

# Draft for Discussion

## Natural Heritage in the Headwaters City



Prepared for  
**The City of Vaughan**  
in collaboration with **Urban Strategies Inc.**

Submitted by  
**Gartner Lee Limited**

**May, 2008**

**Draft for Discussion**

# **Natural Heritage in the Headwaters City**

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**May, 2008**

Reference: **GLL 70-894**

Distribution:

**2 City of Vaughan**

**3 Gartner Lee Limited**





Gartner Lee Limited

May 30, 2008

Mr. Mark Reid and Mr. Pino Di Mascio  
Partners  
Urban Strategies Inc.  
197 Spadina Avenue, Suite 600  
Toronto, ON M5T 2C8

draft for discussion

Dear Mr. Reid and Mr. Di Mascio:

**Re: GLL 70-894 – Natural Environment Analysis in Support of the City of Vaughan  
Official Plan**

We are pleased to provide you with a Natural Heritage Discussion paper that will contribute to the new Official Plan for the City of Vaughan.

This report contains a summary of existing features and functions within the City and a discussion of the importance of maintaining these components in order to receive the natural, social and economic benefits that they provide. An examination of the existing features and functions within Vaughan is followed by a description of three Countryside Concepts, each of which is able to maintain and possibly enhance a spectrum of ecological features, the aim of which is to ensure that a number of ecological services are realized by the residents of Vaughan today and in the future.

Yours very truly,  
GARTNER LEE LIMITED

Dale A. Leadbeater, B.Sc., E.Ed.  
Office Manager, Ecology  
Senior Biologist

DAL:pc  
Attach.



Gartner Lee Limited

May 30, 2008

Mr. Mark Reid and Mr. Pino Di Mascio  
Partners  
Urban Strategies Inc.  
197 Spadina Avenue, Suite 600  
Toronto, ON M5T 2C8

draft for discussion

Dear Mr. Reid and Mr. Di Mascio:

**Re: GLL 70-894 – Issuance of Draft Reports**

A DRAFT is a rough copy of a report. The intent in issuing it is to allow other knowledgeable people associated with the project an opportunity to review the style and content prior to final issuance.

Since the FINAL report may differ from the draft, we think it is only prudent to collect all of the DRAFT reports prior to issuance of the FINAL report.

We would appreciate it if you would see that all copies of the DRAFT are returned to us and then we will issue our FINAL report.

We thank you in advance for your cooperation.

Yours very truly,  
GARTNER LEE LIMITED

E. Grant Anderson, P.Eng.  
President

EGA:pc  
Attach.

# Executive Summary

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draft for discussion

## 1. Overview

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In order to assist with the writing of the Official Plan for the City of Vaughan (the City), Gartner Lee Limited prepared a technical Natural Heritage Existing Conditions Report. It is based on a review of existing documentation and aimed to:

- a) identify key Natural Heritage features and functions;
- b) characterize the sensitivities of those features and functions with respect to land use change; and,
- c) provide a framework for the development of policy and a natural heritage strategy for the City of Vaughan.

In contrast to natural heritage analysis provided to similar planning studies, this technical document provided a discussion of the following aspects of the City's biophysical framework with the objective of identifying the connections among them:

- a) Bedrock and Surficial Geology;
- b) Hydrology and Hydrogeology;
- c) Drainage, Aquatic Habitat and Fisheries (including Water Quality);
- d) Wetland and Terrestrial Vegetation; and,
- e) Wildlife Habitat and Landscape Connectivity.

This executive summary aims to highlight the key concepts within each area of study, identify unique features and functions across the categories, and generate concepts for the maintenance of countryside functions in the City at three levels of benefits.

## 2. Natural Heritage in the Headwaters City

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Headwaters are where rivers are born. Water soaks into the height of land on the Oak Ridges Moraine north of Kirby Road, dipping south to Rutherford Road in the east. Clean, clear, cold water seeps from the ground where the water table intersects the surface, collects into the upper reaches of the Don and Humber Rivers and flows downstream to the Great Lakes. As the water travels toward the Lake, its quantity and quality changes, reflecting the surrounding land use and

altering the character and health of the water on which we rely so heavily for drinking, recreation, and natural habitat.

The quality of habitat within our watercourses depends on numerous factors including: underlying geology, human disturbance and natural processes. Historically, forest cover, meadows and wetlands would have surrounded streams and rivers in southern Ontario. Since the arrival of European settlers there has been considerable loss of forest cover to make way for agriculture, and later settlement, then urbanization, commercialization with concurrent development of transportation systems. The cost of our human success can be read in the changes in the patterns and functions of natural systems in the City.

It all starts with the water: groundwater flowing through the City sustains terrestrial (e.g., vegetation, wetlands and wildlife), and aquatic (e.g., fisheries) habitats and provides humans with domestic, municipal, commercial and industrial water supplies. In maintaining and renewing our forests and wetlands, they in turn clean our water, as well as our air. Trees help to control wind and noise, regulate temperature and precipitation, increase the life span of roads and buildings, maintain privacy, improves human psyche and reduces “city rage”. It is estimated that in Oakville, the price of benefits provided by the trees alone exceed \$2,000,000 annually (Oakville Parks and Recreation Department, Forestry Section 2007). Vaughan is embarking on a new sustainable future, and this summary aims to highlight the key features and functions from which people benefit. This will be the basis for the discussion of how the countryside will be designated, and the nature of the policies that may apply in the new City paradigm.

