation Measures

Well monitoring should be conducted at all three wells along Humber Bridge Trail (#5789, #5821 and #5840) before, during, and following construction, for both groundwater quality (chemistry) and groundwater quantity (level). Should an adverse impact be detected, the homeowner (or resident) will be temporarily supplied with an alternate source of potable water.

A spills response plan should be developed to minimize the likelihood of a spill and to provide an immediate response, should a spill occur.

3.3 Net Effects

Because the effects of construction dewatering are temporary, no significant net or residual adverse effects related to groundwater are anticipated for the re-construction of the Humber Bridge Trail Bridge.

4. Permitting

Construction dewatering, like other water takings in Ontario, is governed by the Ontario Water Resources Act (OWRA) and the Water Taking and Transfer Regulation 387/04 (a regulation under the OWRA).

In accordance with the above-noted regulatory requirements and in compliance with the MOE's policy and their PTTW Manual (April 2005), a water taking permit must be obtained from the MOE for construction dewatering, if the dewatering rate is greater than 50,000 L/day.