

**BOLTON RESIDENTIAL EXPANSION STUDY
BACKGROUND ENVIRONMENTAL STUDY
IN SUPPORT OF
REGIONAL OFFICIAL PLAN AMENDMENT (ROPA)**



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Prepared for
Town of Caledon

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1. STUDY PURPOSE AND OBJECTIVES

The Town of Caledon initiated the Bolton Residential Expansion Study (BRES) in 2012 to determine where and how to accommodate new residential and population-related employment growth anticipated for the Bolton area to 2031. The BRES process included the identification of six Option Areas plus as well as three 'Rounding Out Areas' for growth to accommodate 10,348 additional people on approximately 190 ha of development lands.

Dougan & Associates, Aquafor Beech Limited and Blueplan-GM were retained by the Town of Caledon in 2013 to undertake environmental and servicing studies in support of the BRES. The focus of this report is to address the requirements of the Region of Peel Official Plan for expansion of the urban boundary. Policy 7.9.2.12 (e) of the Regional Official Plan requires *environmental and resource protection and enhancement including the identification of a natural heritage system, in accordance with the policies of this Plan*.

Phase 1 of the BRES project involved developing evaluation criteria to be used to evaluate the Options for expansion, including environmental impacts and opportunities for enhancement. Phase 2 involved the screening and ranking of the Options; the natural heritage screening results were based on existing background information and were summarized in a technical memorandum, prepared by Dougan & Associates, dated June 19, 2013. Phase 3 involved developing a Preliminary Natural Heritage System (NHS), in accordance with Region of Peel and Toronto Region Conservation Authority (TRCA) requirements, for the two option areas (1 and 3) that were identified by Council as requiring further evaluation in July 2013. Phase 3 also involved a review of the three Rounding Out Areas that are also under consideration by the Study Team. The phases outlined above are part of a larger Comprehensive Environmental Impact Study and Management Plan (CEISMP) process for the Bolton Residential Expansion Study.

A Council resolution (July 9, 2013) directing staff and consultants to carry out more detailed studies on Option Areas 1 and 3, which were previously short-listed based on their opportunities and known constraints. Phase 3 of the BRES undertook agency consultations, which directed environmental studies of Option 1 and 3 lands, including seasonal vegetation and wildlife surveys, fish habitat assessments, and headwater features studies. These studies were initiated in the fall of 2013 and continued in the spring and summer of 2014. On the basis of recommendations in planning reports from staff and consultants (including a Technical Memorandum for a Preliminary Natural Heritage System for the Option 1 and 3 lands, prepared by Dougan & Associates), Council passed a resolution on June 24, 2014 selecting Option 3 plus the three Rounding Out Areas as the areas of future expansion.

This Background Environmental Study summarizes studies completed to date for the Option 3 and Rounding Out Area lands, and their adjacent lands. The findings address the environmental study requirements to support a Regional Official Plan Amendment (ROPA) based on environmental findings, and include recommendations for more detailed studies in the Comprehensive

Environmental Impact Study and Management Plan (CEISMP) which will support the preparation of a Secondary Plan for the expansion areas.

The objectives for the Background Environmental Study have been identified in discussions with the Town of Caledon, Region of Peel and TRCA, and include the following:

- 1) Further evaluate the environmental constraints and opportunities in Option 3, including a strategic review of the natural features within the context of the West Humber subwatershed;
- 2) Determine the significance of the environmental features and functions, including consideration of terrestrial and aquatic data collected to date;
- 3) Recommend a Natural Heritage System for the Option 3 lands and Rounding Out Areas, and the means to protect this system as a whole in an urban setting, in accordance with the land use designations of the Town of Caledon and Region of Peel Official Plans;
- 4) Undertake preliminary analysis required in support of future secondary planning, including an evaluation of the potential impacts associated with the development of the Option 3 lands and Rounding Out Areas, including impacts on groundwater quantity and quality, surface water quantity and quality, aquatic and terrestrial biological features and functions; and
- 5) Define Terms of Reference for a Comprehensive Environmental Impact Study and Management Plan which will include more detailed environmental studies required to support Secondary Planning.

This report addresses the policy requirements, utilizing background information, new data collection and analysis of scoped key subject areas in support of a proposed Natural Heritage System, and direction on the more detailed studies required to characterize the environmental systems in the proposed expansion areas, impact assessment of proposed land uses, and an environmental management strategy to address those impacts.

2. BASELINE MONITORING STUDY UPDATE (OPTION 3 & ROUNDING OUT AREAS)

2.1. EXISTING LAND USES

The Option 3 lands are predominantly in active agriculture and are characterized by gently rolling terrain. The Option 3 lands include approximately 28 properties.

There is a small existing employment node at the King Street West/Humber Station Road intersection including: a concrete batching operation; motor home sales, rental and service; construction

equipment and rental. All of these uses are within the Bolton Rural Service Centre boundary, but are not connected to municipal sewer and water services.

In addition to Option 3, three Rounding Out Areas are being considered for development; all are bordered by the Greenbelt Plan and the existing settlement area boundary.

The Duffys Lane Rounding Out Area is located on the north side of King Street and west of Duffys Lane (which is the site of the BAR/Highway 150). These lands contain rural residences on large rural-sized lots with the majority of the lots backing onto lands that are subject to the Greenbelt Plan. Lands to the west of this rounding-out area are designated for industrial purposes and include a stone manufacturing operation and an agricultural supply store (Agro Mart). The lands in this rounding-out area are relatively flat.

The Highway 50/Columbia Way Rounding Out Area is located on the west side of Highway 50, and is the site of the Caledon Public Works yard and a former commercial use, and is generally surrounded by lands within the Bolton Resource Management Tract, which is owned by the Toronto and Region Conservation Authority (TRCA).

The Chickadee Lane Rounding Out Area applies to lands on the east side of King Street West and the Bolton Arterial Road (BAR)/Highway 150 (currently under construction) and includes lands on the south side of Glasgow Road and Chickadee Lane. The lands on the east side of Chickadee Lane contain six homes on rural-sized lots that back onto lands in the Greenbelt Plan area. The triangular area of land between Glasgow Road, Chickadee Lane and King Street is vacant, with a portion to be used for the new Bolton Access Road (BAR) which is intended to connect King Street West to Highway 50 to the north of the Settlement Area.

2.2. SURFACE WATER RESOURCES

2.2.1. BACKGROUND REVIEW

The Option 3 Residential Expansion Lands are located within the Humber River Watershed. Surface drainage from the subject lands is in a general south easterly direction via four intermittent headwater drainage features (HDFs). These features were investigated as part of a set of field investigations which are discussed further in Section 2.6.

In terms of hydrology and flood flows, the 2002 Humber River Hydrology study defines flood flow rates at key locations throughout the watershed. Through discussions with TRCA staff, it is understood that the watershed modelling is being updated as part of a current, on-going study. Further, the results of the updated hydrologic modeling are expected to be used as a basis for defining future stormwater management control targets. This analysis will be undertaken as part of the Comprehensive Environmental Impact Study and Management Plan, to be prepared in support of the Secondary Plan and Local Official Plan Amendment(s).

2.3. GROUNDWATER RESOURCES

A desktop analysis of the hydrogeology and groundwater was conducted for the Option 3 lands. The analysis was based on the Recommended Terms of Reference for Phase 3 Comprehensive Environmental Impact Study and Management Plan (CEISMP), prepared by TRCA and Region of Peel Staff (August 20, 2013). The analysis concentrated on the groundwater regime and its relationship to the regional groundwater model developed by Earthfx "Groundwater Modelling of the Oak Ridges Area, York Peel Durham Toronto Groundwater Management Study" (CAMC-YPDT, 2006) and the Humber River State of the Watershed Study (TRCA, 2008).

2.3.1. BACKGROUND REVIEW

Geological Setting, Hydrostratigraphy and Cross-Sections

The surficial (Quaternary) geology of the Option 3 lands comprises the Halton Till (Figure 1). The Halton Till is composed primarily of silt, with variable proportions of sand (10-55%), gravel and minor clay¹, attaining depths of more than 15 metres.

The surface soils² are clay loams assigned to the Chinguacousy and Oneida Series, characterized as having good to imperfect drainage (Figure 2).

Overburden thickness ranges from approximately 25 metres along the south limits of the Option 3 lands (along King Street) to more than 100 metres to the north, approaching the Humber River along Humber Station Road, as well as on the residual lands north of King Street.

Two cross-sections were prepared on the basis on the MOE water well records and the subsurface geological (and hydrostratigraphic) units derived from Earthfx (2006) and TRCA (2008). Digital files were provided by TRCA. These cross-sections are shown as Figures 3 and 4.

The bedrock consists of shale, siltstone and limestone assigned to the Ordovician-age Georgian Bay Formation³.

¹ White, O.L. (1975). Quaternary Geology of the Bolton Area, Southern Ontario, Ontario Division of Mines, Geological Report 117, 119 p.

² Hoffman, D.W. and N.P. Richards (1953). Soil Survey of Peel County. Report No. 18 of the Ontario Soil Survey, Guelph, Ontario, 85p.

³ Paleozoic Geology – Bolton. Ontario Division of Mines, Map 2338, scale 1:50,000.

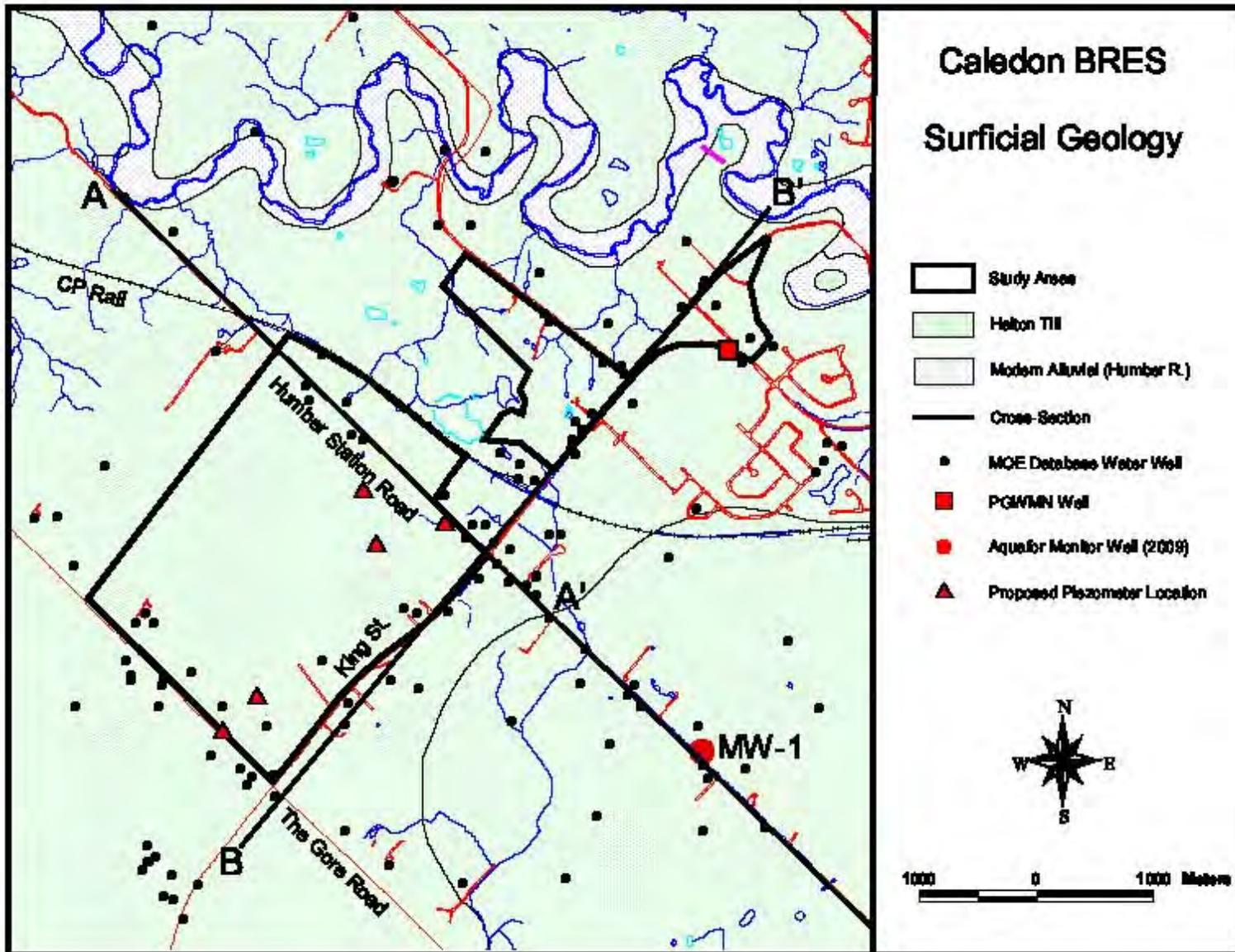


Figure 1 – Surficial Geology

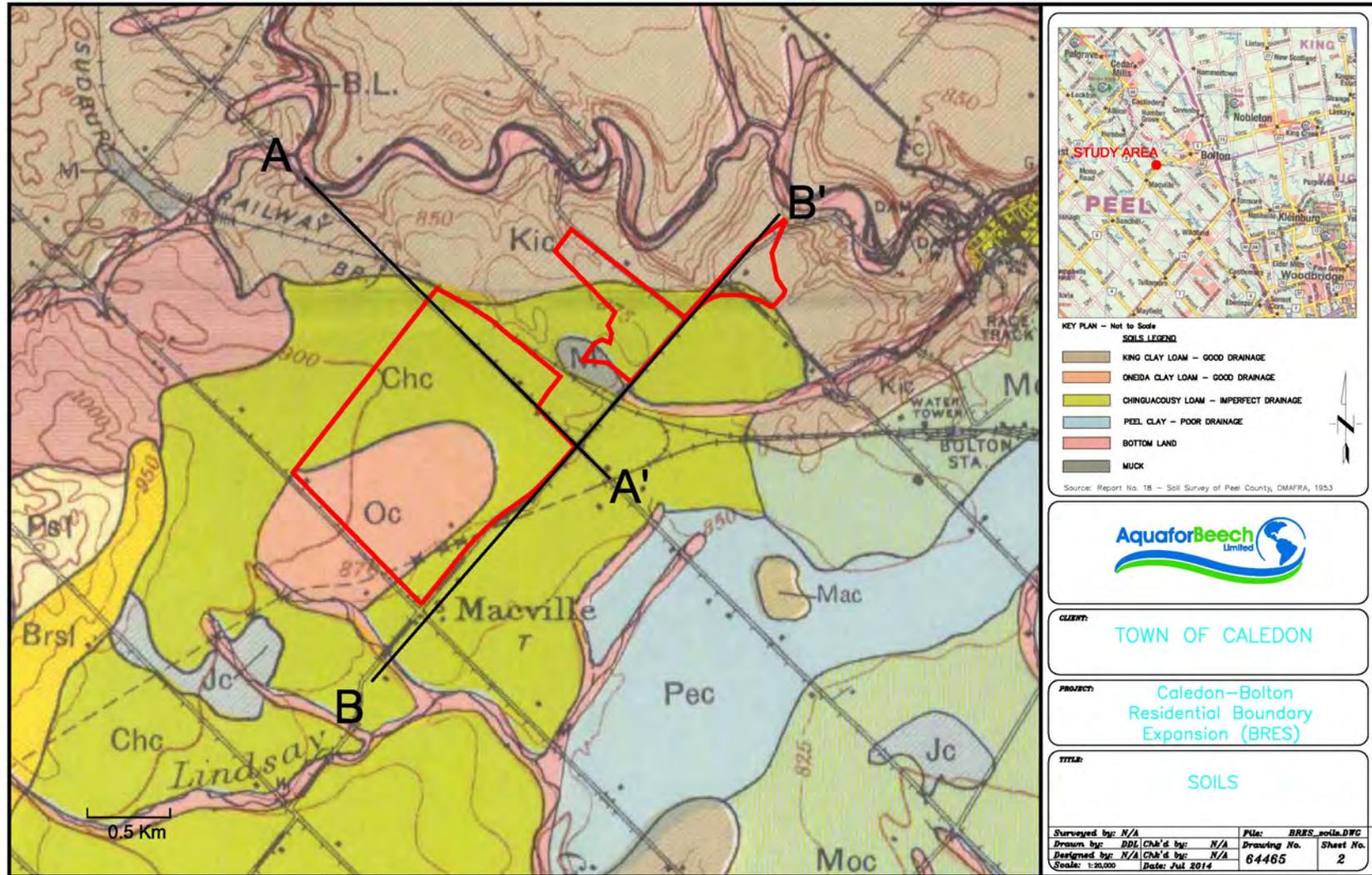


Figure 2 – Soils

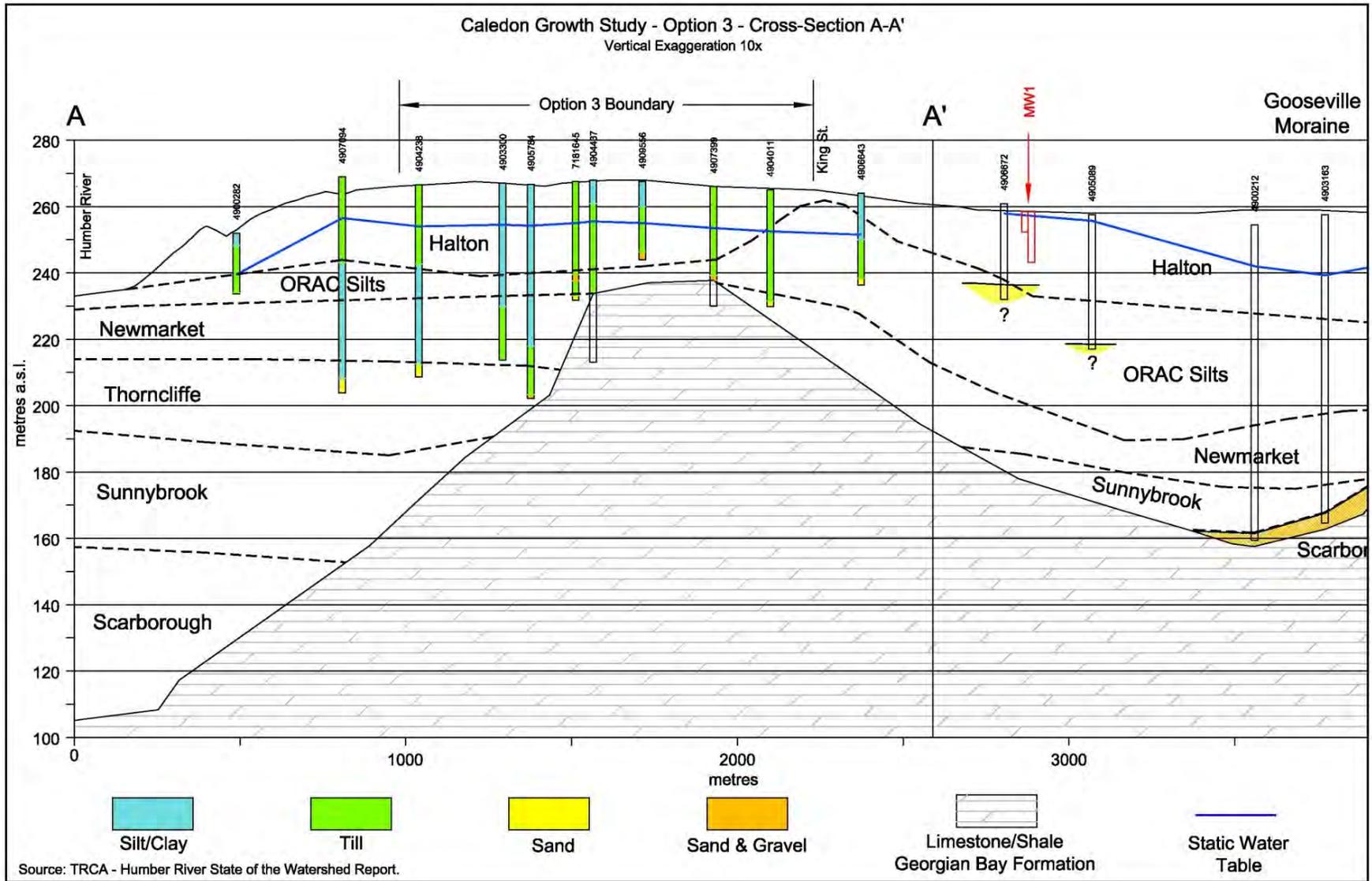


Figure 3 – Cross-Section A-A'