## 2.1 Key Features and Functions

### 2.1.1 Bedrock and Surficial Geology, Hydrology and Hydrogeology;

#### 2.1.1.1 Features

- Regionally important groundwater recharge areas (Oak Ridges Moraine and glacier melt-water soil deposits)
- Discharge areas commonly associated with river valleys

#### 2.1.1.2 Importance

- Sustains a minimum flow of water to some streams, even during the dry months of summer
- Moderates stream temperatures, particularly during hot summer days, and minimizes stream temperature fluctuations
- Groundwater upwelling supports wetland vegetation and animal habitat
- Substantial below-ground construction that requires draining of groundwater can interfere with groundwater flow patterns and the volume of water discharging to wells and streams

- Homes whose basements reach the groundwater table are more expensive to heat

### 2.1.1.3 *Where?*

- main areas of groundwater discharge are the river valleys

### 2.1.1.4 *Consequences*

- Hydrogeologically sensitive areas identified on the basis of surficial geology, groundwater recharge and discharge areas, and the locations of water wells

### 2.1.1.5 *Implications for Planning*

- Proximity of infrastructure to recharge or discharge areas may affect water resources that are used by humans and/or support the natural environment
- Reductions in upwelling in groundwater-fed wetlands could reduce vegetation diversity
- Reduced discharge into particularly sensitive reaches of streams could also create an impact to fish habitat and spawning grounds

## 2.1.2 **Drainage, Aquatic Habitat and Fisheries (including Water Quality);**

Watercourses are an important component of our landscape. Streams, rivers, ponds and lakes provide valuable habitat for fish, amphibians (frogs, toads and salamanders), reptiles (turtles and snakes), insects and birds. They also provide a function to people living in the watershed, by supplying clean drinking water and opportunities for recreational activities such as fishing, bird watching and canoeing.

### 2.1.2.1 *Features*

- Two main watersheds: the Humber River (18,001 ha in Vaughan) and the Don River (9,499 ha in Vaughan)
- Cleanest water is associated with groundwater inputs from the Oak Ridges Moraine
- Poorest water quality associated with the more highly developed southern portion of the watershed
- 48 fish species have been found within the Humber watershed
- 35 species have been identified within the Don River watershed
- Two fish Species at Risk: the redbreast dace (*Clinostomus elongates*) and the northern brook lamprey (*Ichthyomyzon fossor*)

### 2.1.2.2 Importance

- Water quality often determines the species found within a watercourse (e.g., some species are only found in pristine, undisturbed habitats while others tolerate more degraded conditions)
- High levels of nutrients such as nitrogen (and ammonia) and phosphorus can lead to excessive algal growth that can choke waterways and decrease oxygen levels in the water, harming fish and other wildlife
- Nitrogen and phosphorus are commonly found in fertilizers and human or animal waste. High levels of nutrients can occur after heavy rains, that wash excess fertilizer and waste into streams. Runoff also carries sediment from the surrounding land, which can decrease water clarity, impacting aquatic plants and other organisms
- Chlorides from winter road maintenance can also have a negative impact on aquatic species
- High levels of nutrients, suspended solids, bacteria and chlorides have been found in both the Don and Humber rivers

### 2.1.2.3 Where?

- Watercourses and wetlands (See Technical Report)

### 2.1.2.4 Consequence

- Sensitive Fish Areas were identified on the basis of
  - Areas with cold water fish species
  - high fish species diversity, or
  - the presence of Species at Risk, or locally uncommon species
- These areas have quality habitat and /or the presence of physical and biological functions that are susceptible to land use change

### 2.1.2.5 Implications for Planning

- Development within these Sensitive Fish Areas should follow the precautionary principle, and more detailed studies of the area may be required
- Restrictions limiting the type of land use or permitted density may be required, together with the use of innovative mitigation strategies and appropriate construction timing



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## 3. Canopy of the Headwaters

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### 3.1 Natural Cover

The City of Vaughan is in a transition zone between the Carolinian and Great Lakes-St. Lawrence floristic regions. The natural cover is predominately deciduous and mixed deciduous forest, with lesser amounts of meadow, thickets and wetland communities. Less than 20% natural cover remains in the city (TRCA 2007). Most of the remaining natural cover within the city is in river valley systems. Forty-six percent of remaining cover is within the Greenbelt area of the city, with an additional 14% on the Oak Ridges Moraine.

The amount of natural cover in a landscape, with special emphasis on forest cover, dictates what wildlife species can be supported within a region. Although this is especially evident with the disappearance of large mammals such as the Grey Wolf and Black Bear from the highly developed landscapes of southwestern Ontario, this is also true for smaller organisms such as birds and plants. Habitat loss, and therefore reductions in overall natural cover can affect a species in many ways; some species disappear from the landscape, some species become rare and others fail to reproduce (Environment Canada 2004). Species requiring large habitat patches or specialized habitat conditions are most sensitive to reduced forest cover within a landscape. In fact, recent studies have revealed that total forest cover is a greater predictor of species diversity and occupancy than forest size and shape alone. Although it is not clear whether percent forest cover has an influence on reproductive success of different species, the larger effect of habitat loss on avian distribution and abundance than fragmentation, emphasizes the importance of retaining and enhancing existing forest cover and patches within a landscape.

Environment Canada (2004) recommends the retention of 30% forest cover and 10% wetland cover in a watershed to achieve and maintain healthy forest ecosystems and watersheds. The proposed percent cover targets are supported by current scientific understanding of bird population and community response to variable forest cover (Andren 1994, Fahrig 2002, Villard *et al.* 1999). Although little evidence exists for other wildlife species, forest associates such as salamanders, many frog species and certain mammal species are also likely sensitive to reductions in forest cover within a landscape. More conservative thresholds may be necessary to accommodate other wildlife groups and plant species, especially forest dependent organisms that need large forest patches.

#### 3.1.1.1 Features

- Natural Cover in the City of Vaughan comprises approximately 5336 ha, or 19% of the total area of the city (TRCA 2004)
- Natural cover is higher in the Humber River portion of the city at 22%, whereas cover in the Don River is only 15%
- Average forest patch size in Vaughan is 6 ha, versus a mean size of 10 ha in York Region

- Approximately 0.6% wetland cover remains in the City of Vaughan, which accounts for only 2.8% of the existing natural vegetation communities
- two Provincially and three locally significant wetlands
- Approximately 6% meadow cover exists in the City of Vaughan, which accounts for approximately 30% of the existing natural vegetation communities in the area
- Approximately 1% thicket exists in the City of Vaughan, which accounts for approximately 6% of the existing natural vegetation
- Sugar Maple-Black Maple Deciduous Forests and sand barren communities are considered to be regionally rare by the Natural Heritage Information Centre (NHIC)
- Twenty-nine regionally rare plant species occur as well as Butternut (*Juglans cinera*), designated Endangered due to the lethal threat from a fungal disease: Butternut Canker

### 3.1.1.2 Importance

Natural cover in its many forms performs a multitude of environmental services, most of which result in social and economic benefits to society as a whole. Some of the functions performed by natural cover include the provisioning of habitat for migratory birds and other wildlife species, improvement of air and water quality, reduction of stormwater runoff and erosion control. A comprehensive list of the benefits of natural cover is found in Appendix 1 below. Although forest and wetland communities are frequently described as performing most of the described functions, meadow and thicket communities are also capable of providing many of these services. There is however a whole spectrum of performance capabilities according to natural cover type, and generally, communities with greater structural complexity (multiple vertical layers) and a greater woody component (trees) are most effective at providing these services. In addition to community type, the size and health (quality) of a community dictate the capabilities of a system to perform a particular function. Wetlands play an important role in our landscape and have a variety of key attributes including providing habitat for numerous species, flood control, climate regulation, and recreational activities (benefits listed in Appendix B).

### 3.1.1.3 Where?

- Table 2
- 52% of the forested communities are in valleyland systems
- Wetlands are associated with the Oak Ridges Moraine and the Don and Humber River valleys

**Table 2. Natural Cover in the City of Vaughan by Watershed According to TRCA Terrestrial Natural Heritage System Information**

Cover Type	% of Humber River Watershed within Vaughan	% of Don River Watershed within Vaughan	% of City of Vaughan
	Watershed Composition (%)	65	35
Natural Cover (%)	22	15	19
Forest Cover (%)	13	9	12
Wetland Cover (%)	0.7	0.4	0.6
Meadow Cover (%)	7	4	6
Successional Cover (%)	1	0.6	1

3.1.1.4 *Consequences:*

Table 3 summarizes the attributes and functions that are important within the study area, and for which consideration should be provided during the planning process.

**Table 3. Significance and Sensitivity of Vegetation Features in the City of Vaughan**

Attribute	Location	Sensitivity/Significance
Upland Forest Communities	Primarily north of Teston Road and on the Oak Ridges Moraine	Rare vegetation communities in Vaughan. Are usually the first forests to be removed for agriculture and urban development. Protect remaining patches.
Wetland Communities	Primarily on the Oak Ridges Moraine. Smaller units in southern part of the city within ESAs and in riparian areas associated with Tributaries.	Provide a number of important ecological, economic and social functions. Retain base flow and vegetation units. Provide undesignated units protection.
Sand Barren Communities	2 communities in northeastern part of city on Oak Ridges Moraine.	Provincially Rare vegetation communities. Protect communities.
Provincially, Regionally and Locally Rare Species	29 species. Concentrated in ESA's and narrow vegetated cover west of Pine Valley Drive.	Sensitive to urbanization.

### 3.1.1.5 *Implications for Planning*

- TRCA has designated a target Terrestrial Natural Heritage System based on terrestrial vegetation together with a strategy for appropriate policies
- High quality vegetation in the valley at Huntington Road, Pine Valley and Teston Road should be left intact (i.e., the crossings should not be constructed)
- Policies should incorporate ecosystem design objectives for optimization of the connected vegetated corridors with emphasis on inter-watershed connectivity
- Considering the benefits of wetlands in the City and the loss of wetlands in the last 200 years it is important that the proper measures are taken to maintain the current wetland coverage, and increase it wherever feasible

## **3.2 Wildlife Habitat and Landscape Connectivity.**

### **3.2.1 Wildlife**

#### 3.2.1.1 *Features*

- 147 breeding bird species have been recorded in the City, three of which are non-native
- Five of the observed species have been detected as Provincially Rare or Species at Risk
- Forty area-sensitive bird species occur (i.e., bird species are found at higher breeding densities in larger habitat patches)
- Larger thickets will also support area sensitive species such as Brown Thrasher (*Toxostoma rufum*), Yellow-billed Cuckoo (*Coccyzus americanus*) and provincially threatened Golden-winged Warbler (*Vermivora chrysoptera*).
- Twelve amphibian and five reptile species have been reported including one Species at Risk and one Provincially Rare species
- A total of 22 mammal species occur, two of which are non-native (Coyote and Virginia Opossum) and tend to be common urban-tolerant species)
- One mammal species detected in Vaughan, the Southern Flying Squirrel, has been designated as a species of Special Concern by COSEWIC and OMNR, and is provincially Vulnerable (S3) according to NHIC

#### 3.2.1.2 *Importance*

- Fourteen animal species observed in the city of Vaughan have been designated as At Risk provincially and/or nationally.
- Seven observed species have been classified as provincially rare according to the OMNRs Natural Heritage Information Centre
- A total of 22 species have been detected in the City of Vaughan that are designated as Species at Risk or provincially rare species, according to the OMNRs Natural Heritage Information Centre.