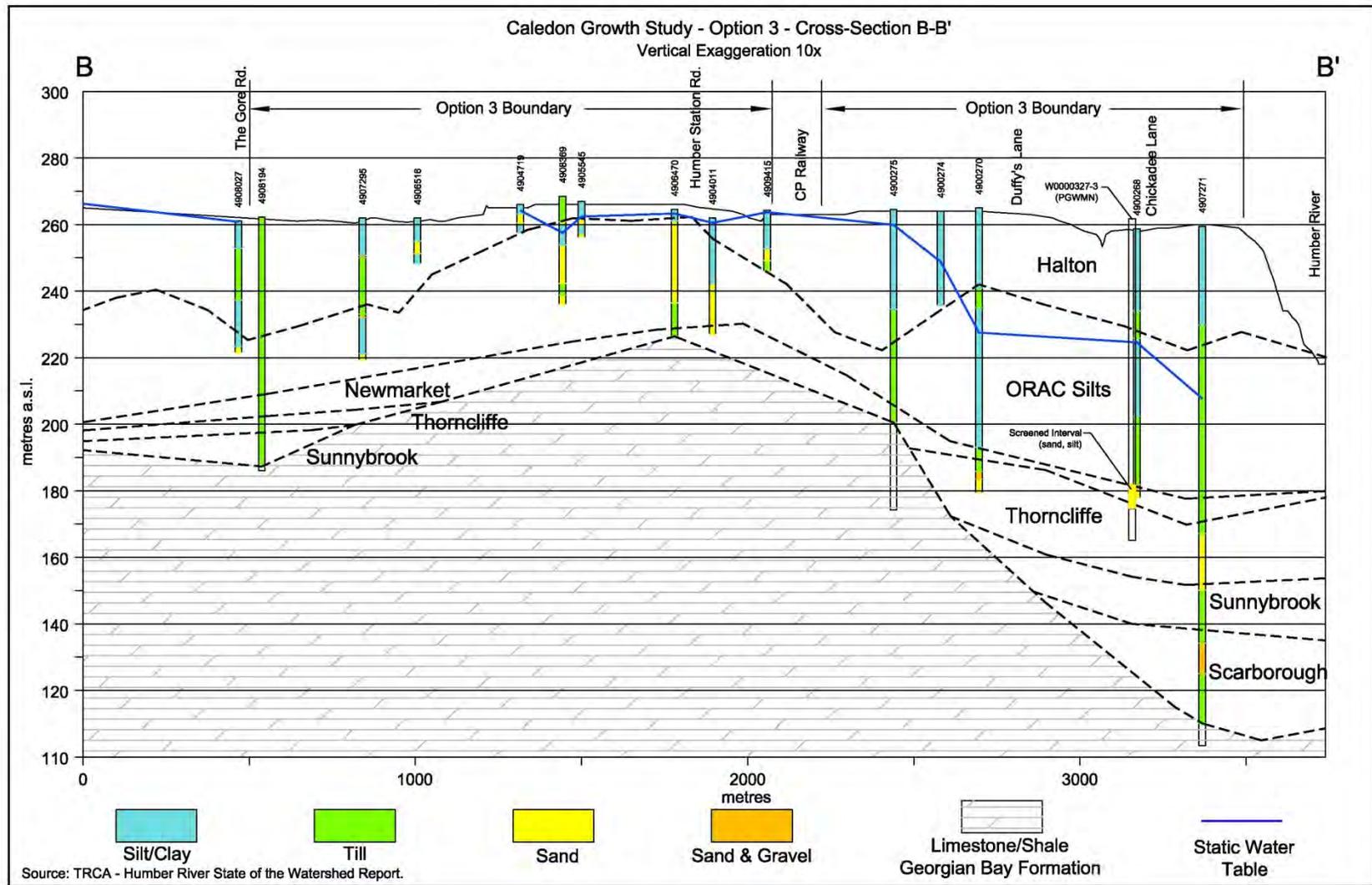


Figure 4 – Cross-section B-B'

Hydrogeology Overview

The regional hydrogeology of the Bolton area comprises two major aquifers. The majority of the water wells obtain water at or near the bedrock interface at depths greater than 40 metres, often in contact with sediments of the Scarborough Aquifer Complex in deeper sections or associated with sand and silty sand related to the Thorncliffe Aquifer Complex (or equivalent) at shallower depths. A second (and more localized) aquifer is found in discontinuous sand lenses within the Halton Till or in the uppermost sandy silt of the Oak Ridges Aquifer Complex silts (aka the ORAC Silts) at depths generally in excess of 20 metres. This shallow aquifer often provides sufficient water for domestic purposes.

The majority of the water wells tap the deep aquifer, which is overlain by the Newmarket and Halton Till aquitards that also sandwich the aquifer in the ORAC Silts. The water levels thus display the piezometric surface of a confined aquifer system. The potentiometric surface varies between 5 and 20 metres below ground surface and deeper (40+ metres) approaching the Humber River along King St.

Previous Field Investigations (Albion-South Bolton CEISMP)

One nested monitor well (MW-1S and MW-1D) was established along Humber Station Road in November 2009, specifically in the Bolton Employment Lands study area (South Albion-Bolton CEISMP). This well is shown in Figure 1. MW-1D (15.85 metres total depth) intersected 3 metres of stone-free silty clay (Peel clay) followed by 12 metres of silty clay with trace gravel and silt lenses (Halton Till). This well is probably representative of the Halton Till underlying the Option 3 lands. Groundwater levels in MW-1 were monitored using *In-Situ Ltd.* miniTROLL loggers. The loggers were programmed to read water levels every 30 minutes between February and December 2010.

Hydraulic Conductivity

The hydraulic conductivity in MW-1S and MW-1D were measured by slug tests and *In-Situ* loggers. The calculations were performed with AquiferTest 2011 (Schlumberger Water Services) and a summarized in **Table 1**. The measured horizontal hydraulic conductivity (K_H) for the Halton Till is of the same order of magnitude as used in the Regional Groundwater Flow Model⁴.

Table 1: Monitor Well Details and Hydraulic Conductivity Measurements

Monitor Well Number	Location	Screen + sand (metres bgs)	Formation	Horizontal Hydraulic Conductivity K_H (m/sec)	Earthfx (2008). Tables 14 & 7
MW-1S	Humber Station Rd. (Employment Lands)	1.0 - 6.2	Peel Clay & Halton Till	8.7×10^{-8}	5×10^{-7}
MW-1D		11.1 - 15.2	Halton Till	1.5×10^{-8}	1.5×10^{-8} in bedrock

Long-Term Water Level Monitoring

⁴ Earthfx Inc. Groundwater Modelling of the Oak Ridge Moraine Area, CAMC/YPDT Technical Report Number 01-06, February 2006 (Table 14 and Table 7)

The water level in the deeper section of the Halton Till (MW-1D, screened between 11 and 15 metres) showed an annual fluctuation of 0.44 metre, peaking in July. When plotted against precipitation, it is suggested that infiltration of surface water to depths of several metres will occur over a one or two days following significant precipitation events (generally >10 mm in a 24hour period). This suggests that vertical hydraulic conductivity (K_v) is significantly greater than horizontal conductivity (K_H). The precipitation-related groundwater peaks dissipate due to deeper infiltration within 2 days.

Water Balance

A water balance for existing conditions was prepared for the South-Albion Bolton CEISMP using the monthly Thornthwaite & Mather calculation to determine potential evapotranspiration (PET), actual evapotranspiration (AET) and the resulting water surplus. The calculation was based on a clay loam soil with deep-rooted vegetation (e.g. pasture) having a water retention capacity of 250 mm. These derived data are compared to the Agriculture and Agri-Food Canada estimates for AET for Ecodistrict 562, which encompasses the area of concern (Table 2).

Table 2: Thornthwaite & Mather Evapotranspiration for Albion Climate Normals (1971-2000) (Environment Canada) for a clay loam with a water-holding capacity of 250 mm

Month	Average Precipitation	Average Monthly Temperature	PET	Actual (AET) ⁵	AET for Ecozone 562 ⁶
1	57.2	-7.5	0.0	0.0	0.0
2	45.5	-6.6	0.0	0.0	0.0
3	58.2	-1.6	0.0	0.0	0.0
4	66.6	5.6	30.24	30.24	30.3
5	69.3	12.3	76.20	75.30	74.3
6	70.4	17.1	108.36	105.40	107.6
7	76.4	19.8	128.70	116.40	115.4
8	75.4	19.0	115.20	100.40	104.2
9	69.8	14.3	71.76	70.80	77.4
10	67.4	8.0	37.05	37.05	37.9
11	74.5	2.1	7.20	7.20	10.5
12	61.4	-4.1	0.0	0.0	0.0
Total	792.1	-	-	542.76	558.5

Based on the values in Table 2, the following water budget components are estimated for the Option 3 lands:

- Water surplus = 792.1 – 542.76 = **249.34 mm/year**
- Infiltration factor = 0.15 (rolling topo: 6m/km) + 0.1 (clay) + 0.1 (cultivated) = 0.35

⁵ Thornthwaite & Mather calculation for clay soil and deeply-rooted vegetation (water holding capacity = 250 mm)

⁶ Agriculture and Agri-Food Canada derived variables for Ecodistrict 562 (water retention = 250 mm)

- Infiltration = $0.35 \times 249.34 = 87.3 \text{ mm/year}$
- Runoff = $249.34 - 87.3 = 162.1 \text{ mm/year}$

The Thornthwaite & Mather water balance demonstrates that 70% of annual precipitation is lost as evapotranspiration. The remainder (249 mm/year) is the water surplus that is partitioned between infiltration (INF = 87 mm/year) and runoff (RO = 162 mm/year). This partitioning was done on the basis of surface topography, soils and vegetation⁷. These results compare favourably to the infiltration (recharge) values determined by Earthfx (90 m/year for Halton Till south of the Oak Ridge Moraine) and by TRCA's PRMS model.

Groundwater – Surface Water Interactions

The Option 3 lands have no measurable groundwater discharge (Figure 5, after TRCA, 2008). This is not unexpected, as the water table is several metres below ground surface over most of the year. Headwater Drainage Features Assessments⁸ indicates that much of the Option 3 lands are tile-drained, with intermittent flows in ill-defined channels associated with low points in terrain.

Preliminary field investigations to confirm the absence of groundwater discharge could entail advancement of hand-driven stream-bed piezometer at locations shown in Figure 1. The suggested locations are in the southern part of the Option 3 lands, avoiding the tile-drained fields. Previous experience in Brampton has shown that shallow piezometers in tiled fields are generally dry or (rarely) have downward gradients.

Aquifer Vulnerability

Aquifer vulnerability was assessed by means of the Aquifer Vulnerability Index (AVI), based on available mapping products (e.g., depth to aquifer, soil type and thickness, etc). The AVI measures the relative amount of protection provided by the type of materials above the aquifer. The AVI method produces a numerical index representing the relative vulnerability of an aquifer, based on the type and thickness of the soil above. The index quantifies the natural vulnerability of aquifers to sources of contamination at or near the surface, and through a translation process, categorizes groundwater vulnerability as high, medium or low, as shown in Figure 6⁹. The majority of the Option 3 lands are classified as having medium to low aquifer vulnerability. The southern part of the Option 3 lands are assigned high aquifer vulnerability due to the relatively shallow bedrock, in particular where the Halton Till is thin and the ORAC Silts are present at shallow depth.

⁷ MOEE. Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

⁸ Preliminary Headwater Drainage Feature Assessment – Mapping and Management Recommendations. Aquafor Beech Limited, Reference 65473 (November 25, 2013).

⁹ Approved Assessment Report: Toronto and Region Source Protection Area, TRCA (January 2012).

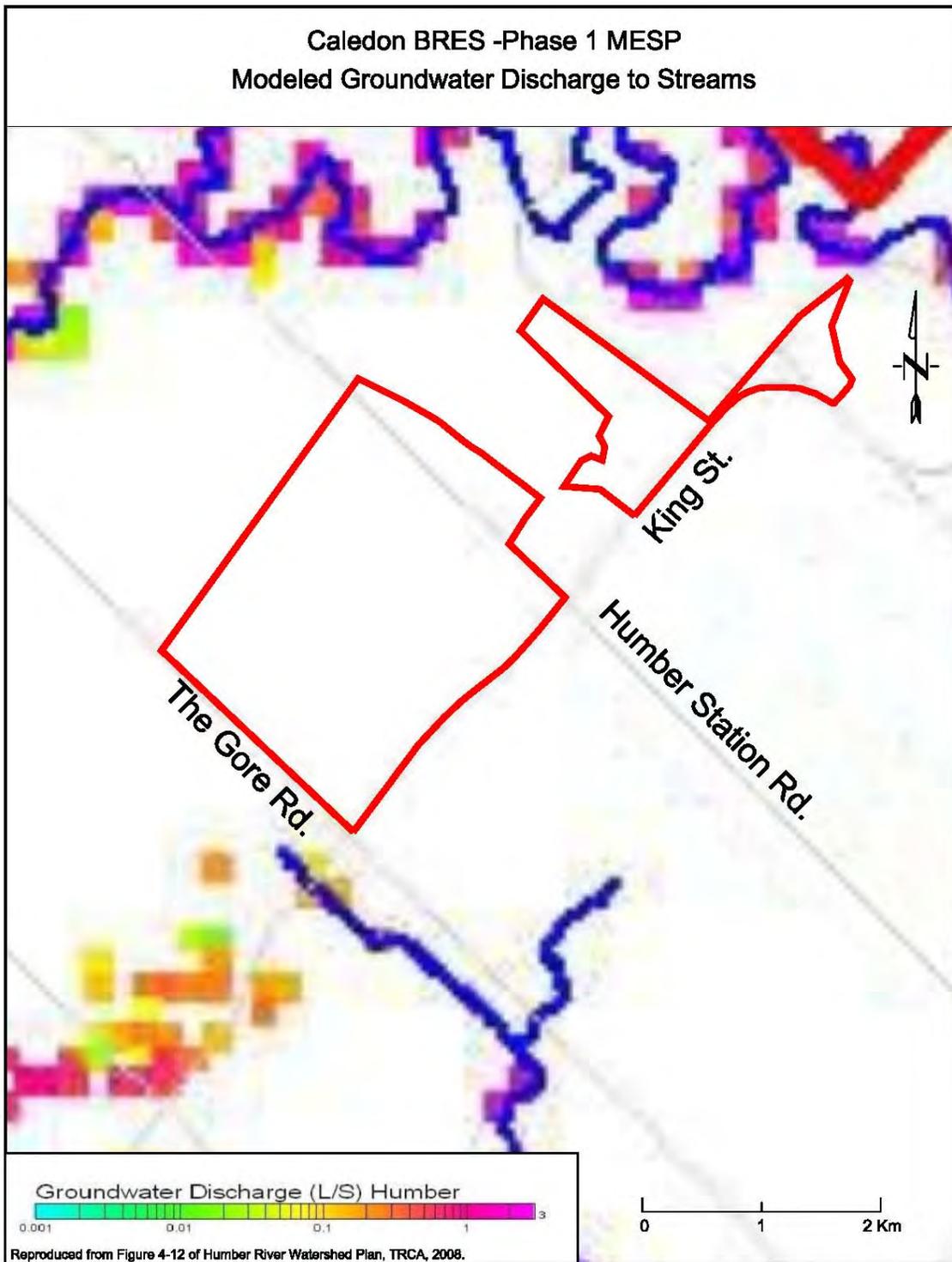


Figure 5 – Modeled Groundwater Discharge to Streams

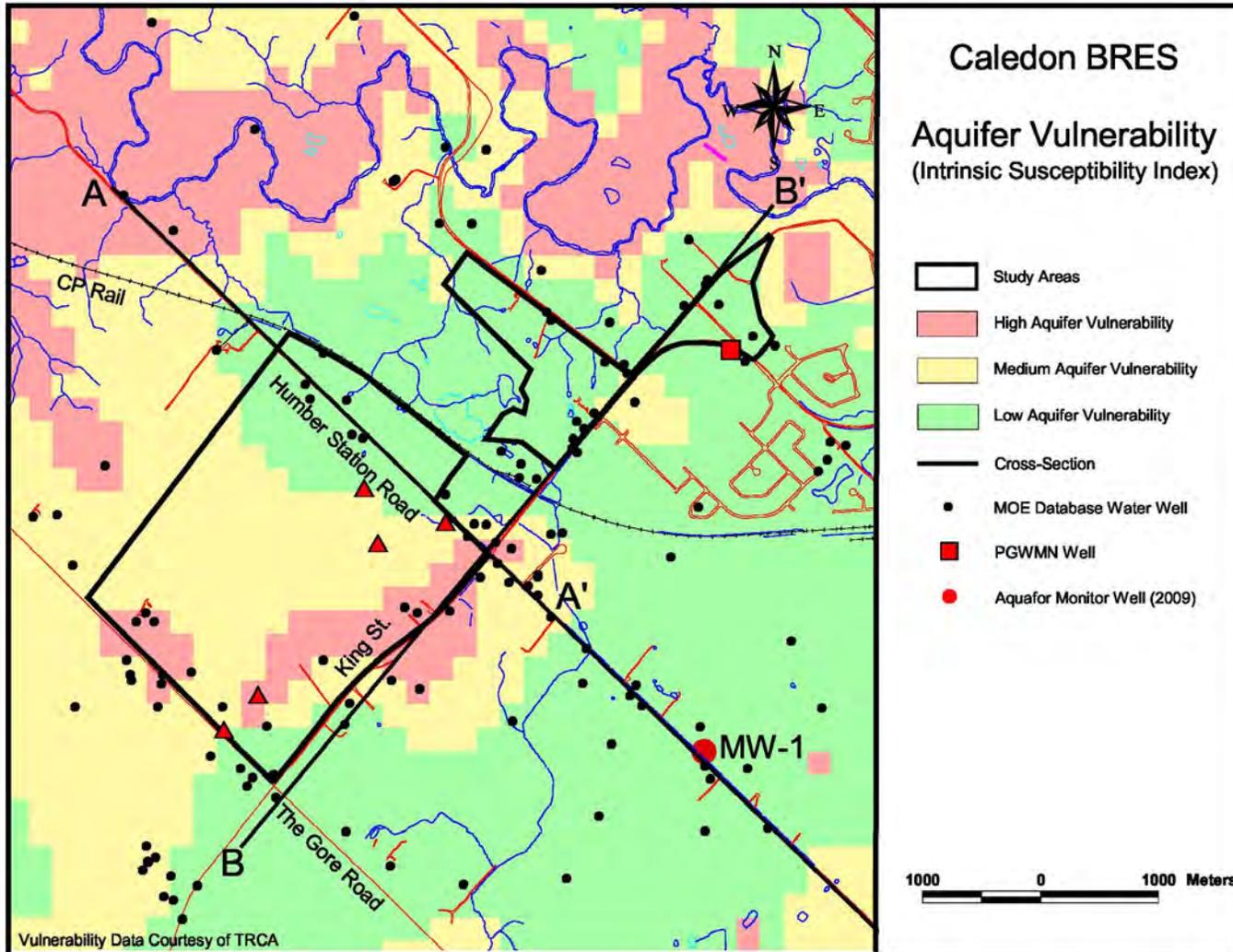


Figure 6 – Aquifer Vulnerability

There appears to be no constraints to promoting infiltration on the Option 3 lands, as these do not lie within wellhead protection areas (WHPA).

Conclusions

The desktop compilation demonstrates that the surface soils are relatively tight and remain so to the depth of the Halton Till (more than 15 metres). Hydraulic conductivity is of the order of 10^{-7} metre/second in the Halton Till. The Option 3 lands are a low groundwater recharge area (LGRA).

Groundwater discharge is not significant as the water table remains several metres below ground surface over most of the year. Water levels in shallow monitor wells in the Halton Till show that the water table rises about 0.3 metre over a period of one to two days following significant precipitation events and falls again over a period ranging from several days to several weeks. Infiltration to the shallow water table occurs, but it is slow.

The water balance, derived for a clay loam soil with deep-rooted vegetation, demonstrates that almost 70% of annual precipitation is lost as evapotranspiration under current conditions. The remainder (249 mm/year) is partitioned as 87 mm/year infiltration and 162 mm/year runoff.

There are no constraints to promoting infiltration, as the Option 3 lands have no wellhead protection areas (WHPA). In keeping with general practice, it is preferable to discourage infiltration under certain land uses (potential "hot-spots"). Guidance can be found in the Low Impact Development (LID) manual (Tables 1.4.3 and 2.8.1).

2.4. AQUATIC RESOURCES/WATER QUALITY

2.4.1. BACKGROUND REVIEW

Fish collection data were obtained from MNRF and TRCA. While no fish collections have been undertaken by MNRF or TRCA within the watercourses on the Option 3 lands, the fish community in the main Humber River in the vicinity of where the three Rounding Out Areas and a small north-east portion of the Option 3 area drains was characterized using data from three MNRF stations (4, 5, and 364) and one TRCA station (HU029WM). Similarly, the fish community in the West Humber River, where the remaining bulk of the Option 3 area drains, was characterized using data from two MNRF stations (157 and 158) and one TRCA sampling station (HUFMP06). Generally, the downstream fish communities are cool water, as the majority of fish species that are present prefer cool water conditions (19-25°C). Most of the fishes listed in Table 3 are typically residents of fast-flowing streams.

Most of the watercourses that drain the Option 3 lands eventually become Ministry of Natural Resources and Forestry designated Redside Dace (*Clinostomus elongatus*) habitat. Redside Dace are considered Endangered by the Committee On the Status of Endangered Wildlife In Canada

(COSEWIC), but this status has yet to be recognized under the federal Species at Risk Act (SARA), where it is still listed in Schedule 3 as the lesser status of Special Concern (August 19, 2014), which does not afford legal protection (www.sararegistry.gc.ca). The Ontario Endangered Species Act (ESA) lists Redside Dace as Endangered, providing legal protection for this fish and its habitat (www.mnr.gov.on.ca). The shortest distance along a watercourse from Option 3 to designated Redside Dace habitat is 1.5 km.

Table 3. Fish communities downstream of the Option 3 lands. Years when collections occurred are indicated. Data earlier than 1972 are not included.

Species Common name (<i>Scientific name</i>)	Humber River		West Humber		Preferred Temp. ¹
	MNRF (1972, 1984, 1985, 1987, 1991, 1999)	TRCA (2001, 2004, 2007, 2010)	MNRF (1972, 1984, 1985, 1999)	TRCA (2004)	
American Brook Lamprey (<i>Lampetra appendix</i>)	x	x	x		cold
Blacknose Dace (<i>Rhinichthys atratulus</i>)	x	x	x	x	cool
Bluntnose Minnow (<i>Pimephales notatus</i>)	x	x	x	x	warm
Brown Bullhead (<i>Ameiurus nebulosus</i>)			x		warm
Brown Trout (<i>Salmo trutta</i>)	x	x			cold/cool
Common Shiner (<i>Luxilus cornutus</i>)	x	x	x	x	cool
Creek Chub (<i>Semotilus atromaculatus</i>)	x	x	x	x	cool
Fantail Darter (<i>Etheostoma flabellare</i>)	x	x	x	x	cool
Fathead Minnow (<i>Pimephales promelas</i>)	x	x	x		warm
Golden Shiner (<i>Notemigonus crysoleucas</i>)		x			cool
Iowa Darter (<i>Etheostoma exile</i>)			x		cool
Johnny Darter (<i>Etheostoma nigrum</i>)	x	x	x	x	cool
Longnose Dace (<i>Rhinichthys cataractae</i>)	x	x			cool
Logperch (<i>Percina caprodes</i>)		x			cool/warm
Rainbow Darter (<i>Etheostoma caeruleum</i>)		x	x	x	cool
Rock Bass (<i>Ambloplites rupestris</i>)			x	x	cool
Stonecat (<i>Noturus flavus</i>)		x			warm
White Sucker (<i>Catostomus commersonii</i>)	x	x	x		cool

¹Preferred temperature: cold < 19°C; cool 19 - 25°C; warm > 25°C (Coker *et al.* 2001).

2.4.2. FIELD STUDIES

An initial field examination of all watercourses exiting or entering the periphery of the proposed urban expansion option areas that were accessible by public road was undertaken on August 23, 2013, to primarily record the amount of water, flow and the instream habitat condition during this typically dry season. On October 15, 2013, all locations that held water on August 23, as well as a select number of other locations, were electrofished using a Halltech Model HT 2000 backpack electrofisher. On December 3 and 4, 2013, the watercourses in urban expansion Options 1 and 3, and three Rounding Out Areas were walked and examined and the habitat characterized and photographed. On April 28

and 29, 2014, the watercourses in urban expansion Options 1 and 3 were again walked and examined for evidence of spring spawning fishes and to characterize the resident fish community, as well as to characterize and photograph habitat.

On June 24, 2014, the Caledon council approved the Option 3 lands and the three Rounding Out Areas as the option to move forward. In October 2014, water quality characterization will be undertaken using benthic invertebrate collections and analysis for those watercourses with permanent flow. This analysis will be undertaken as part of the Comprehensive Environmental Impact Study and Management Plan, to be prepared in support of the Secondary Plan and Local Official Plan Amendment(s).

2.5. TERRESTRIAL RESOURCES

2.5.1. BACKGROUND REVIEW

Data were obtained from the Town of Caledon and Toronto and Region Conservation Authority (TRCA), and encompasses a wide range of relevant digital data available from the Town and TRCA through their internal departments, and through their data sharing agreements with the Ontario Ministry of Natural Resources and Forestry and Region of Peel. These data were summarized in Appendix 1 of the *Bolton Residential Expansion Study: Phase 2, Technical Memorandum – Natural Heritage*, dated June 19, 2013. In summary, the digital data included the following:

- Significant faunal and plant records (TRCA data);
- Caledon wetlands (TRCA);
- Humber River Fisheries Management Plan stream classification (TRCA);
- Caledon Earth and Life Science ANSIs (MNRF);
- Greenbelt limits (Town of Caledon);
- Peel and Caledon Significant Woodlands (Peel Region);
- MNRF and TRCA fisheries data (species location records) for the Humber River watershed; and
- Redside Dace Occupied Habitat (Peel Region).

Additional background information that was reviewed includes the following:

- Natural Heritage Information Centre element occurrence database;
- Various faunal resources (e.g. Ontario Mammal Atlas, Ontario Herpetofaunal Atlas);
- Ontario Breeding Bird Atlas (2001 – 2005);
- Ontbirds listserve observational data (2008 – 2013);
- South Albion-Bolton Community Plan – Employment Land Needs Study and North Hill Supermarket Comprehensive Environmental Impact Study and Management Plan Phase 1 Report (Aquafor Beech and NRSI 2009) which covers parts of BRES Option 1 land and areas adjacent to both BRES Options 1 and 3 lands;
- Bolton Arterial Road Environmental Assessment data

- Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines (CVC & TRCA 2009); and
- Region of Peel Watermain Environmental Assessment.

2.5.2. FIELD STUDIES

2013 Studies

In November and December 2013, Dougan & Associates collected Ecological Land Classification (ELC) data for Option 3 and the three Rounding Out Areas. All properties with potential significant natural heritage features were visited after the Town arranged permission to access. In addition, adjacent lands to 120 metres beyond the boundaries of the study area were assessed. Wetland boundaries were mapped; MNRF has been contacted for potential wetland data; if available this will be integrated as part of the Comprehensive Environmental Impact Study and Management Plan, to be prepared in support of the Secondary Plan and Local Official Plan Amendment(s).

Visits were made to the study area to screen for seasonal indicators of Significant Wildlife Habitat in November and December 2013, with particular attention paid to potential suitable habitats for open country Species-at-Risk birds that may exist: Barn Swallow, Bobolink and Eastern Meadowlark. Searches for other key wildlife habitat, including candidate Significant Wildlife Habitat and habitats for other potentially occurring Species-at-Risk, such as Chimney Swift and Monarch, were also conducted.

Dougan & Associates also conducted preliminary roadside breeding bird surveys in early July 2013. These surveys allowed for the collection of some breeding bird data and assisted in scoping the surveys undertaken in June 2014.

2014 Studies

As outlined in the Preliminary NHS Report (Dougan & Associates, June 2014), an Information Request Form was submitted to the MNRF on November 1, 2013, for any natural heritage features and element occurrences in the Bolton Residential Expansion Study area. A Species at Risk Screening letter was received from MNRF on January 2, 2014, outlining records for five Species at Risk: Bobolink, Butternut, Eastern Meadowlark, Redside Dace, and Snapping Turtle. All of these species were searched for during the 2014 field season.

As per the TRCA Terms of Reference for the Bolton Residential Study Comprehensive Environmental Impact Study and Management Plan (CEISMP) (August 20, 2013; see Appendix 1), additional field work was undertaken in 2014 to gather all of the required data. Refinement of the ELC boundaries determined in October and November, 2013, was undertaken in spring and summer, 2014. Particular attention was paid to wetland features as TRCA normally requires these habitats to be delineated in the growing season after May 1. The boundaries did not change significantly based on the refinement surveys.

Breeding bird surveys were conducted on Option 3 and the three Rounding Out Areas on June 7, 8, 21,

and 22, 2014. Surveys followed protocols established by the Ontario Breeding Bird Atlas (OBBA, 2001), which requires two surveys at least one week apart, between May 24 and July 12. The surveys took place between dawn and 10:00 a.m., and under appropriate weather conditions, that is, with light winds and no heavy rain. Species at Risk occurrences are discussed in Section 3.5.

Nocturnal amphibian surveys were conducted in the vicinity of wetland features on the Option 3 and Rounding Out Areas on April 25, May 27, and June 24, 2014. The surveys followed the Marsh Monitoring Program Protocols (BSC, 2003) which stipulate that the surveys take place from April 15 – 30, May 15 – 31, and June 15 – 30, between sunset and midnight, and with light winds, no heavy rain, and temperatures of above 5 °C (April), 10 °C (May), and 17 °C (June).

Spring and summer vegetation surveys took place in all key natural heritage features during 2014, up to early September to record seasonal composition within natural ELC polygons. The additional flora and ELC data collected in 2014 will be analyzed and documented as part of the CEISMP. The 2013-2014 field work and mapping fulfills the existing conditions and characterization requirements for Part A of the CEISMP, which will be submitted prior to proceeding to Part B of the CEISMP. Figure 7 summarizes ELC communities mapped on the Option 3 and Rounding Out Areas, as well as on adjacent lands. Figures 11 and 12 (see Section 3.7) present the updated Preliminary NHS.

2.6. STREAM MORPHOLOGY AND HEADWATER FEATURES

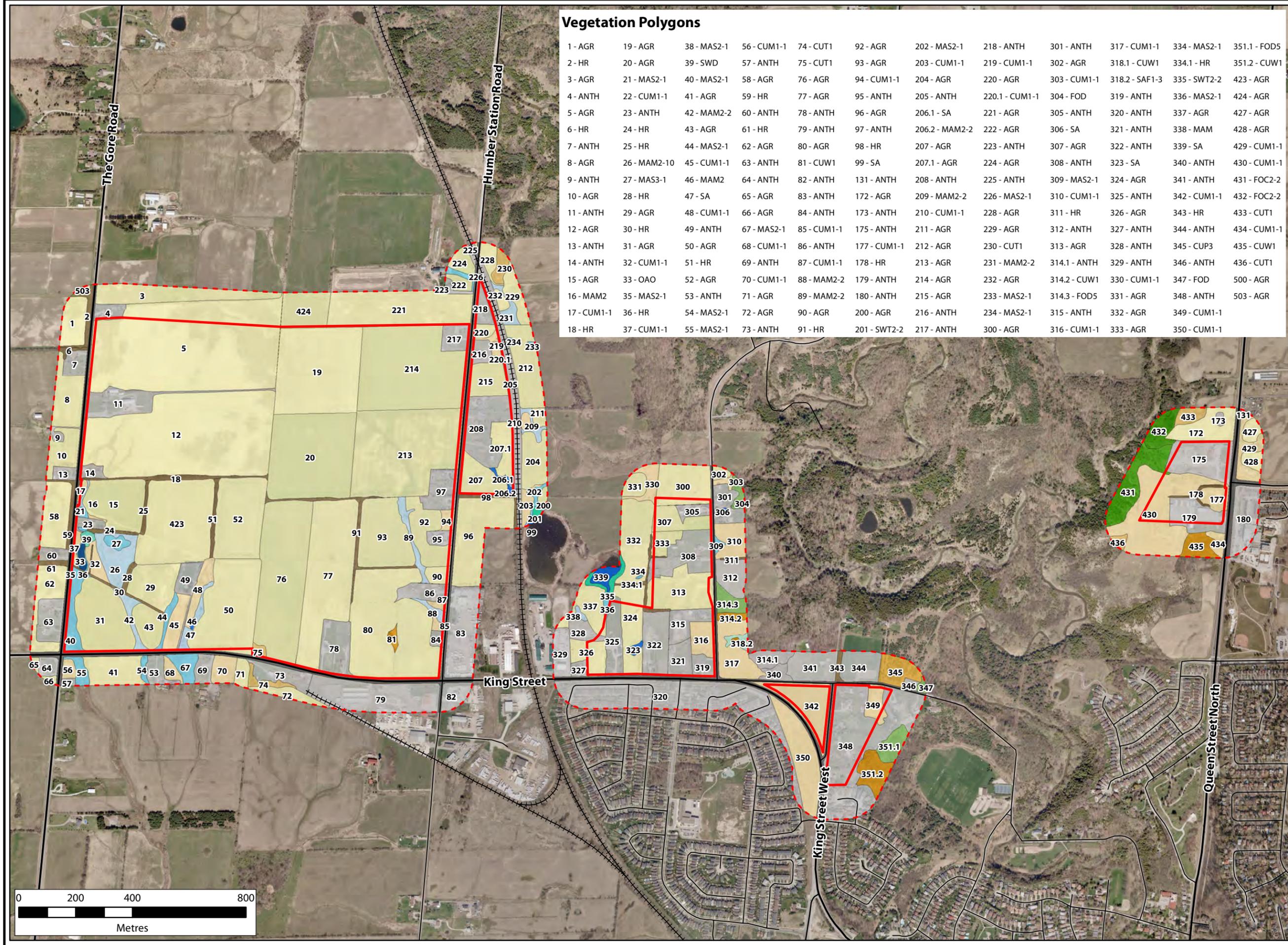
Unlike a watercourse with an identifiable and permanent channel in which flow of water occurs regularly or continuously, a headwater drainage feature (HDF) is not considered to be a permanently flowing drainage feature and are often first order or zero order intermittent and ephemeral channels. The alteration or removal of an HDF can have broad implications for water quality and quantity, recharge/infiltration, and the overall health of local HDFs and downstream habitats.