**Table 4. Significant Wildlife Species in the City of Vaughan**

Common Name	Scientific Name	S-Rank1	MNR Rank2	COSEWIC Rank3
<b>BIRD</b>				
Least Bittern	<i>Ixobrychus exilis</i>	S3	THR	THR*
Trumpeter Swan	<i>Cygnus buccinator</i>	S2S3	--	--
Ruddy Duck	<i>Oxyura jamaicensis</i>	S2	--	--
Peregrine Falcon	<i>Falco peregrinus</i>	S2S3	END	THR*
Short-eared Owl	<i>Asio flammeus</i>	S3S4	SC	SC
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	S3	SC	SC
Acadian Flycatcher	<i>Empidonax virescens</i>	S2	END	END*
Loggerhead Shrike	<i>Lanius ludovicianus</i>	S2	END	END*
Carolina Wren	<i>Thryothorus ludovicianus</i>	S3S4	--	--
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	S4	--	THR*
Cerulean Warbler	<i>Dendroica cerulea</i>	S3	SC	SC*
Hooded Warbler	<i>Wilsonia citrina</i>	S3	THR	THR*
Henslow's Sparrow	<i>Ammodramus henslowii</i>	S1	END	END*
<b>ODONATA</b>				
Midland Clubtail	<i>Gomphus fraternus</i>	S3	--	--
Rapids Clubtail	<i>Gomphus quadricolor</i>	S1	--	--
Rusty Snaketail	<i>Ophiogomphus rupinsulensis</i>	S3	--	--
<b>FISH</b>				
Redside Dace	<i>Clinostomus elongatus</i>	S3	THR	SC
Northern Brook Lamprey	<i>Icthyomyzon fossor</i>	S3	SC	SC
<b>AMPHIBIAN</b>				
Jefferson x Blue Spotted Salamander	<i>Ambystoma hybrid</i>	S2	--	--
<b>REPTILE</b>				
Milk Snake	<i>Lampropeltis triangulum</i>	S3	SC	SC*
<b>MAMMAL</b>				
Southern Flying Squirrel	<i>Glaucomys volans</i>	S3	SC	SC

<sup>1</sup>**S-rank:** The Natural Heritage provincial ranking system (provincial S-rank) is used by the MNR Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities.

Definitions are as follows:

- **S1**  
Critically Imperiled; extremely rare in Ontario with 5 or fewer occurrences in the province. These species are especially vulnerable to extirpation
- **S2**  
Imperiled; very rare in Ontario due to restricted range, 20 or fewer populations or steep declines. These species are vulnerable to extirpation.
- **S3**  
Vulnerable; rare to uncommon in Ontario due to restricted range, fewer than 80 populations or recent and widespread declines.
- **S4**  
Apparently Secure; uncommon but not rare. Usually greater than 100 occurrences in the province.
- **S5**  
Secure; common, widespread and abundant in the province.

<sup>2</sup>**MNR Status:** Based on consultation with COSSARO (Committee on the Status of Species at Risk in Ontario), which evaluates the conservation status of species occurring in Ontario.

Definitions are as follows:

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

<sup>3</sup>**COSEWIC rankings:** The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assigns a federal status ranking to all assessed species.

Definitions are as follows:

- EXT** Extinct; a species that no longer exists anywhere.
- EXP** Extirpated; a species that no longer exists in the wild in Canada, but occurring elsewhere.
- END** Endangered; a species facing imminent extinction or extirpation in Canada.
- THR** Threatened; a wildlife species likely to become endangered if limiting factors are not reversed.
- SC** Special Concern; a species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats.

\* Species included on Schedule 1 of the federal Species at Risk Act.

### 3.2.1.3 *Where?*

- Highest concentrations of area sensitive bird species occur within the ESA and valleyland communities to the west of Pine Valley Drive and to the east of Keele Street on the Oak Ridges Moraine
- ESAs and in the valleyland systems that are associated with the Humber and Don Rivers, combine to form large contiguous patches of forest, wetland and meadow with interior habitat
- The natural communities bordering the Humber River, north of Nashville road also provide habitat for a high concentration of area sensitive bird species. Apart from the ESA protected lands, these valleylands are the only other areas that provide large enough habitat patches for species such as the Black-throated Blue Warbler (*Dendroica caerulescens*) and Scarlet Tanager (*Piranga olivacea*)
- Although there is a low incidence of wetlands in Vaughan, amphibians have been detected in most riparian areas along tributaries, except in the highly developed southeastern part of the city
- highest concentration of breeding amphibians have been detected in the wetland, meadow and forest communities encompassed by the ESAs west of Pine Valley Drive and the valleylands of the Humber River
- Reptiles have also been detected most frequently in these areas

### 3.2.1.4 *Consequences*

- Concentrations of biodiversity recognized
- Occurrences of Species at Risk and regionally rare species recognized

### 3.2.1.5 *Implications for Planning*

- Development within identified concentrations of biodiversity should also follow the precautionary principle, and more detailed studies of the mapped locations may be required
- Development is restricted in the significant habitat of identified Species at Risk as outlined in the Endangered Species Act of Ontario, 2007.
- Habitats providing habitat for Species at Risk, regionally rare species and with high biodiversity should be left in tact

## 3.2.2 **Landscape Connectivity and Corridors**

### 3.2.2.1 *Features*

- a linear feature or vegetated strip that differs from the surrounding matrix and connects two or more natural features within a landscape
- Don and Humber River valleys provide a substantial amount of natural cover in the City

### 3.2.2.2 *Importance*

- increase the effective size of core areas within the landscape so that ecological processes and wildlife can function as they would in areas with contiguous patches of natural cover
- natural processes functioning more effectively and wildlife species attaining viable species populations in connected landscapes
- provide 4 main functions: 1) Conduits for movement of plant and animal species; 2) Habitat for wildlife species; 3) Buffers and filters; and 4) Ecological Services
- Benefits are listed in appendix 3