2.6.1. BACKGROUND REVIEW

The evaluation of HDFs within the Option 3 lands was undertaken following the most recent protocol developed by TRCA. The protocol Evaluation, Classification and Management of Headwater Drainage Features (TRCA, 2013), utilizes standard survey methods and a tiered study design to establish risk of functional impairment to an HDF through land development. The protocol takes into consideration the existing form and function of the HDF, and uses existing modules of the Ontario Stream Assessment Protocol (OSAP) to facilitate effective comparisons between features and ultimately the management recommendation.

Steps involved in HDF assessment include:

- **Evaluation;** desktop evaluation of HDFs to determine sampling locations and project scope,
- **Classification;** proper classification of HDF hydrology, riparian corridor and terrestrial habitat, aquatic habitat and fish communities.
- **Management Recommendation;** each HDF is given a management recommendation based on



Vegetation Polygons

1 - AGR	19 - AGR	38 - MAS2-1	56 - CUM1-1	74 - CUT1	92 - AGR	202 - MAS2-1	218 - ANTH	301 - ANTH	317 - CUM1-1	334 - MAS2-1	351.1 - FOD5
2 - HR	20 - AGR	39 - SWD	57 - ANTH	75 - CUT1	93 - AGR	203 - CUM1-1	219 - CUM1-1	302 - AGR	318.1 - CUW1	334.1 - HR	351.2 - CUW1
3 - AGR	21 - MAS2-1	40 - MAS2-1	58 - AGR	76 - AGR	94 - CUM1-1	204 - AGR	220 - AGR	303 - CUM1-1	318.2 - SAF1-3	335 - SWT2-2	423 - AGR
4 - ANTH	22 - CUM1-1	41 - AGR	59 - HR	77 - AGR	95 - ANTH	205 - ANTH	220.1 - CUM1-1	304 - FOD	319 - ANTH	336 - MAS2-1	424 - AGR
5 - AGR	23 - ANTH	42 - MAM2-2	60 - ANTH	78 - ANTH	96 - AGR	206.1 - SA	221 - AGR	305 - ANTH	320 - ANTH	337 - AGR	427 - AGR
6 - HR	24 - HR	43 - AGR	61 - HR	79 - ANTH	97 - ANTH	206.2 - MAM2-2	222 - AGR	306 - SA	321 - ANTH	338 - MAM	428 - AGR
7 - ANTH	25 - HR	44 - MAS2-1	62 - AGR	80 - AGR	98 - HR	207 - AGR	223 - ANTH	307 - AGR	322 - ANTH	339 - SA	429 - CUM1-1
8 - AGR	26 - MAM2-10	45 - CUM1-1	63 - ANTH	81 - CUW1	99 - SA	207.1 - AGR	224 - AGR	308 - ANTH	323 - SA	340 - ANTH	430 - CUM1-1
9 - ANTH	27 - MAS3-1	46 - MAM2	64 - ANTH	82 - ANTH	131 - ANTH	208 - ANTH	225 - ANTH	309 - MAS2-1	324 - AGR	341 - ANTH	431 - FOC2-2
10 - AGR	28 - HR	47 - SA	65 - AGR	83 - ANTH	172 - AGR	209 - MAM2-2	226 - MAS2-1	310 - CUM1-1	325 - ANTH	342 - CUM1-1	432 - FOC2-2
11 - ANTH	29 - AGR	48 - CUM1-1	66 - AGR	84 - ANTH	173 - ANTH	210 - CUM1-1	228 - AGR	311 - HR	326 - AGR	343 - HR	433 - CUT1
12 - AGR	30 - HR	49 - ANTH	67 - MAS2-1	85 - CUM1-1	175 - ANTH	211 - AGR	229 - AGR	312 - ANTH	327 - ANTH	344 - ANTH	434 - CUM1-1
13 - ANTH	31 - AGR	50 - AGR	68 - CUM1-1	86 - ANTH	177 - CUM1-1	212 - AGR	230 - CUT1	313 - AGR	328 - ANTH	345 - CUP3	435 - CUW1
14 - ANTH	32 - CUM1-1	51 - HR	69 - ANTH	87 - CUM1-1	178 - HR	213 - AGR	231 - MAM2-2	314.1 - ANTH	329 - ANTH	346 - ANTH	436 - CUT1
15 - AGR	33 - OAO	52 - AGR	70 - CUM1-1	88 - MAM2-2	179 - ANTH	214 - AGR	232 - AGR	314.2 - CUW1	330 - CUM1-1	347 - FOD	500 - AGR
16 - MAM2	35 - MAS2-1	53 - ANTH	71 - AGR	89 - MAM2-2	180 - ANTH	215 - AGR	233 - MAS2-1	314.3 - FOD5	331 - AGR	348 - ANTH	503 - AGR
17 - CUM1-1	36 - HR	54 - MAS2-1	72 - AGR	90 - AGR	200 - AGR	216 - ANTH	234 - MAS2-1	315 - ANTH	332 - AGR	349 - CUM1-1	
18 - HR	37 - CUM1-1	55 - MAS2-1	73 - ANTH	91 - HR	201 - SWT2-2	217 - ANTH	300 - AGR	316 - CUM1-1	333 - AGR	350 - CUM1-1	

Legend

Community Code

- AGR
- ANTH
- RD
- CUM
- CUT
- CUP
- CUW
- FOD
- FOC
- HR
- MAM
- MAS
- OAO
- SA
- SAF
- SWD
- SWT

Map Base

- ++++ Railway
- Final Options
- Final Options, 120m Buffer

Bolton Residential Expansion EIS Ecological Land Classification



PROJECT: DA13-041-01

CLIENT:

	DATE: SEPTEMBER 2014
	SCALE: 1:12,500
	DRAWN BY: LW
	CHECKED BY:

Figure: **7**

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation. MNR data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNR or the Ontario Government of such products.

- the above assigned classification. Potential recommendations include; protection, conservation, mitigation, recharge, maintain terrestrial linkage and no management required.

2.6.2. FIELD STUDIES

Two rounds of field investigations have been completed in order to accurately identify and evaluate the headwater drainage features within the Option 3 lands. An initial field assessment was completed in November 2013 and a report: Preliminary Headwater Drainage Feature Assessment: Mapping and Management Recommendations (Aquafor Beech, 2013) summarized the findings of the first round of evaluations.

Under TRCA HDF assessment protocol, multiple evaluations should be conducted in order to determine the presence and seasonality of sensitive biota as well as feature form and function. As such, a second round of evaluations was completed in April 2014. Since the initial 2013 field investigation, additional features were identified through ArchHydro mapping provided by the TRCA. These features were included in the second field investigation.

Each watercourse identified is separated using reach delineation. Reach delineation is an approach whereby a watercourse is spatially grouped by channel characteristics and processes. Stream reaches are lengths of channel that display relative homogeneity with respect to the controlling and modifying influences of channel form. As such, channel characteristics, functions and processes are relatively constant within a reach, and reaches can be used to help identify management objectives and restoration opportunities. Reaches were defined by key factors, including hydrology, gradient, geology, valley setting, sinuosity, and riparian vegetation.

A total of 4 headwater drainage features (HDFs) were identified within the Option 3 lands. These HDFs flow southeast within the study area and contribute water to the Humber River and West Humber River. Through the background review and field investigations, the HDFs were separated into a total of twenty-seven (27) reaches. The three Rounding Out Areas contain very localized HDF's.

3. PRELIMINARY CONSTRAINTS, OPPORTUNITIES AND PROPOSED MANAGEMENT STRATEGIES

3.1. PROPOSED LAND USES

It is anticipated that land uses will encompass low to high density residential, mixed use areas, natural heritage system (Environmental Protection Areas comprised of wetlands, stream corridors, buffers and enhancement areas), and stormwater management ponds. Land use concepts will be developed through a secondary planning process, supported by the CEISMP which will provide technical guidance on potential impacts, mitigation and environmental management.

3.2. SURFACE WATER RESOURCES

3.2.1. SUMMARY OF CONSTRAINTS AND POTENTIAL IMPACTS

The future Option 3 residential expansion lands will need to incorporate stormwater management measures to mitigate the hydrologic impacts of the proposed future urban development and associated loss of pervious surfaces. Stormwater management targets to be applied will generally be defined by the Toronto and Region Conservation Authority (TRCA) Stormwater Management Criteria document (August 2012), and the MOE Stormwater Management Planning and Design Manual (March 2003). The key control elements to be incorporated include the following:

- Water quality control;
- Erosion control;
- Flood (quantity) control;
- Water balance

Further description of the anticipated requirements for each of these controls is provided below.

Water Quality Control

In terms of water quality control, Level 1, or “Enhanced” water quality control is required. The MOE Stormwater Management Planning Manual defines the targets for water quality control. For stormwater management ponds servicing residential-type land uses (50% impervious), the following is required for water quality control:

- 140 m³/ha of permanent pool storage; and
- 40 m³/ha of active, extended detention storage.

It should be noted that the overall active storage required within the stormwater ponds will be governed by the larger requirements for flood control (see below). Therefore, the small amount of active storage specified above can be incorporated into the larger flood control storage requirements.

Erosion Control

Erosion control requirements are often determined based on the sensitivity and characteristics of the receiving streams. However, where detailed geomorphologic assessments and/or erosion threshold analyses are not available, a more general stormwater management target is often selected such that the majority of the most frequent storm events are captured and released at gradual flow rate.

Based on discussions with TRCA staff, it is recommended that, at this preliminary stage, erosion control targets similar to those applied in the recent 2012 Bolton Employment Lands Expansion Study be applied. For erosion control, sufficient extended detention storage is required within the future stormwater ponds to capture and release runoff from a 25mm storm event over 48 hours. Assuming a runoff coefficient of 0.5 for future residential land uses, the following conceptual targets are identified:

- 125 m³/ha of extended detention storage; and
- an average release rate of 0.72 L/s/ha.

Flood Control

To prevent an increase in downstream flood flow rates, quantity control storage will be necessary to attenuate stormwater runoff from the proposed future urban lands to pre-development levels. Pre-development release rates for the Humber River watershed are defined through a series of unit flow relationships which were established as part of the 1997 Humber River Watershed Hydrology/Hydraulics and Stormwater Management Study. Based on discussions with TRCA staff, it is understood that these unit flow rates are expected to be updated as part of a current TRCA hydrologic modelling study for the Humber River Watershed. Further, TRCA anticipates that post-to-pre control will be required for a full range of flood events from the 2-year to 100-year storm and for the Regional Storm event.

The precise storage requirements for the residential expansion lands cannot be determined until the TRCA hydrologic modeling study is complete, however, based on experience from the recent 2012 South-Albion Bolton Employment Lands Expansion Study, stormwater ponds designed for Regional Storm control are anticipated to require up to approximately 1,200 m³/ha of extended detention storage, and occupy approximately 10% to 15% of the drainage areas which they serve.

Water Balance

The residential expansion lands will also require stormwater measures to minimize impacts to the overall hydrologic cycle, maintain the current water balance and groundwater recharge. It is anticipated that this will be accomplished through the use of Low Impact Development (LID) measures. Further discussion is provided in Section 3.3.

In summary, it is anticipated that the water balance targets will be met through the use of LID source and conveyance control measures which will be incorporated into individual lots and/or roadways. The water quality control, erosion control, and flood control targets will be met through the use of permanent pool and extended detention storage within future stormwater management ponds.

Figure 8 illustrates conceptual stormwater pond locations and corresponding drainage areas within the Option 3 expansion lands. The locations are based on a cursory review of the existing topography, drainage patterns, and environmental constraint areas. It is understood that the exact number of ponds, their locations and sizes are unknown at this point in time, and will ultimately depend on the finalized development limits, future road network, location and depth of suitable pond outlets, fragmentation of land ownership, and ability to co-ordinate the timing of the various development sites through future functional servicing studies. Further planning and design for the stormwater ponds is expected to be governed by the following:

- 2012 TRCA Stormwater Management Criteria document (general stormwater management targets and sizing requirements);
- 2003 MOE Stormwater Management Planning and Design Manual (water quality and erosion

- control storage requirements, general design characteristics);
- Current TRCA Humber River Hydrology Update Study (flood control release rates and storage requirements);
- TRCA Stream and Valley Corridor Management Program (siting of the ponds and outlets relative to defined valleys);
- Town of Caledon Standards (general drainage, grading and pond design characteristics)

In terms of relative requirements, the flood control storage requirements for Regional Storm control are expected to be much larger than the erosion control and water quality control requirements. Therefore, the overall size and land requirements for the stormwater ponds will be defined largely by the flood control criteria. The sizing of the conceptual ponds illustrated in **Figure 8** is not based on any modelling results, rather, a conservative estimate of 15% of the contributing drainage area has been assumed based on experience from the recent 2012 South-Albion Bolton Employment Lands Expansion Study. This figure includes allowances for:

- permanent pool for water quality;
- extended detention for erosion control and flood (quantity) control of the Regional Storm;
- pond side slopes; and
- maintenance access roads.

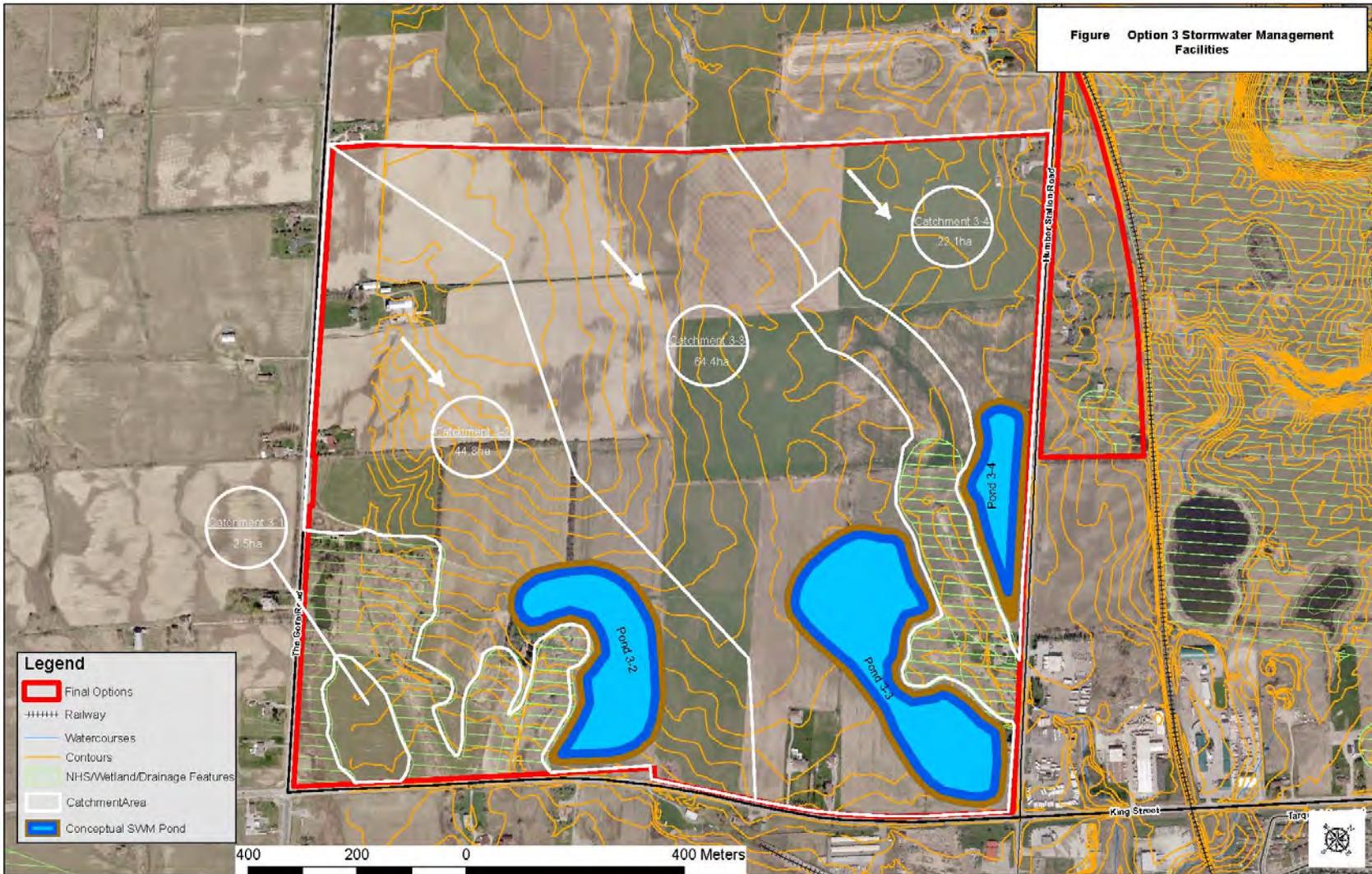


Figure 8 – Option 3 Stormwater Management Facilities

3.3. GROUNDWATER RESOURCES

3.3.1. SUMMARY OF CONSTRAINTS AND POTENTIAL IMPACTS

As discussed in Section 3.2, the Option 3 residential expansion lands will require stormwater measures to minimize impacts to the overall hydrologic cycle, maintain the current water balance and groundwater recharge. It is anticipated that this will be accomplished through the use of Low Impact Development (LID) source and conveyance control techniques within the future development lands which infiltrate, evapotranspirate, or re-use stormwater.

The water balance target criteria will ultimately be chosen based on the current soils and groundwater recharge characteristics of the area, which are anticipated to be similar to those derived for the Albion-South Bolton CEISMMP, where a design target of 5mm of retention was applied for LID measures.

Source control LIDs would be implemented on individual lots, while conveyance control LIDs would be incorporated into the overland flow routes between lots and/or within road rights-of-way. Further planning and design for the LID measures is expected to be governed by the following:

- 2012 TRCA Stormwater Management Criteria document (general stormwater management targets and sizing requirements);
- 2010 TRCA Low Impact Development Stormwater Management Planning and Design Guide (detailed design and sizing for individual LID measures);
- Town of Caledon Standards (general drainage and grading requirements)

3.4. STREAM MORPHOLOGY AND HEADWATER FEATURES

3.4.1. SUMMARY OF CONSTRAINTS AND POTENTIAL IMPACTS

Following completion of the two onsite field investigations, management recommendations were developed for the various reaches of the four identified headwater drainage features within the Option 3 lands. The recommendations are based on classifications of flow attributes and functions contributing to aquatic and terrestrial habitat (Figure 9 – HDR Management Recommendations Flow Chart, TRCA, 2013). A summary of management recommendations for the Option 3 Lands along with their headwater features is illustrated in Figure 10.