### 3.2.2.3 *Where?*

- Currently exists in a north-south direction along the Humber and Don Rivers
- corridors are largely isolated from each other, so there is little connectivity in the east-west direction

### 3.2.2.4 *Consequences*

- Isolated habitat patches are likely to degrade in a landscape surrounded by agricultural and urban land use
- Enhancing connectivity will result in ecosystems functioning as larger units
- Identification of existing corridors and areas requiring enhanced connectivity to contribute to ecosystem functions

### 3.2.2.5 *Implications for Planning*

- The northern portion of the Humber watershed affords the best opportunity to improve landscape connectivity. Much of the northern portion of the City (north of Teston Rd) has yet to be developed
- There are numerous isolated woodlots that could be enlarged and connected to other woodlots by planting native shrubs and trees. This would also benefit streams in the area by providing more riparian cover

## **3.2.3 Designated Areas**

The areas within a landscape that are identified as having unique or uncommon natural features are highlighted as designated areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas). These designated areas often represent the best examples of given natural feature within that region. The analysis of the natural heritage in the City of Vaughan has followed the precautionary principle and incorporated the important natural features such unique vegetation communities, Species at Risk and uncommon or sensitive species. As a result, this focus on the



unique and uncommon features of the landscape has incorporated all the designated areas into the natural heritage system of the City of Vaughan.

### 3.2.3.1 Features

- two Provincially and three locally significant wetlands
- five Life Science ANSI's in Vaughan
- 24 Environmentally Significant Areas are found within the subject lands: 22 are considered to have ecological importance and are therefore designated as Life Science Sites. The remaining 2 sites have a geologically important feature, thereby designating them as Earth Science Sites

## 4. Natural Heritage System Concepts

### 4.1 Hotspots of Natural Features within the City limits

Natural heritage hot spots have been identified in the city of Vaughan. Hot spots were identified as areas with high species diversity and abundance, sensitive hydrological features and high quality woodlots. Three main hot spots regions exist within the City (Figure 1). One is located along the upper reaches of the Main Humber River, north of Nashville Rd. The area in the northwest corner of the City near the terminus of Kirby Rd and Huntington Rd. is largely undeveloped and is predominantly natural cover. The wildlife in this area benefit from fact that no roads cross this large contiguous block of habitat. If Kirby Rd. or Huntington Rd were to be extended in the future, much of the ecosystem services would be lost in this natural hotspot.

The second natural heritage hotspot also occurs in the Humber River watershed. This hot spot is associated with the East Humber River valley and extends north from Langstaff Rd. The area north of the terminus of Pine Valley Drive is a hotspot for bird and amphibian breeding. If Pine Valley Drive were to be extended there would be disruption to this habitat block.

The third hotspot is found in the Don River Watershed, in the headwaters of the East Don. This area north of Carville Rd. These coldwater tributaries are important for the Don River as a whole, by providing year round flow, even in dry periods. The features on the Oak Ridges Moraine are unique in the City and require special consideration.

### 4.2 Countryside as a component of Natural Heritage

In the ever-expanding urban landscape of southern Ontario, countryside has become a valuable feature. Countryside includes well know natural features such as forests, ravines, wetlands, meadows, parks and agricultural lands, but also includes local businesses associated with these

features such as, local markets, artisan shops (honey, maple syrup, baked goods) and Inns and B&Bs. Countryside has many valuable attributes including economic, environmental and social.

Countryside has been officially designated in both the Oak Ridges Moraine Conservation Plan and the Greenbelt Plan. The Oak Ridges Moraine Conservation Plan defines countryside as areas that include Natural Core Areas, Natural Linkage Areas, Settlements, and agricultural lands. In the Greenbelt plan countryside includes the Agricultural System, Natural System and Settlement areas (Hamlets, Towns and Villages).

Maintaining countryside within the City provides natural cover, which is essential for the survival of many species, but it also provides linkages through agricultural fields and hedgerows. These linkages provide connectivity in the fragmented landscape. Natural areas (forests, meadows and wetlands) interspersed with agricultural land use provides better habitat than natural areas interspersed with urban or industrial development. Often roads and intensely developed areas act as barriers to species movement and can limit the overall diversity in an area. Countryside also provides areas for groundwater recharge and flow, functions that are not possible in asphalt dominated environments.

### 4.2.1 Three Natural Heritage Concepts

Three natural heritage systems have been developed for the City of Vaughan. Each system was based on the available natural heritage information as well as associated literature and natural heritage policy. We have identified hotspots (discussed above) related to hydrology, fisheries, vegetation, wildlife and designated areas. These hotspots were used to highlight areas that should be maintained in their current form, or enhanced wherever feasible. The framework for the three systems varies, with Alternative 1 being least restrictive to development, and Alternative 3 being most restrictive to development.

#### 4.2.1.1 *Alternative 1*

Concept 1 highlights the features that should be maintained according to the present municipal and provincial regulations. Maintaining these features is vital, but this represents the minimum acceptable system, and some ecosystem functions will be lost because the amount of natural cover may be below the threshold for a naturally functioning system (Figures 2 & 5).

#### 4.2.1.2 *Alternative 2*

Concept 2 includes the regulatory guidelines in Alternative 1, but also includes corridors and buffers connecting important natural heritage features. These corridors provide a essential connection between the Don and Humber Rivers that will allow the movement of mammals and other wildlife, which will improve genetic diversity, and the overall health of the ecosystem (Figures 3 & 6).