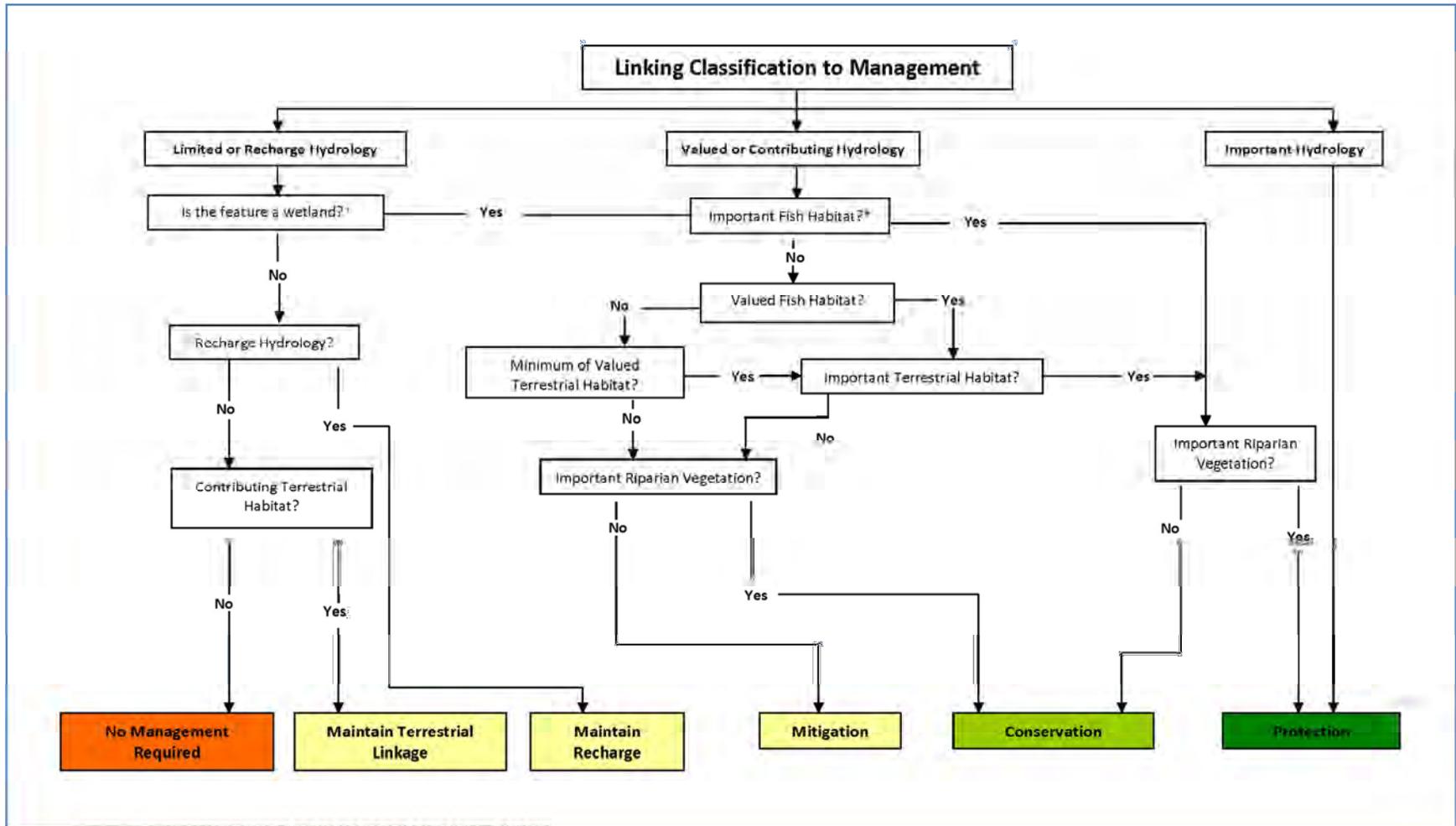


Figure 9 – HDF Management Flow Chart (TRCA, 2013)

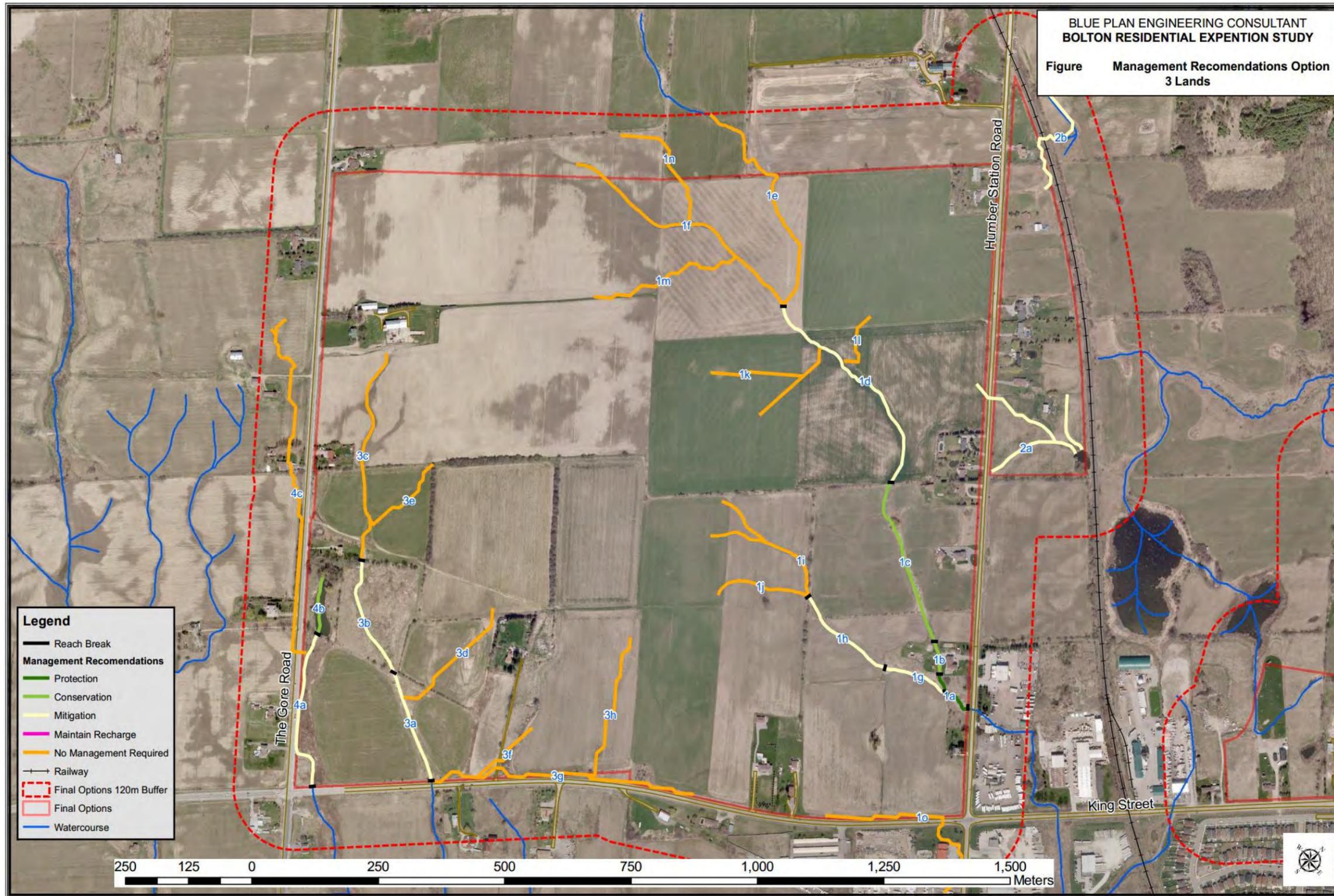


Figure 10 – HDF Management Recommendations

3.5. AQUATIC RESOURCES

3.5.1. SUMMARY OF CONSTRAINTS AND POTENTIAL IMPACTS

All of the watercourses flowing across the Option 3 lands are considered headwater drainage features (HDF) and therefore often do not have the same complex functions or aquatic communities that are found in larger downstream watercourses that are permanently or seasonally flowing. Nonetheless, HDFs can account for a significant portion of the catchment area of a stream system and are considered important sources of water, sediment, nutrients, organic matter, and food to downstream reaches. Therefore it is important to maintain their current functions given the downstream habitats that includes MNRF designated Redside Dace habitat.

More than half of the watercourses on the Option 3 lands are considered "contributing" habitats. While these watercourses can be relocated or eliminated, it is important that their subwatershed boundaries are respected and their functions be replicated using Low Impact Development (LID) measures such as lot-level conveyance measures (e.g. vegetated swales).

Two of the watercourses on the Option 3 lands have downstream sections that are considered seasonal habitat. These have permanently standing water but flow is apparently intermittent. One of these watercourses that occurs along the west side of Option 3 also has an on-line pond. Both of these watercourse sections support populations of Brook Stickleback (*Culaea inconstans*), and a single dead Cyprinid (minnow family) was found in the on-line pond, suggesting that the pond may support at least one additional species. Brook Stickleback are commonly found in HDFs in southern Ontario, and are commonly the only fish species captured in such habitats. Stewart and Watkinson (2004) state that it commonly moves into man-made drainage ditches and stormwater management ponds, and in other habitats that go dry as summer progresses. These types of watercourses must be retained on the landscape, but can be relocated using natural channel design techniques to maintain or enhance productivity.

The three Rounding Out Areas contain small headwater features which are highly modified and not fish habitat, either because flows are intermittent, or barriers (i.e. perched culverts) are present. These features can likely be modified or eliminated, if functions are maintained.

3.6. TERRESTRIAL RESOURCES

3.6.1. SUMMARY OF CONSTRAINTS AND POTENTIAL IMPACTS

3.6.1.1. VEGETATION

Figure 7 presents the current ELC community mapping for Option 3 lands and Rounding Out Areas. ELC determination followed Lee et al. (1998).

The Option 3 lands are primarily agricultural with active field crop production in most of the area. Natural and cultural vegetation features include cultural woodlands (hedgerows), cultural meadows, and wetlands (meadow marsh, thicket swamp, open aquatic). There are no forested areas present. Wetlands predominantly occupy riparian margins at the south end of the lands, and include impounded areas created for agricultural purposes. One of these tributary systems (2a on Fig. 11) drains toward the CNR tracks just east of Option 3 lands; the downstream system contains the Bolton Provincially Significant Wetland Complex, a portion of which is contained within adjacent lands to Option 3 (i.e. within 120 m). Heavy clay soils are associated with the most extensive wetland cover, close to Gore Road. Small wetlands are associated with tributaries (3 and 4 on Fig. 11) which cross a former rail spur embankment and King Street to the south. TRCA has been engaged with a landowner on restoration works in the southwest corner of Option 3 lands (L. Lee-Yates, pers. comm., 2014); plantings of wetland trees and shrubs were observed in several of the features, and a flow control structure has been installed on a small headwater tributary (3b) which crosses a former railway spur embankment.

Based on available information, none of the wetlands have been evaluated under the Ontario Wetland Evaluation System, however all are regulated by TRCA. The Preliminary NHS identifies potential buffers/enhancement areas for these features; these are shown on figures 12 and 13. The more confined wetland units are closely tied to the riparian zones of headwater drainage features, most of which did not meet criteria for protection *in situ* as part of the headwater features assessment (see Figure 10). Given the localized character of the wetlands, there are opportunities to maintain and enhance their functions as part of the future NHS, including integration with naturalized stormwater features and enhanced riparian corridors. This will be addressed in the CEISMP.

The Rounding Out Areas generally lack natural heritage features with the exception of a small marsh pocket (<0.5 ha) located in the centre of the Duffys Lane Rounding Out Area. The balance of the Rounding Out Areas are in residential, agricultural, commercial and public works uses. Portions of the Greenbelt Natural Heritage System extend within adjacent lands to all of the Rounding Out Areas. The Preliminary NHS (Figures 11 and 12) identifies buffer and enhancement areas to protect the off-site natural features. These will be studied further in the CEISMP as land use options are considered in greater detail.

Plant composition data has been collected during three seasons of field studies completed in 2013 and 2014; this will be presented in Part A (Characterization) of the Comprehensive Environmental Impact Study and Management Plan, to be prepared in support of the Secondary Plan and Local Official Plan Amendment(s).

3.6.1.2. WILDLIFE

Birds

Option 3 Lands

A total of 48 species of birds were detected possibly breeding during the 2013 and 2014 breeding bird surveys. Most of these species are common and widespread in southern Ontario, and are representative of mostly open habitats, with isolated patches of woodlands, hedgerows, small wetlands, and limited riparian habitats.

Duffys Lane Rounding Out Area

A total of 29 species of birds were detected in this area during 2013 and 2014 breeding bird surveys. All of the species detected are common and widespread in open agricultural habitats in southern Ontario.

Chickadee Rounding Out Area

A total of 30 species of birds were detected in 2013 and 2014 at the Chickadee Rounding Out Area. All of them are common and widespread in southern Ontario in suburban and forested settings.

Columbia Way/Highway 50 Rounding Out Area

A total of 34 species were detected at this area in 2013 and 2014, all of which are common and widespread in southern Ontario in open field and disturbed habitats.

Reptiles and Amphibians

During nocturnal amphibian surveys, a total of five (5) species of amphibians were detected, all common and widespread in southern Ontario: Spring Peeper, Wood Frog, Gray Treefrog, Green Frog, and American Toad. For the most part, these species were in relatively low numbers although full choruses were detected in some locations. Most of the observations were in wetland and open water areas that are contained within the proposed Natural Heritage System. The Option 3 area contained numerous sites with calling amphibians, whereas the Duffys Lane Rounding Out Area only had one site (a small unevaluated wetland just north of King Street) and neither the Chickadee nor Columbia Way/Highway 50 Rounding Out Areas had calling amphibians within the site or in adjacent lands.

Two species of turtles were detected: Painted Turtle and Snapping Turtle. Painted Turtle and Snapping Turtle were both observed in the small unevaluated wetland in the Duffys Lane Rounding Out Area. Snapping Turtle, which is Special Concern in Ontario, is discussed in more detail in section 3.6.1.3 below. This feature is relatively close to the Bolton PSW complex which contains extensive ponded areas.

3.6.1.3. SPECIES AT RISK (TERRESTRIAL AND AVIAN)

MNRF was contacted in November 2013 to initiate engagement regarding potential approaches to address any Species at Risk (SAR) issues that may arise on the Option 3 lands. To date the interactions with MNRF have been as follows:

- November 1, 2013 – submitted Species at Risk Information Request Form for the BRES Option 3 study area to Aurora District MNRF;
- November 13, 2013 – correspondence with Steve Strong (District Planner, Aurora MNRF) to arrange a meeting to discuss SAR approach for the study area;
- December 19, 2013 – meeting at Caledon East Town Hall with Steve Strong and Jackie Burkhart (Planners, Aurora MNRF) to discuss SAR matters and an integrated approach to accommodating these species early in the residential expansion planning process;
- January 2, 2014 – Species at Risk screening letter received from Melinda Thompson (SAR Biologist, Aurora District MNRF) listed five (5) Species at Risk as being on record in the vicinity: Redside Dace, Butternut, Bobolink, Eastern Meadowlark, and Snapping Turtle;
- April 25, 2014 – communication with Mark Heaton, Aurora District MNRF Biologist regarding fish sampling in Option 3 Area.

The discussion with MNRF planning staff in December 2013 concerned the fact that the lands in the recommended option area will likely not undergo development until after 2017-2018 based on the timing of approvals that are required, which therefore affords an opportunity to plan for SAR in a more strategic manner. Specifically, MNRF would like to move toward addressing protection of SAR habitats and species at a landscape system level rather than on a case-by-case basis. This would require that the Town and Region, in cooperation with MNRF, proceed with a larger scale examination of an approach to identify or create “stronghold areas” for individual SAR. Since Species at Risk were determined to be present in the residential expansion area, compensation that helps to create and maintain strongholds will result in a “net benefit” for the species, as per the ESA (2007), in a manner that addresses the anticipated expansion of the Town in Bolton and elsewhere.

During 2014, further seasonal field studies were undertaken to clarify the status of SAR already on record in the vicinity, and determined what others were present. The findings will be summarized in the CEISMP Part A Characterization Report in the Fall of 2014, and impacts will be evaluated in the Part B Report in 2015 once a Secondary Plan concept is available. By this time it is recommended that discussions between the Town of Caledon, Region of Peel and MNRF should proceed towards a separate study to identify a comprehensive, landscape system approach to ensure “net benefit” for particular SAR species and their habitats.

Birds

Option 3 Lands

Of 48 species detected during the breeding bird surveys, four (4) are considered Species at Risk:

Barn Swallow (Threatened), Bank Swallow (Threatened), Bobolink (Threatened), and Eastern Meadowlark (Threatened). These species are summarized below:

- Barn Swallow – a total of 14 birds were seen at six locations within the Option 3 lands;
- Bank Swallow – one (1) bird was seen flying over Humber Station Road on July 13, 2013; given the habitat in this location and the surrounding areas, it was not likely breeding locally;
- Bobolink – a total of at least 42 birds were seen in six general locations within the Option 3 lands;
- Eastern Meadowlark – a total of six (6) birds, all individual birds singing, were seen at six locations within the Option 3 lands;

Duffys Lane Rounding Out Area

Of 29 species detected during the breeding bird surveys, two (2) are considered Species-at-Risk: Barn Swallow and Eastern Meadowlark. These two species are discussed below:

- Barn Swallow – a total of 11 birds were seen at four locations;
- Eastern Meadowlark – a single singing bird was detected along Humber Station Road on both breeding bird surveys.

Chickadee Rounding Out Area

Two (2) of the 29 species tallied during the breeding bird surveys are considered Species at Risk: Eastern Wood-Pewee (Special Concern) and Barn Swallow (Threatened). These two species are discussed as follows:

- Eastern Wood-Pewee – a single bird was heard singing on July 13, 2013, in the woods to the north side of Glasgow Road, in the northwest corner of the area;
- Barn Swallow – a single bird was detected on June 8, 2014, foraging over the open lawn of the residence at the northwest corner of Glasgow Road and Chickadee Lane.

Columbia Way/Highway 50 Rounding Out Area

Two (2) of the 34 bird species observed during the breeding bird surveys are considered Species at Risk: Eastern Wood-Pewee (Special Concern) and Barn Swallow (Threatened). They are discussed below:

- Eastern Wood-Pewee – a single bird was heard singing on June 21, 2014; it was well outside the area, in the Humber River valley to the west. There is no suitable habitat for this species within this Rounding Out Area;
- Barn Swallow – four (4) birds were seen foraging over the open fields to the south of the area, but within the 120 metre adjacent lands. Given the numerous structures and buildings in the area, it is very likely that they were nesting locally.

Other wildlife

- Snapping Turtle (Special Concern) – a single Snapping Turtle was detected at the small unevaluated wetland in the Duffys Lane Rounding Out Area. It likely occurs at the pond on the east side of The Gore Road, just north of King Street.
- Monarch (Special Concern) – two (2) butterflies were seen in the Columbia Way/Highway 50 Rounding Out Area on June 21, 2014; however, there are a number of stands of Common Milkweed in the Option 3 and two other Rounding Out Areas so it is likely this species can be found potentially breeding elsewhere.

Flora

No plant species designated as Species at Risk were identified in Option 3 or the Rounding Out Areas during the three seasons of fieldwork conducted to date. One putative Butternut tree (provincially Endangered) was observed on the Greenbelt NHS just east of the adjacent lands to the Chickadee Rounding Out Area in September 2014; it is located well beyond the potential development area. Based on the other habitats that are present, it is considered unlikely that other plant Species at Risk are present.

3.7. PRELIMINARY NHS (REFINED)

The Preliminary NHS (Figures 11 and 12) identifies the areas that will be protected, enhanced and buffered as part of future development. This system was originally mapped as part of the Draft Natural Heritage System Report which was presented to Council and the public in February-March 2014, and circulated to the Region of Peel and TRCA for comment and formed part of the information supporting Council's June 24, 2014 decision to approve Option 3 and the three Rounding Out Areas as the preferred expansion area. It has now been refined to reflect new field information, including some refinement of feature polygons, and generic identification of Species of Risk locales. Potential restoration and enhancement areas were previously identified using ELC community mapping with only minor changes.

The proposed NHS will be considered within the CEISMP and accompanying secondary planning process. Opportunities to integrate the system with complementary land uses such as stormwater management, LIDs and parkland will be examined. The functioning of the watercourses in the future landscape will be examined to determine best management practices to reinforce functions that affect downstream habitats, including those for Redside Dace.

3.7.1. BUFFERS, RESTORATION OR ENHANCEMENT OPPORTUNITIES

Table 4 identifies the potential buffers and enhancement areas for the NHS identified in Figures 11 and 12; these will be reviewed and potentially refined as part of the CEISMP process, subject to policy-based review and approval by TRCA, Region of Peel, and the Town of Caledon. Based on feedback at

meetings and a recent site walk, no specific comments or concerns regarding the Preliminary NHS were identified. Some headwater drainage features are subject to relocation, and this may affect the ultimate form of the system. Parks and stormwater management uses may be complementary uses which affect buffer requirements.

In general, the proposed NHS will substantially expand natural cover in the areas indicated, based on the placement of buffers and enhancement areas. Subject to the environmental management guidance of the CEISMP, a series of consolidated riparian, wetland and upland habitats will take place within the identified NHS. It is expected that the future system will include wooded cover and habitat elements that are not present in the current landscape. On a subwatershed basis, the expansion of natural cover and connectivity in this headwater location will complement functions along stream reaches to the south, including those supporting Redside Dace.

Table 4. Natural Heritage System Buffers

NHS COMPONENT	GUIDING LEGISLATION / POLICY						PROPOSED BUFFER
	Region	Town	FFA	ESA	GbP/ORM	TRCA	
Significant Habitat of Endangered and Threatened Species	X	X		X			TBD
Wetlands: Provincially Significant and Non-significant (Evaluated)	X	X					30 metres
Wetlands: Unevaluated	X	X					15 metres
Significant Woodlands	X	X					N/A
Significant Valleylands	X	X					TBD
Significant Wildlife Habitat	X	X		X			N/A
Fish Habitat			X	X			15-30 metres
Greenbelt / ORM NHS					X		30 metres (N/A)
Regulated Areas						X	15-30 metres from regulated feature

- Region of Peel and Town of Caledon policies reflecting the Provincial Policy Statement (2014) issued under the Planning Act (1990)
- FFA - Federal Fisheries Act (1985)
- ESA - Endangered Species Act (2007)
- GbP - Greenbelt Plan (2005)
- ORM – Oak Ridges Moraine Conservation Plan (2002)
- Conservation Authorities Act (TRCA Regulation) – Section 3(1) of the Regulation permits development within regulated areas
- TBD – requires further field study and/or confirmation with MNRF or TRCA
- N/A – component not present within Option 3/Rounding Out Areas

4. POLICY COMPLIANCE

Figures 11 and 12 present the updated Preliminary Natural Heritage System for the Option 3 lands and the Rounding Out Areas. Natural features and watercourses form the basis for the basic NHS framework, supplemented by buffers, restoration and enhancement areas. Appropriate preliminary buffers for the natural heritage components were assigned under relevant environmental legislation and policies. This report also summarizes the high level conditions with respect to ground and surface water resources, and provide conceptual direction on management practices that will be specified in the CEISMP, based on more detailed analysis and modelling.

The following key legislation and policy documents have been addressed by this report:

- Region of Peel Policy 7.9.2.12 (e) which requires *“environmental and resource protection and enhancement including the identification of a natural heritage system”*
- Other Region of Peel and Town of Caledon policies reflecting the Provincial Policy Statement (2014) issued under the Planning Act
- Endangered Species Act
- Greenbelt Plan
- Federal Fisheries Act
- Conservation Authorities Act (TRCA Regulation)

Based on the guiding legislation and policies, the following categories of natural heritage features and ecological functions were used to delineate the Preliminary NHS:

1. **Significant Habitat of Endangered and Threatened Species** – this category was divided into a) terrestrial and b) aquatic. Species at Risk are on record in the vicinity of the BRES according to terrestrial, aquatic and avian species. Open country Threatened bird species associated with active agricultural lands and barns are present in Option 3 and the Rounding Out Areas; discussion was initiated with MNRF regarding a comprehensive strategy for the listed species (see Section 3.6.1.3).
2. **Wetlands** – No Provincially Significant Wetlands are present within Option 3, or the Rounding Out Areas; a PSW complex is present to the east of Option 3 which extends onto adjacent lands to Option 3 and the Duffys Lane Rounding Out Area. All identified wetlands in the Option 3 lands and Rounding Out Areas are included in the updated Preliminary NHS.
3. **Significant Woodlands** – The Region of Peel and Town of Caledon have significant woodland policies in conformity with the PPS. Option 3 lands do not contain any woodlands within or adjacent to the defined option boundary. Rounding Out Areas also do not contain significant woodlands but they are present within the adjacent lands of

each area, and are part of the Greenbelt NHS.

4. **Significant Valleylands** – The Region of Peel has significant valleyland policies in conformity with the PPS. Option 3 does not contain ravine features; portions of tributary 1a-c likely have a regulated floodplain, and the headwater tributaries in Option 3 and the Highway 50 Rounding Out Area are all linked to downstream natural features as well as occupied habitat for Redside Dace, an Endangered species.
5. **Significant Wildlife Habitat** – the Region of Peel and Town of Caledon have significant wildlife habitat (SWH) policies in conformity with the PPS, although there is no Town, MNRF or TRCA data or mapping of SWH to date. In general, SWH is usually aligned with specialized habitats such as wetlands, larger forested areas, extensive successional cover, or vegetated valleylands. Field assessments in 2013 and 2014 did not identify specific SWH candidate areas in Option 3 or the Rounding Out Areas.
6. **Fish Habitat** – has been classed using the *Evaluation, Classification and Management of Headwater Drainage Features: Interim Guidelines* (CVC and TRCA, 2009), since all watercourses within the Option 3 area are small first or second order watercourses. This system classes small watercourses as Permanent (continuously flowing), Seasonal (flows intermittently but has a fish community), Complex Contributing (intermittent flow, no fish, and with hydrophilic vegetation and/or a flow-formed channel), Simple Contributing (ephemeral flow, no fish, and with terrestrial vegetation and/or no flow-formed channel), and Not Fish Habitat. It should be noted that, based on mapping provided to the Town of Caledon by the Ontario Ministry of Natural Resources and Forestry, there is occupied Redside Dace habitat downstream from Option 3. Therefore, since Option 3 drains to occupied habitat tributaries, headwater drainage features, wetlands and groundwater recharge or discharge areas within those areas may be considered indirect Redside Dace habitat if they affect occupied habitats downstream. As such, the maintenance of baseflows, cool or coldwater conditions, and water quality are all important functional considerations. However, irrespective of whether Redside Dace is supported, fish habitats are federally regulated resources that are reliant on physical conditions (surficial soils and topography, surface and groundwater).

Only drainage features with watercourse management recommendations of “Protection” (Permanent) and “Conservation” (Seasonal) were included within the proposed NHS; these must be either protected in place, or may be relocated, respectively. Other drainage features classed as Complex Contributing or Simple Contributing have the watercourse management recommendation of “Mitigation”, and can be removed subject to replication of functions.

7. **Greenbelt Plan Boundaries** – portions of the Greenbelt Protected Countryside border components of the study area. These contain rural and agricultural land uses and

relatively high concentrations of natural habitat. Greenbelt lands also occur on adjacent lands to the three Rounding Out Areas.

8. **Regulated Areas** – features and watercourses are present within the BRES Study Area that are regulated by TRCA. Based on the work conducted by Aquafor Beech and C. Portt and Associates, those watercourses with regulated limits are shown on the proposed NHS map for Option 3 (Figure 12). Regulated areas are also associated with wetlands and floodplains; regulated features are present in Option 3 and their adjacent lands. They are only present in the adjacent lands to Rounding Out Areas. The features triggering Regulated Areas are protected within the proposed NHS.
9. **Vegetated Protection Zones (VPZ)** – the widths of these buffer zones were determined based on applicable legislation and policy for each of the natural heritage features. Natural feature buffers and watercourse setbacks are shown as 15 to 30 metres.
10. **Corridors** – these have been delineated in association with identified watercourses that are to be retained based on assessments in November 2013. Hedgerows have been identified on the Preliminary NHS map, but are not considered part of the proposed NHS due to their limited size and vegetative composition. These will be addressed in the CEISMP.
11. **Restoration and Enhancement Areas** – these were identified based on ELC categorization (e.g. cultural woodlands or successional habitats), pre-existing restoration areas (e.g. plantings in cultural meadows), proposed buffers, and proposed watercourse corridors. They are part of the proposed.

Areas of Natural and Scientific Interest (ANSIs) are not present in the vicinity of the BRES Study Area and therefore are not included in the Preliminary NHS.

5. RECOMMENDATIONS FOR LOPA STUDIES

In addition to the preliminary investigations and analyses outlined above, there will be further study requirements in support of the LOPA process. In this regard, Appendix 1 contains the draft Terms of Reference for the CEISMP from TRCA and the Region. A draft Table of Contents prepared by the consultant team is provided in Appendix 2. The Table of Contents outlines the contents of the report that will be submitted in support of the LOPA process.

6. CONCLUSIONS

This background study for Option 3 lands builds on the previous BRES phases which included:

- a) strategic subwatershed-focused, environmental screening of potential residential development areas in Bolton;
- b) targeted seasonal field studies of terrestrial, aquatic and stream resources in two short-listed options areas; and
- c) preparation and evaluation of Draft Natural Heritage Systems for each option.

Surface and groundwater resources have been characterized at a background level that will require verification through more intensive field monitoring. The site-specific studies completed to date have validated the earlier screening process; no issues have been identified that would significantly constrain development, or that cannot be addressed through conventional environmental management strategies consistent with the policy frameworks of the Province, Region and Town. The studies conducted to date will contribute to the characterization within the CEISMP process in support of the Local Official Plan Amendment, and are in accordance with the direction of Terms of Reference provided by TRCA and the Region of Peel. Therefore the Objectives of the present study as summarized in Section 1 have been achieved.

This report has addressed the study requirements and policy areas that are required to support a Region Official Plan Amendment for the expansion of the urban boundary. The report reflects the outcome of the BRES planning and consultation process over two years. The criteria that formed the basis for the short-listing of Option 3 and three Rounding Out Areas in June 2013 have been further validated by field and background studies. This information forms a sound basis for the commencement of Part A of the CEISMP in accordance with the Terms of Reference provided by TRCA and the Region of Peel.

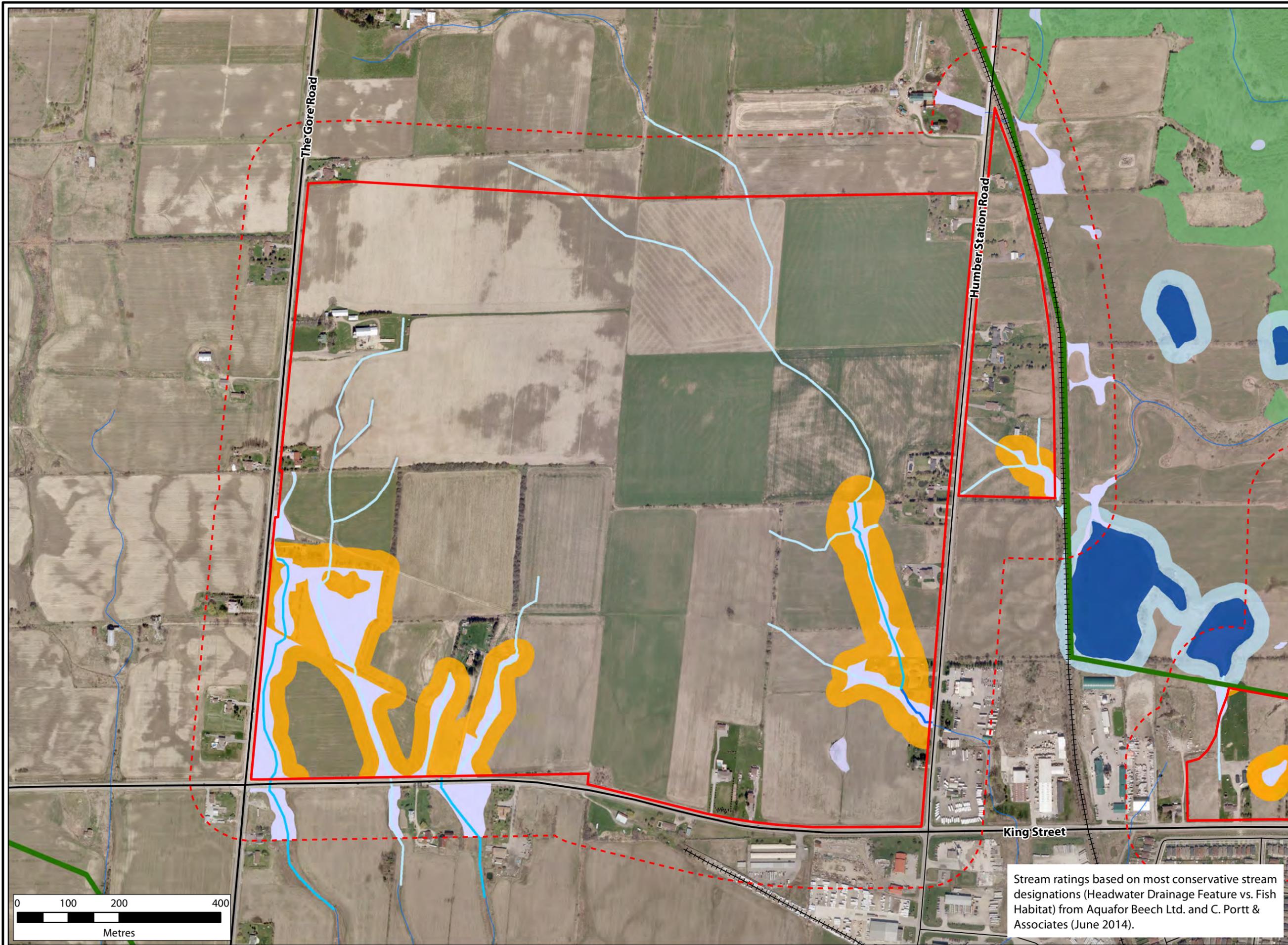
Respectfully submitted:



Jim Dougan, B.Sc., M.Sc., OALA (Hon)
Principal and Senior Ecologist
Dougan & Associates

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Legend

Aquatic Habitat Classes

- Protection
- Conservation
- Mitigation / No Management
- Watercourse (unevaluated)

Wetlands

- Provincially Significant Wetland
- Other Wetland
- Unevaluated Wetland
- PSW 30m Buffer

NHS Features

- Enhancement / Restoration
- Greenbelt Plan Boundary
- Oak Ridges Moraine
- Significant Woodlands (>4ha)

Map Base

- Railway
- Final Options
- Final Options, 120m Buffer

Bolton Residential Expansion Study
 Preliminary Natural Heritage System
 Updated August 2014



PROJECT: DA13-041-01

CLIENT:

	DATE: OCTOBER 2014
	SCALE: 1:7,000
	DRAWN BY: LW
	CHECKED BY: JD/IR

Figure: **11**

Stream ratings based on most conservative stream designations (Headwater Drainage Feature vs. Fish Habitat) from Aquafor Beech Ltd. and C. Portt & Associates (June 2014).

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation. MNR data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNR or the Ontario Government of such products.



Legend

Aquatic Habitat Classes

- Protection
- Conservation
- Mitigation / No Management
- Watercourse (unevaluated)

Wetlands

- Provincially Significant Wetland
- Other Wetland
- Unevaluated Wetland
- PSW 30m Buffer

NHS Features

- Enhancement / Restoration
- Greenbelt Plan Boundary
- Oak Ridges Moraine
- Significant Woodlands (>4ha)

Map Base

- Railway
- Final Options
- Final Options, 120m Buffer

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Figure: **12**

Stream ratings based on most conservative stream designations (Headwater Drainage Feature vs. Fish Habitat) from Aquafor Beech Ltd. and C. Portt & Associates (June 2014).