#### 4.2.1.3 *Alternative 3*

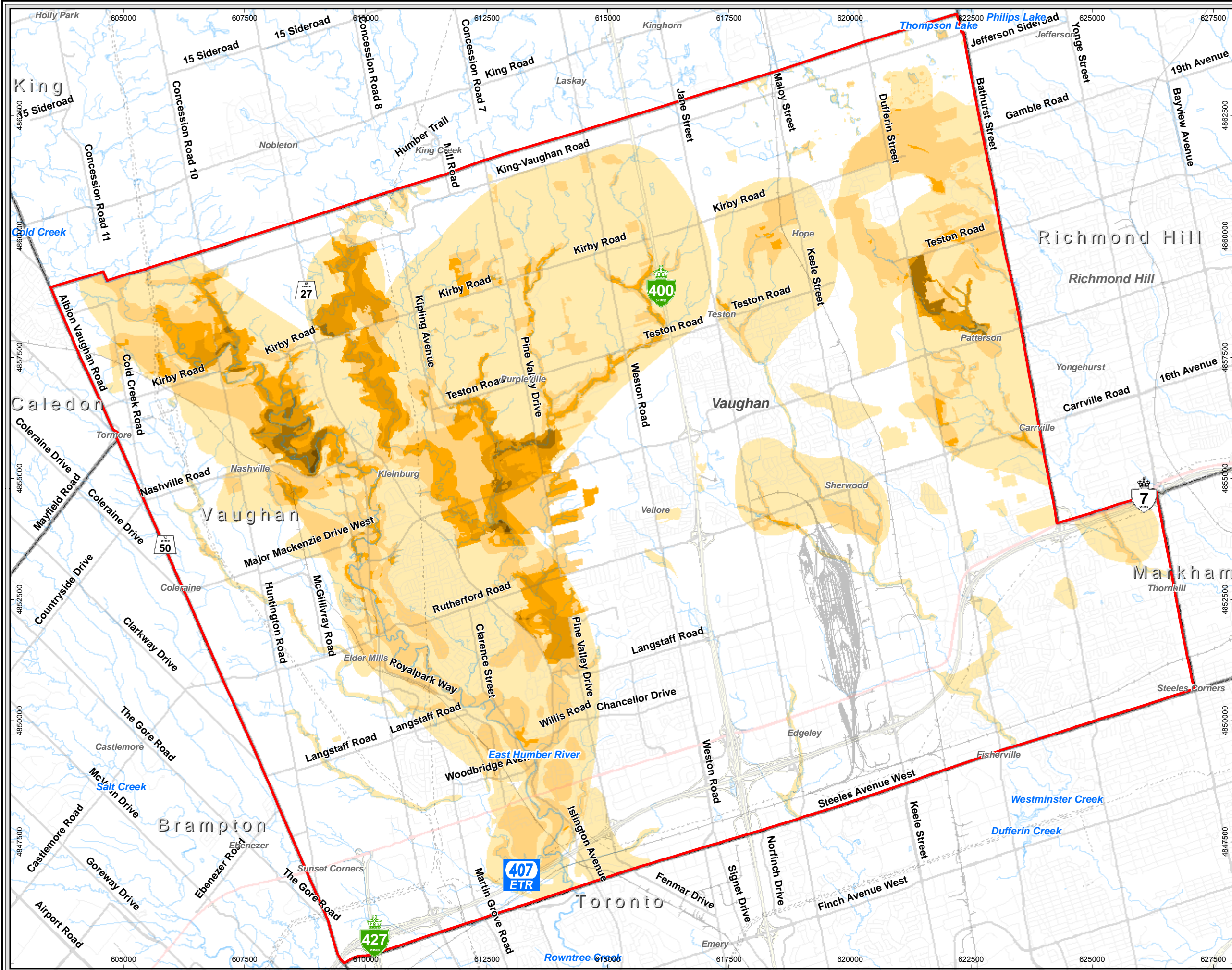
Concept 3 represents the ideal natural system because the broad corridors connecting important features offers habitat for numerous species and permits natural ecosystem processes to persist and endure, in the face of diverse external pressures (Figures 4 &7).

Draft

# Figures

Draft

Map Document: (N:\Projects\2007\70894\2008\Final\GIS\Biodiversity\Concentrations-11x17.mxd) 6/17/2008 8:31:55 AM



**Legend**

- Watercourse (TRCA)
- Transmission Line
- Railway
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Vaughan
- Municipal Division
- Waterbody
- Cartographic Wetland