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APPENDIX 1

Bolton Residential Expansion Study

Recommended Terms of Reference for Phase 3 Comprehensive Environmental Impact Study and Management Plan (CEISMP)

Prepared by TRCA and Region of Peel Staff

August 20, 2013

1.0 STUDY PURPOSE AND OBJECTIVE

The purpose of the Comprehensive Environmental Impact Study and Management Plan (CEISMP) is to conduct an impact assessment and develop a management plan for the natural environment potentially affected by urban development associated with the expansion of the Bolton Rural Service Centre to accommodate future residential growth to 2031. The management plan will inform planning and decision making so that changes in land use are compatible with natural systems and consistent with the Provincial Policy Statement (PPS) and applicable Region of Peel and Town of Caledon Official Plan policies.

The CEISMP shall include the completion of impact modeling based on land use scenario(s) developed and refined in the first phases of the Study (Parts A and B). The CEISMP will provide a sufficient level of detail and give clear direction for the implementation of development in accordance with the PPS, the Region of Peel Official Plan and the Town of Caledon Official Plan. The CEISMP study may be completed in a phased manner that will provide appropriate documentation of the municipal comprehensive review requirements for both the Regional and Town of Caledon Official Plan Amendments. The study will be completed in accordance with applicable Provincial, Conservation Authority, Regional and Municipal requirements.

1.1 Addressing Regional MCR Requirements in 7.9.2.12 e) and p)

The policy in 7.9.2.12 e) and p) requiring the demonstration of environmental protection shall be addressed through the completion of a CEISMP as outlined below. This study will address environmental and resource protection and enhancement including the identification of a conceptual natural heritage system, at a Regional scale, in accordance with the ROP policies. Requirements to enable a Regional Official Plan Amendment to proceed will be satisfied through:

1. Completion of all of the Part A Existing Conditions and Characterization;

2. Substantial completion of the Part B Impact Assessment and Detailed Studies components of the CEISMP terms of reference;
3. Identification of Core Areas of the Greenlands System, if any; and
4. Identification of a conceptual natural heritage system to the satisfaction of the Region and Town of Caledon, in consultation with the TRCA and other agency staff (e.g. Ministry of Natural Resources).

The substantial completion of the Part B component must **at a minimum** include setting the detailed targets for each discipline (e.g. ecology, surface water, groundwater, etc.) based on the detailed existing characterization of conditions completed in Part A; and establishing the conceptual plans/measures to meet those targets. For example, establishing a conceptual Low Impact Development (LID) plan that demonstrates mitigation measures that would be appropriate for meeting the site water balance targets would be required; and the detailed plan would be finalized through the completion of the CEISMP. Finalization of the CEISMP to the end of Part C and detailed refinement and finalization of natural heritage system boundaries will not be necessary for the purposes of satisfying Regional level approvals for a ROPA.

Additional direction to address Regional MCR requirements are outlined below:

- The CEISMP study component will identify a conceptual natural heritage system utilizing existing available inventories of natural features and areas supplemented by additional information collected through the completion of Parts A and B as outlined above. The identification of the conceptual natural heritage system will consider the natural heritage system policies contained in the Regional Official Plan and the Town of Caledon Official Plan.
- This study will apply the criteria for identification of the Core Areas of the Greenlands System and confirm, as appropriate, if any Core Areas exist in the recommended boundary expansion area. Spatial data and mapping of refined Core Areas of the Greenlands System boundaries shall be provided in a format satisfactory to the Region. Criteria for identifying Core Areas of the Greenlands System in Policy 2.3.2.2 of the Regional Official Plan should be applied for this purpose.
- The consultant should also utilize existing and ongoing studies and inventories and supplementary field work if necessary and appropriate.
- The Regional MCR environmental study results for the Regional ROPA shall be documented and submitted in a separate report in a format acceptable to the Region.

1.2 Preparation of a Detailed Workplan

These terms of reference provide overall guidance and a framework for carrying out a Comprehensive EIS and MP (CEISMP). It is intended that the Consultant(s) will prepare a detailed workplan with a proposed starting date of September 2013. The workplan should describe, in a more specific technical manner, how the Consultant(s) will fulfill the requirements of the terms of reference. The detailed workplan shall identify all necessary tasks, including but not limited to: a preliminary listing of all literature and background data to be relied upon; a detailed methodology for carrying out environmental characterization; monitoring and technical studies, including required technical expertise; the proposed approach to modeling urban land use scenarios and related impact assessments; the identification of anticipated deliverables; the methods of consulting with relevant agencies, stakeholders and the public; and, the timelines related to all key steps in the process. The detailed workplan is to be approved by the Town of Caledon, Region of Peel and TRCA.

TRCA will provide background data and information to the Town and consultant to inform the CEISMP. However, further consultation with the TRCA will be required to verify the extent and usability of the models/datasets, as well as to gather any additional data not initially provided.

1.3 Study Approach and Structure

To meet the objectives of Phase 1 of the Bolton Residential Expansion Study (BRES), TRCA will compile their existing environmental data (terrestrial and aquatic) related to the potential expansion area and produce screening mapping and GIS data. This will include a review of secondary sources, such as the South Albion-Bolton Boundary Expansion CEISMP. The consultant will be responsible for reviewing the mapping and data provided by the TRCA and provide a memorandum to the principle consultant setting out what known environmental features exists within the expansion areas and what constraints these features and their location may have on the potential for development.

To meet the objectives of Phase 3 and 4 of the BRES, a CEIMP will be required, which consists of fifteen (15) steps generally structured into three parts as outlined in Table 1 (these steps are described in more detail later in the terms of reference).

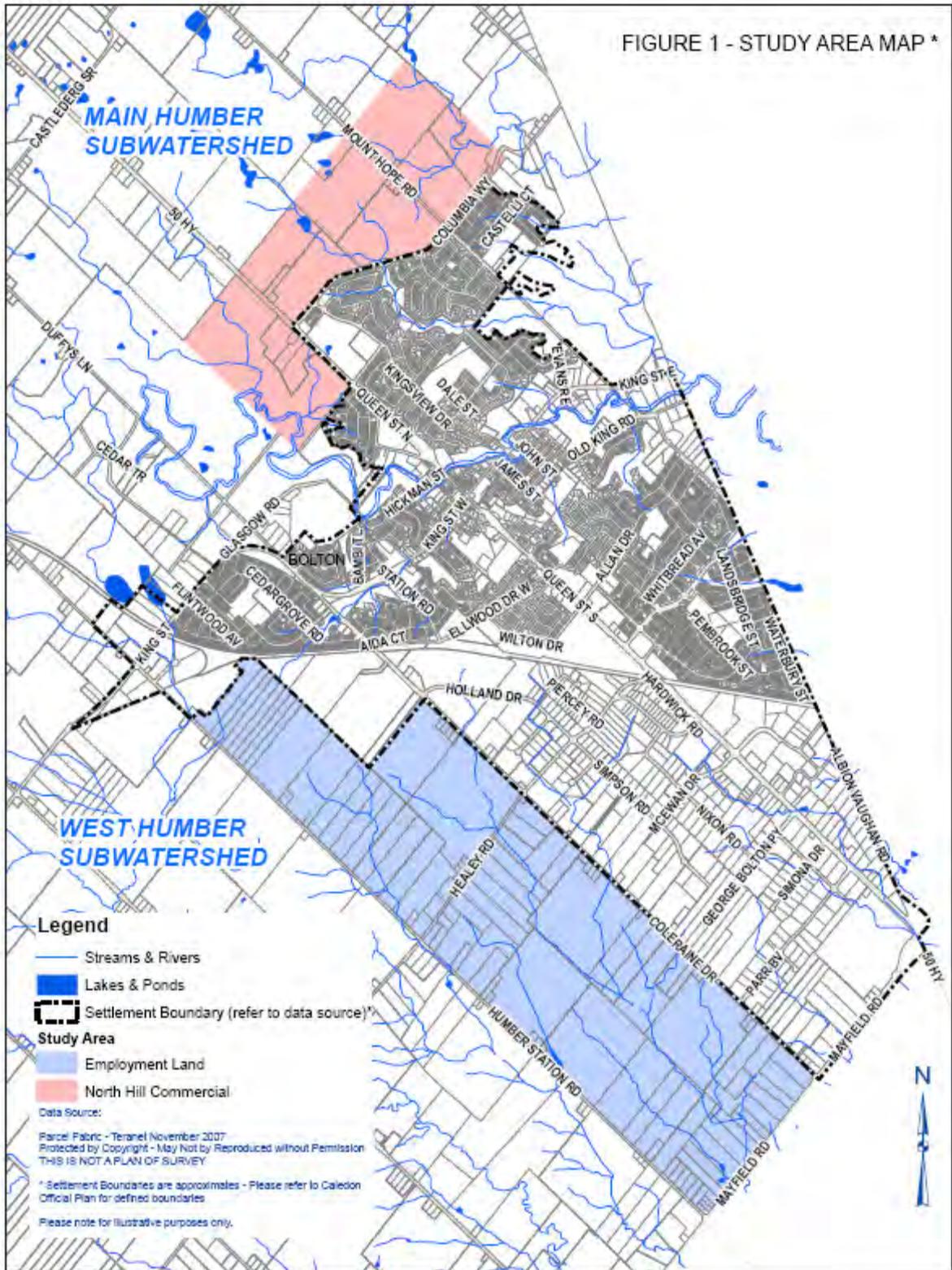
Part A characterizes the environmental resources of the study area. Background and supplemental field data is assessed within each discipline (hydrology/hydraulics, hydrogeology, water quality, stream morphology, aquatics and terrestrial and wildlife) and integrated across disciplines. Key deliverables of Part A include the identification of data gaps and resultant detailed studies required in Part B, and the establishment of initial goals and objectives.

Part B identifies and evaluates the potential impacts of urban land use scenarios within the study area. Required detailed studies identified in Part A will be carried out to fill data gaps. Goals and objectives will be finalized and key targets and strategies for meeting the finalized goals and objectives will be developed.

Based on the results of Parts A and B, Part C identifies all necessary components of an implementation strategy which will ensure that all goals, objectives, targets and other related recommendations and management measures are implemented. This will include the establishment of guidelines for the preparation of required site specific environmental studies, including but not limited to site specific Environmental Impact Study & Management Plans (EIS & MPs).

Table 1: Contents of a Comprehensive Environmental Impact Study and Management Plan

<p>Part A Existing Conditions and Characterization</p>	<ol style="list-style-type: none"> 1. Introduction to the Study Area 2. Background Information 3. Baseline Monitoring 4. Existing Conditions Characterization and Initial Constraints and Opportunities Mapping 5. Part A Report
<p>Part B Impact Assessment and Detailed Studies</p>	<ol style="list-style-type: none"> 6. Detailed Studies 7. Land Use Evaluation and Impact Assessment 8. Part B Report
<p>Part C Implementation</p>	<ol style="list-style-type: none"> 9. Conclusions, Recommendations, Strategies and Management Measures 10. Long Term Monitoring Plan 11. Comprehensive Adaptive Management Plan 12. Policy Conformity Assessment and Recommendations 13. Guidelines for Site Specific Environmental Studies 14. Executive Summary 15. Final Report and Reporting Format



*Note: The study area boundary may be refined through the detailed workplan to incorporate other lands determined to be functionally connected to the study area through Parts A and B of the study.

2.0 PART A – EXISTING CONDITIONS AND CHARACTERIZATION

2.1 Introduction to the Study Area

The purpose of this section is to provide a general introduction and overview of the study area to provide context for readers of the document. This shall include but not be limited to textual description and relevant base mapping. Examining the impacts of the residential boundary expansion on the natural environment will require a sub-watershed approach, rather than only focusing on the boundaries of the preferred expansion options. Therefore, the broader study area must be defined and the assessment of impacts will apply to the full study area. The Town of Caledon, Region of Peel and TRCA will provide further guidance to the consultant regarding the delineation of the broader study area. If through the study process, other expansion area options are identified, the scope of the CEISMP may need to be revised to include any additional work.

2.2 Background Information

This section shall list all literature, background reports, mapping, technical data and all other information sources to be relied upon in the study.

2.3 Baseline Monitoring

The purpose of the baseline monitoring is to establish the baseline conditions within the study area and existing environmental trends against which future monitoring results will be compared. This will allow the projected impacts of future land uses to be monitored as land uses change over time and will link to the Adaptive Management Plan.

Information to be collected shall include but not be limited to:

- (a) Surface water quality and quantity;
- (b) Aquatic resources;
- (c) Hydrology;
- (d) Surface water - groundwater interconnections;
- (e) Groundwater quality, quantity and flow patterns;
- (f) Feature and Site Water budget/balance;
- (g) Stream morphology; and

- (h) Terrestrial resources – woodlots, wetlands, wildlife, Environmentally Sensitive Areas, Areas of Natural or Scientific Interest.

When preparing a baseline monitoring plan, it is important to ensure that many different disciplines are being monitored at the same sampling site where possible and appropriate. For example, fisheries and water quality monitoring should take place at the same site.

The monitoring plan should include an explanation of how the indicator parameters were established, e.g. what criteria were used when deciding what to monitor.

2.4 Existing Conditions Characterization and Initial Constraint & Opportunities Mapping

Field work should be carried out to better define the existing ecosystem forms, functions, and linkages within the study areas shown on Figure 1. Any areas identified as having potential functional connections that are outside the limits of the study areas shown on Figure 1 shall be addressed, as appropriate. Detailed constraint mapping (1:5,000 min. specified in step 15) will be prepared which highlights the environmental resources within the study area, as well as agency and municipal constraints (i.e. Fisheries Act, Official Plan designations, valley land setbacks). Initial objectives, which complement and build upon the subwatershed and related studies, will be developed based on the information and data inferences.

The mapping shall include but not be limited to:

- (a) All hydrologic features including watercourses, swales, ponds, depression areas, springs, seepage areas and existing stormwater management facilities. Headwater features should be classified and mapped according to the CA's headwater drainage feature assessment guidelines;
- (b) Existing hydrology, hydraulics, floodlines and floodline estimates as per TRCA Flood Plain Management Policies;
- (c) Present day land use;
- (d) Vegetation communities using Ecological Land Classification (ELC) mapping;
- (e) Wildlife species locations and relative abundance (including amphibian and bird breeding);
- (f) Terrestrial corridors (existing and potential), taking into consideration lands that have been targeted for the restoration of natural cover using TRCA's Terrestrial Natural Heritage System Strategy methodology and relevant subwatershed studies;
- (g) Aquatic habitat, including water quality;
- (h) Feature and Site Water balance/water budget assessment;

- (i) Aquatic communities and habitat (with inventory sites), reach delineation, and appropriate setbacks;
- (j) Valley slopes, top of bank, ecological considerations, geomorphic and geotechnical hazard areas, including stable slope lines, as per the CA's technical guidelines;
- (k) Groundwater recharge and discharge areas, the linkages between them and existing condition groundwater recharge rates determined through a water budget assessment;
- (l) Aquifer vulnerability to surface sources of contamination;
- (m) Groundwatersheds (extending outside the study area – if applicable);
- (n) Stream morphology, channel sensitivity and setbacks required to allow natural channel functions (migration, flooding, erosion);
- (o) Preliminary channel classifications based on CA's technical guidelines;
- (p) Refined municipal constraint limits (Town of Caledon EPA and Supportive Natural Systems and Linkages);
- (q) Existing soils and geology;
- (r) Significant landforms;
- (s) Flora and Fauna species (based upon assessments using accepted protocols and seasonal sensitivities);
- (t) Restoration or enhancement opportunity areas; and
- (u) Ecological buffers.

Data deficiencies and information gaps need to be summarized and a workplan developed for filling gaps through detailed studies to be carried out in Part B. It is anticipated that this will include the review of regional groundwater models for the area (that will be provided by the TRCA), and extrapolate data from the models in combination with monitoring data to explain the groundwater conditions in the study area.

2.5 Part A Report

Once the requirements of steps 1 to 4 have been fulfilled, a Part A Report will be submitted in draft form to the Town of Caledon, Region of Peel and TRCA for review and approval prior to proceeding to Part B of the CEISMP.

3.0 PART B – IMPACT ASSESSMENT AND DETAILED STUDIES

3.1 Detailed Studies

It is anticipated that certain detailed studies will be required to complete the constraint mapping, confirm the areas functionally connected to the study area, carry out required detailed impact assessments and/or develop protection, restoration and enhancement plans for the area. In addition, the evaluation and refinement of land use options and impact assessment described in step 6 above may provide direction regarding detailed study requirements. A number of watershed and sub-watershed scale studies that are relevant to the study areas have been completed or are in progress. These studies provide strategies, guidance, targets and recommended actions to guide land use decisions and new development and should be considered when completing the detailed study components of the Comprehensive EIS and MP.

The EIS and MP must be completed in a manner such that the findings of each component study and analysis are integrated throughout the document. In addition, each aspect of the component studies must recognize the principle of adaptive management and incorporate an appropriate level of flexibility into the design. In doing this, interrelationships between components will be more fully considered and a proactive management approach may result. For example, the potential impacts of modifications to surface and/or groundwater on natural features and systems must be considered to determine the feasibility of the proposed land use changes and if/what mitigation and adaptive design measures may be required. In this regard, natural and built systems should not be considered in isolation but as integrated and adaptive units.

The need for, and scope of, the detailed studies are to be confirmed with the Town of Caledon, in consultation with the Region of Peel and TRCA, and they may include but are not limited to:

- (a) Surface Water and Groundwater Resources studies;
- (b) Aquatic Resources and Water Quality Study;
- (c) Stream Morphology Study;
- (d) Natural Heritage Study;
- (e) Stormwater Management Study;
- (f) Water Budget / Balance Study; and
- (g) Geotechnical and Slope Stability Assessment.

The following subsections outline the potential contents of the above-referenced detailed studies, if it is determined they are required.

a) Surface Water and Groundwater Resources

The initial constraint mapping will have identified known hydrologic features within and adjacent to the study area, however, the overall hydrologic system must be described and features/functions confirmed. The components of the system to be addressed by the detailed studies include but are not limited to:

- (i) Identification of flow characteristics of watercourses and swales, and a description of the feature and site water balance within the study area;
- (ii) Characterization of all hydrologic features (watercourse, swales, natural areas providing flood storage/attenuation, depression storage, recharge areas, seepage areas and springs). Particular emphasis should be placed upon headwater tributaries and the functions that they perform within the system;
- (iii) Identification of volume and distribution patterns of the major discharge areas and a representative location used for monitoring; and
- (iv) Description of the relationship and dependencies between these features and the surrounding terrestrial, wetland and aquatic resources.