**Biodiversity Concentrations (Number of Layers)**

	1		4
	2		5
	3		6

DRAFT

Basemapping from Ontario Ministry of Natural Resources

Km

0 0.5 1 2 3

1:75,000

UTM Zone 17N, NAD 83

Vaughan OP

**Concentrations of Biodiversity & Ecosystem Services**

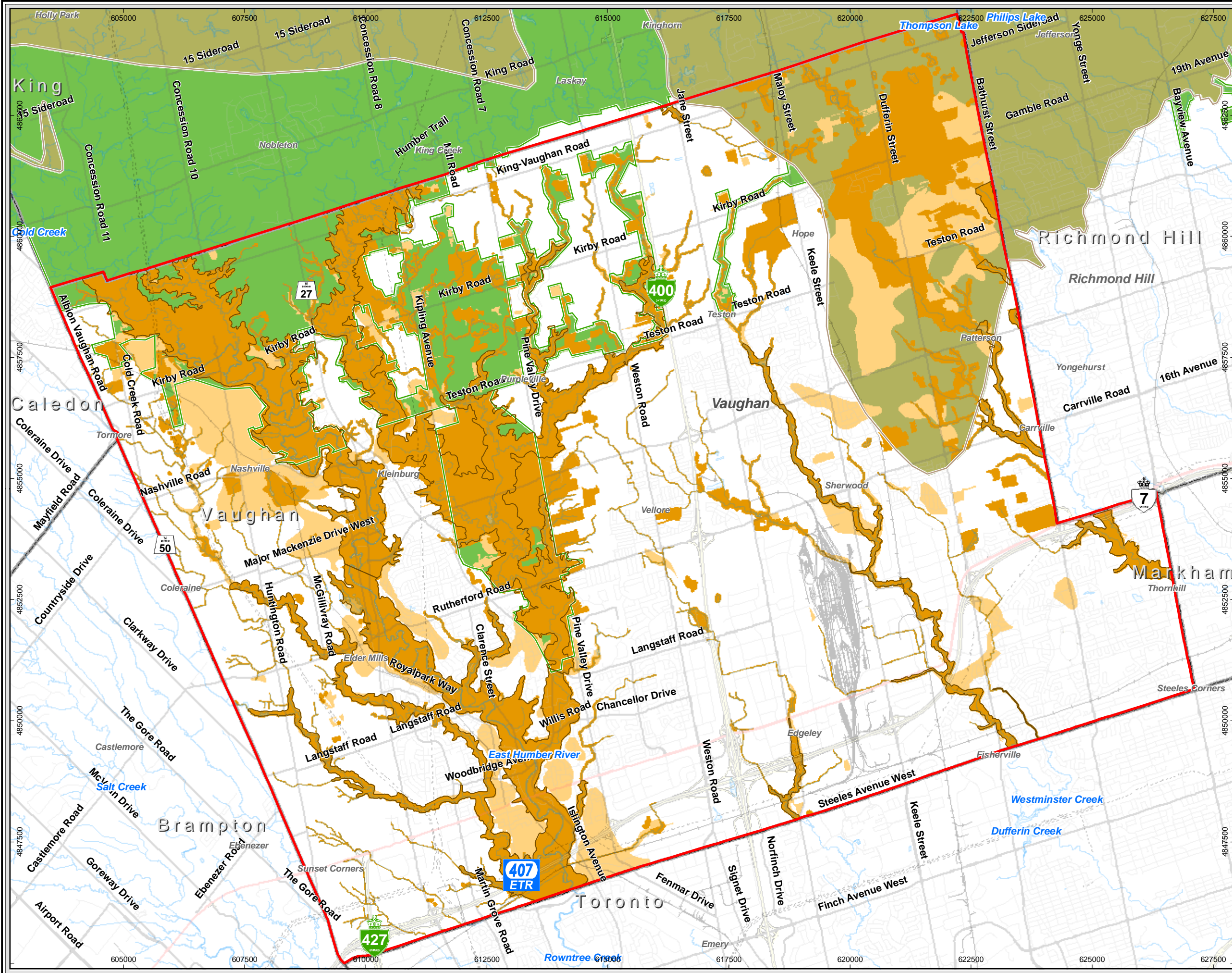
June 2008  
Project 70894

Gartner Lee

**Figure 1**



Map Document: (N:\Projects\2007\70894\2008\Final\GIS\Spatial\MXDs\Report\XD\June-2008\70894\Countryside Framework 1-11x17.mxd) 6/17/2008 8:34:48 AM



**Legend**

- Watercourse (TRCA)
- Transmission Line
- Railway
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Crest of Slope
- Vaughan
- Municipal Division
- ORM
- Greenbelt
- Special Policy Areas
- Sensitive Lands & Current Regulatory Setbacks
- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