Since the study areas may include wetlands, watercourses, fishery resources and other features of potential sensitivity to changes to groundwater resources, a detailed hydrogeological impact assessment will likely be required. This may include but not be limited to:

- (i) The general groundwater setting and linkages between the local and surrounding groundwater system;
- (ii) Sensitivity of the natural environment and the function of the groundwater related to natural features such as the fishery, aquatic system, terrestrial resources, geomorphology, surface water, water quality and water quantity etc.;
- (iii) Approximate high water table location;
- (iv) Regional groundwater flow and direction and the general geologic setting;
- (v) Potential recharge and discharge areas within the study areas;
- (vi) Local groundwater resource usage within the study areas;
- (vii) Projected post-development groundwater recharge rates including any anticipated deficits;

- (viii) Location and usage of water wells within 1 km of the study areas;
- (ix) Detailed description of the local geologic conditions and the function of the geologic units from a hydrogeologic perspective;
- (x) Detailed assessment of the groundwater flow system, local flow direction, linkages to surface water and the regional groundwater flow system;
- (xi) Delineate major and local aquifers in the area and interpret the connection to the study area;
- (xii) Studies on springs, surface water courses or discharge to surface water that focus on groundwater/surface water interaction, determining linkages to recharge and discharge areas through baseflow assessment, vertical gradients, and water table location. This information should be incorporated into the water balance;
- (xiii) Contamination risk assessment that considers aquifer vulnerability and proposed land use changes and identification of a risk management strategy; and,
- (xiv) Assessment of potential impacts on groundwater flow and volume from required servicing.

b) Aquatic Resources and Water Quality

The initial constraint mapping will have identified fish habitat and water quality classification for the tributaries. The detailed study is to provide the following information in support of the habitat classifications and planned land use change conditions:

- (i) Confirm the fish habitat and water quality classifications of all watercourses and fish habitat within the study area;
- (ii) The direct and indirect physical and bio-physical impacts of the land use scenarios on water bodies, water quality and quantity;
- (iii) The fish species present, and the direct and indirect biological impacts of the physical impacts;
- (iv) The life stages of aquatic organisms supported by the impacted habitat; and
- (v) Opportunities for maintaining and enhancing aquatic habitat and species through the land use scenarios.

c) Stream Morphology

The study will describe the physical form of the watercourse. The following information will be included:

- (i) Characterization of geomorphic features including sensitive reaches, areas of erosion and aggradation, channel migration, etc;
- (ii) Determine the relationship between hydrology of the stream and geomorphology, aquatic resources and water quality, using a continuous simulation modeling approach;
- (iii) A meander belt width analysis and delineation of the 100 year erosion limit; and
- (iv) Assessment of stream bank erosion and the potential for such erosion within the 100 year timeframe, with consideration for potential impacts on the morphology of the valley or stream corridor.

d) Natural Heritage

The study will describe the physical form and function of the ecological systems and features within the study area, and identify any functional relationships to broader systems (e.g. regional wildlife corridors), define what additional issues must be examined (i.e. opportunities for linkages) and demonstrate how the land use scenarios will affect the ecological features and functions of the study area. This shall include but not be limited to:

- (i) Identification and design of a natural heritage system that enhances the form, function and integrity of ecological features within and surrounding the study area and maintains or enhances connectivity amongst ecological features. This will also include ecological buffers as well as enhancement and restoration opportunity areas;
- (ii) Strategies to avoid and/or mitigate anticipated impacts of land use changes on the form and function of ecological features; and
- (iii) Consideration of conservation authority 'target' natural heritage systems, and opportunities to (re)establish linkages between natural features and systems. This may include enhancing the form and maintaining the function of linkages that currently exist prior to development.

e) Stormwater Management

This study will address stormwater management considerations, including but not limited to:

- (i) Evaluation of stormwater management options and selection of a preferred stormwater management strategy that includes lot level, conveyance, and end-of-pipe solutions, with emphasis placed on at source controls, and as per TRCA's Stormwater Management Criteria;

- (ii) Identification of preliminary locations of stormwater management ponds and infrastructure outside of the natural system (including ecological buffers);
- (iii) Identification of major and minor system flow routes;
- (iv) Identification of proposed road crossing locations and criteria;
- (v) Implementation strategy for inclusion on the overall Study Environmental Management Plan (e.g. phasing, interim works, roles, etc.);
- (vi) Identification of erosion and sediment control requirements to be implemented, integrating conservation authority guidelines;
- (vii) Methods for mitigating any projected groundwater recharge deficits associated with proposed land use changes;
- (viii) Updating the CA's relevant hydrology models, based on the preferred stormwater management strategy and proposed land uses;
- (ix) Methods for maintaining the seasonal water budget of hydrologically sensitive terrestrial features (i.e. wetlands and wet forests) affected by proposed land use changes; and,
- (x) Updated floodplain mapping within the study area, as well as the surrounding area, if affected.

f) Water Budget / Balance

One component of achieving the sustainability and adaptive management objectives for the community is the integration of best management practices pertaining to maintaining as closely as possible, pre-development ground water conditions post-development. With changes in impervious areas, and potential changes to surface and ground water quality and quantity, best management practices which serve to promote post-development groundwater infiltration/recharge, and maintain pre-development water balance conditions to the greatest feasible extent are required. This report (to be completed by a Professional Engineer or Professional Geoscientist with expertise in this area of practice) should include the development of a detailed water balance on a catchment area basis under existing and post-development conditions.

The investigation should provide definitive, factual information that verifies the final recommendations and should include the components listed below:

1. Introduction.

- (i) Background;
- (ii) Hydrogeological setting, geological setting; and
- (iii) Site location and proposed land use.

2. Methodology.

- (i) Report and water balance objectives;
- (ii) Background data studies and information utilized and considered; and
- (iii) Data and considerations.

3. Water Balance Methodology.

- (i) Provided on a catchment basis (existing and proposed);
- (ii) Appropriate long-term water budget assessment (e.g. AES Thormewaite, minimum monthly);
and
- (iii) Groundwater recharge contributions to natural features must be quantified.

For preparing the Feature Based Water Balance study methodology, please refer to TRCA's Water Balance Guidelines for the Protection of Natural Features, which can be downloaded at:

http://www.sustainabletechnologies.ca/Portals/_Rainbow/Documents/Water%20Balance%20for%20the%20Protection%20of%20Natural%20Features%20Guideline%20.pdf

4. Predevelopment water balance analysis.

5. Post-development water balance analysis.

- (i) Land use considerations.

6. Comparison of pre- and post-development water balances.

- (i) Proposed mitigation measures (if required);
- (ii) Potential measures (above and beyond traditional lot level controls) that may be considered in the analysis include:
 - Rain water harvesting from roof-top water collection on commercial or employment lands, which may be used for irrigation purposes;
 - Infiltration galleries;
 - Exfiltration galleries;
 - Biofiltration measures;

- Green roofs;
 - Porous pavement;
 - Additional non-compacted topsoil;
 - ‘third pipe’ systems; and
 - Additional evapotranspiration measures.
- (iii) Preliminary assessment based upon hydrogeological assessment of areas in which enhanced ground water recharge measures may be employed;
- (iv) Establish specific targets, thresholds, and objectives for water balance in these areas;
- (v) Provide alternative measures that may be employed to meet these objectives – utilizing best management practices;
- (vi) Design (may consider interflow, baseflow contributions, downstream erosion and thermal impacts mitigation);
- (vii) Provide locations in which these measures would be optimized;
- (viii) Implementation (including funding, fiscal implications, technical feasibility, long-term maintenance, cost sharing and landownership considerations if applicable);
- (ix) Maintenance; and
- (x) Monitoring of water balance enhancement measures.

7. Conclusions and Recommendations.

g) Geotechnical and Slope Stability

A geotechnical investigation will be required to identify areas in which potential slope instability exists. Existing Top-of-Slope (ETOS) and the Long-Term-Stable Top-of-Slope (LTSTOS) should be assessed in areas where they are not coincident with the physical crest of slope. Because of the complexities of site development and soil conditions, comprehensive assessments are required for development projects close to major features, while less detail may be required for minor works near shallower slopes. The assessment of the LTSTOS is to be completed following the MNR’s Technical Guide on River and Stream Systems: Erosion Hazard Limit (2002) and should be accompanied by a detailed slope stability analysis.

Where required, a solution based on sound technical data should be recommended to minimize or eliminate the impact of the development and associated activity, and at the same time ensure that the development will be safe for a design period of 100 years. Alternatives should be considered,

and a final solution recommended and justified by comparing it to the alternatives. The basic requirements are as follows (more specific components should be discussed with conservation authority and Town staff):

- (i) Determine the existing subsoil conditions and pertinent geotechnical parameters for the entire height of the slope;
- (ii) Model the slope conditions and assess its stability. Determine the stable slope inclination corresponding to a minimum Factor of Safety of 1.5; and
- (iii) Provide and assess mitigation strategies, where required.

The TRCA will provide specific guidelines for the required structure of the assessment giving a general guide for the documentation and calculations required. The level of detail required for a specific submission will depend on factors such as:

- (i) Slope characteristics (e.g., height, angle, and distance from watercourse);
- (ii) Distance of development from the slope;
- (iii) Local soil conditions; and
- (iv) The type of development proposed.

3.2 Land Use Evaluation and Impact Assessment

Through an analysis of the dynamics and interrelationships of the ecosystem, the study will assess the potential environmental impacts of locating residential uses and the associated infrastructure within the respective study areas, and their compatibility with the Town's ecosystem goals, objectives, policies and performance measures.

The study will recommend environmental protection and enhancement measures for use in assessing the environmental impacts and enhancement opportunities of the residential land use options. The study will consider the impacts of development adjacent to the natural system and identified enhancement opportunities, and will discuss approaches to avoiding or minimizing impacts of adjacent land uses. The location of infrastructure, including roads adjacent to the natural system, will need to be considered with the design eliminating or minimizing any proposed crossings of the natural system.

The study will outline an environmental management strategy for the preferred development locations which will recommend measures for the management, enhancement, restoration and monitoring of the ecosystem.

It is expected that an iterative relationship will exist between steps 6 and 7.

3.3 Part B Report

Once the requirements of steps 6 and 7 have been fulfilled, a report on Part B will be submitted in draft form to the Town of Caledon, Region of Peel and TRCA for review and approval prior to proceeding to Part C of the CEISMP. Based on the results of Steps 6 and 7, the Part B report will recommend finalized goals and objectives and key targets and strategies for meeting the finalized goals and objectives.

4.0 PART C – IMPLEMENTATION

4.1 Conclusions, Recommendations, Strategies and Management Measures

This section will synthesize the results of Parts A and B of the study and provide all related conclusions, recommendations, and management/mitigation strategies. This shall include but not be limited to:

- (a) A comparative evaluation of alternative management options leading to the selection of the preferred option;
- (b) Conclusions and recommendations; and
- (c) Strategies and Management Measures – if impacts are expected or may occur, what plans are in place to maintain ecosystem features and functions?

It is expected that key components of Part C will include a long term monitoring program, an adaptive management plan, policy recommendations and guidelines for site specific environmental studies, as generally outlined in Steps 10 to 13 below.

4.2 Long Term Monitoring plan

Monitoring is to continue after baseline conditions are established. The monitoring plan should be designed in such a way that impacts can be distinguished from natural trends at an early stage. If impacts are detected:

- (a) A more aggressive type of monitoring should take place that determines where, why and how fast the change is occurring;
- (b) Establish cause-effect relationships between environmental resources and land use change;
- (c) Be able to deal with change by proposing appropriate mitigative measures (as per adaptive management plan); and
- (d) Focus on evaluating ongoing or proposed management practices.

Items that should be monitored over the long term include but are not limited to:

- (i) Water quality and quantity, including stormwater system performance (including any best management practice measures and/or designs used);
- (ii) Fisheries and aquatic resources;
- (iii) Hydrology and hydraulics;
- (iv) Groundwater quality and quantity;
- (v) Stream morphology and slope stability;
- (vi) Terrestrial resources – woodlots, wetlands, flora and fauna, Environmentally Sensitive Areas, Areas of Natural or Scientific Interest, terrestrial linkages, buffer areas, invasive species, natural system encroachments, natural system edge management, and vernal pools; and
- (vii) Feature Based and Site Water balance and the effectiveness of groundwater recharge enhancement measures.

It is essential that long term monitoring be included in the final study report, and that the costs and responsibilities for long term monitoring be addressed. The length of time for monitoring will be determined during the study, and may depend upon the feature to be monitored (i.e. different features may need different lengths of time).

4.3 Comprehensive Adaptive Management Plan

The broad objective of the Comprehensive Adaptive Management Plan (CAMP) is to provide direction for monitoring the performance of the recommended aquatic and terrestrial resource mitigation strategies, and to provide a flexible mitigation system that can be adjusted in response to monitoring results. For the CAMP to be effective, flexible measures must be accommodated at the initial stages of all aspects of the community design (e.g. stormwater management infrastructure, open space system, transportation network, landscaping etc.) to allow for an adaptive system that can react to required change. The CAMP is a management framework that encompasses and provides for the following:

- (a) Identify key Study Area features and functions and associated protection goals and objectives;
- (b) Management targets required to meet goals and objectives;
- (c) Mitigation measures to address the performance targets;
- (d) Monitoring requirements to monitor the success of the mitigation measures in relation to the targets;
- (e) Evaluation of the monitoring results in relation to the management targets; and
- (f) Long term adjustment of the overall Plan/CAMP as needed.

Specifically, the CAMP will include a framework for long-term environmental monitoring to measure the performance of the recommended mitigation/management strategies. Recommendations for long-term monitoring of surface water, groundwater, water quality, fisheries, stream morphology and terrestrial/wetland resources will be provided. The data collected as part of the Study will form a baseline for monitoring change over time and for evaluating proposed management practices. Monitoring frequency, parameters and responsibility will also be addressed. The monitoring program will be designed in a way that will help to distinguish between natural variation in ecosystem function and potential land use development impacts.

In keeping with the adaptive management plan approach, the CAMP will discuss responses to changing conditions or anticipated impacts. This might include more aggressive monitoring necessary to determine the cause and effect relationship associated with the change or anticipated impact as well as providing general directions for consideration of impact contingency measures that might be considered as adjustments to the plan where necessary after taking into account monitoring results.

The CAMP will provide the framework linking the site specific studies and CAMPs into the broad management plan or CAMP for the study area management, to ensure mitigation and monitoring plans, as well as enhancement and restoration, are consistent and integrated and address the identified resource protection targets, within the context of the broader ecological and water resources context as documented through the Study.

In areas of widespread development, the conservation authority may undertake long-term environmental monitoring (should funding be provided) to reduce overall costs and to achieve better consistency.

4.4 Policy Conformity Assessment and Recommendations

As previously stated, the CEISMP is required to not only address the policy requirements of the Caledon Official Plan, but also the applicable policies and requirements of other relevant agencies, including the Provincial Policy Statement, Provincial Acts, the Region of Peel and TRCA. Step 12 of the CEISMP is intended to clearly reference relevant policy, legislative and technical requirements and describe how the CEISMP meets or exceeds these requirements.

4.5 Guidelines for Site Specific Environmental Studies

It is anticipated that one of the products of the CEISMP will be guidelines for carrying out future site specific environmental studies, including site specific Environmental Impact Study & Adaptive Management Plans to be prepared by individual applicants in support of development proposals in the study area. These site specific studies will assess the merits of the application and will apply findings, recommendations and strategies contained in the CEISMP. Establishing guidelines for the preparation of site specific environmental studies will assist future applicants in determining the scope and content of such studies.

4.6 Executive Summary

Include a summary at the front of the final report (step 15 below) that summarizes the results of Parts A, B and C, highlighting key findings, recommendations and strategies.

4.7 Final Report and Reporting Format

A complete description of all the work and conclusions involved in the Comprehensive EIS & MP (Parts A, B, and C) is to be included in the final report.

Reports should be submitted in hard copy along with an electronic copy in Word for Windows 2007 Office and Portable Document Format (PDF) on a CD. Ten copies of all draft and final reports, each with a full set of graphics, artwork and maps shall be submitted to the Town of Caledon.

Graphics

Graphics should be submitted in Microsoft PowerPoint format on a CD separately from the main report as well as incorporated into the main report.

Artwork

Artwork should be submitted in JPG format on a CD separately from the main report as well as incorporated into the main report.

Mapping

Mapping should be in a scale of 1:5000 or less. It should be noted that Arc GIS 9.x is the GIS software currently used in the Town of Caledon, and as such, ArcView shape files are required. In general, digital graphic data:

- (a) **must** be georeferenced in UTM using NAD 83;
- (b) **must** be clean, i.e. polygons should be closed, dangles eliminated, polygons with common borders should not overlap, etc.;
- (c) should be packaged/organized into logical layers, for example, a soils layer, a wetlands layer, etc.; and
- (d) **must** be in vector as opposed to raster format, unless otherwise specified.

Tabular Attribute Data

Attribute data should be provided in Excel format files (preferred), dBase IV format files, or in formatted (i.e. with defined columns) ASCII files.

Textual Data for Graphics

Text should be provided in Word for Windows 2003 Office. Please be aware that any tabular data to be referenced to actual map features should **not** be provided as tables in a Word document.

Digital Photos

Digital photos, whether they are scanned photographs or computer-generated artwork, should be provided in JPG format.

Spatial Data Requirements

Spatial data provided by the Vendor to the Agency will be in ESRI Shapefile format. All spatial data will be geo-referenced and projected in 6 Degree Universal Transverse Mercator (UTM), Zone 17, North American Datum 1983 (NAD83). Mapping (cartographic) templates may be provided to the Vendor upon request.

Spatial data will be topologically correct. Polygon features will not overlap and gaps (slivers) will not be present (areas of no data accepted). Linear features will not have dangles, self intersects or self overlaps. Sample data may be provided to the Vendor upon request.

Metadata will be provided with all data. The metadata will include an abstract, purpose and process steps used to create the data. Attribute field definitions will also be provided. Metadata will be attached to the GIS data through a metadata record and/or as a Readme file. Sample metadata may be provided to the Vendor upon request.

The successful Vendor will be responsible for entering into a Digital Data Use Agreement (DDUA) with the Agency. A template of the DDUA is attached.

All data created by the Vendor will become the property of the Agency. Data may become available to the Public through open data initiatives.

APPENDIX 2

Comprehensive Environmental Management Study and Management Plan

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