Vaughan OP

**Countryside Framework 1**

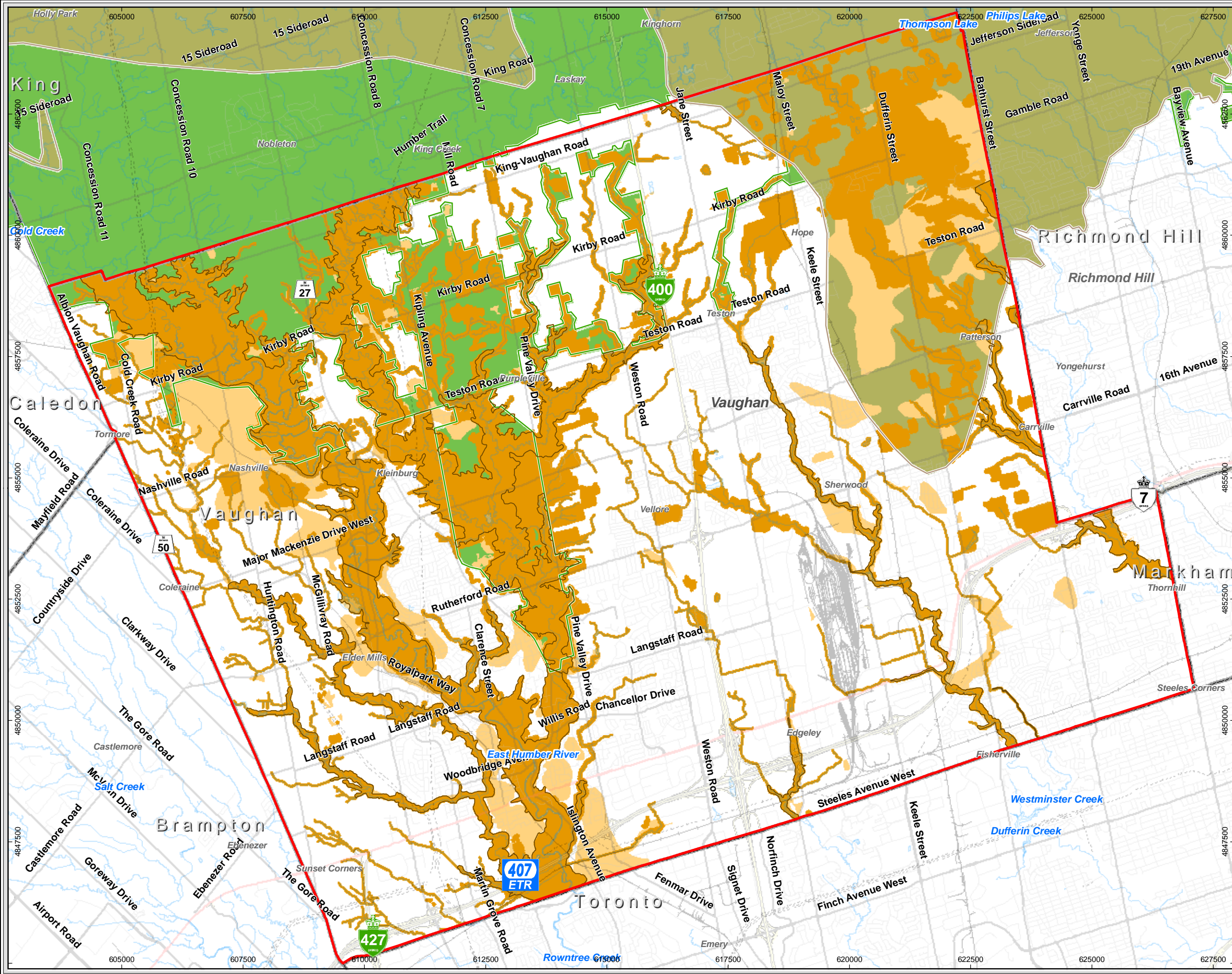
June 2008  
Project 70894

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**Figure 2**



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**Legend**

- Watercourse (TRCA)
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- Special Policy Areas
- Sensitive Lands & Current Regulatory Setbacks
- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

Km  
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1:75,000  
UTM Zone 17N, NAD 83

Vaughan OP

**Countryside Framework 2**

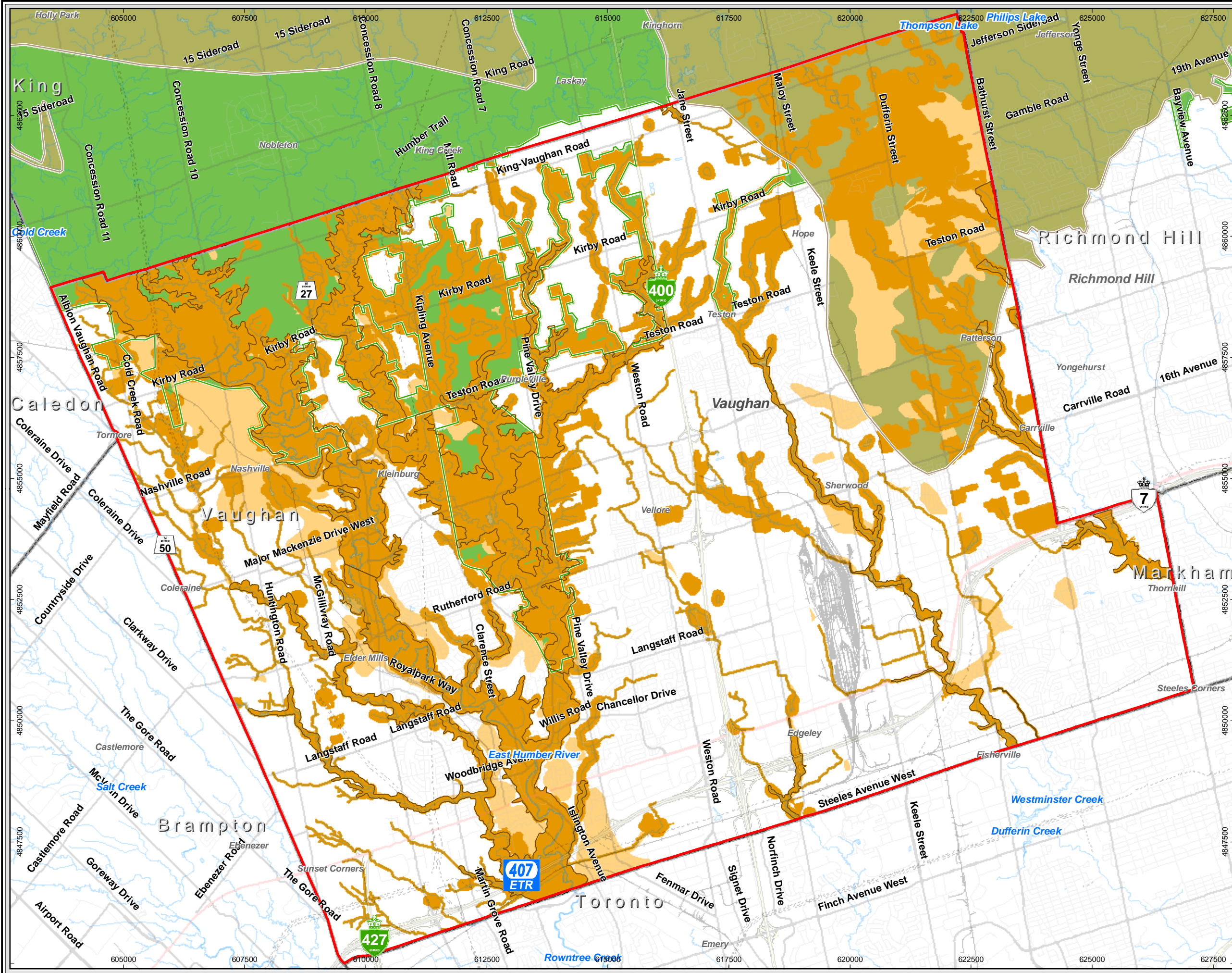
June 2008  
Project 70894

Gartner Lee

**Figure 3**



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**Legend**

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- Transmission Line
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- Crest of Slope
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- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

Km  
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UTM Zone 17N, NAD 83

Vaughan OP

**Countryside Framework 3**

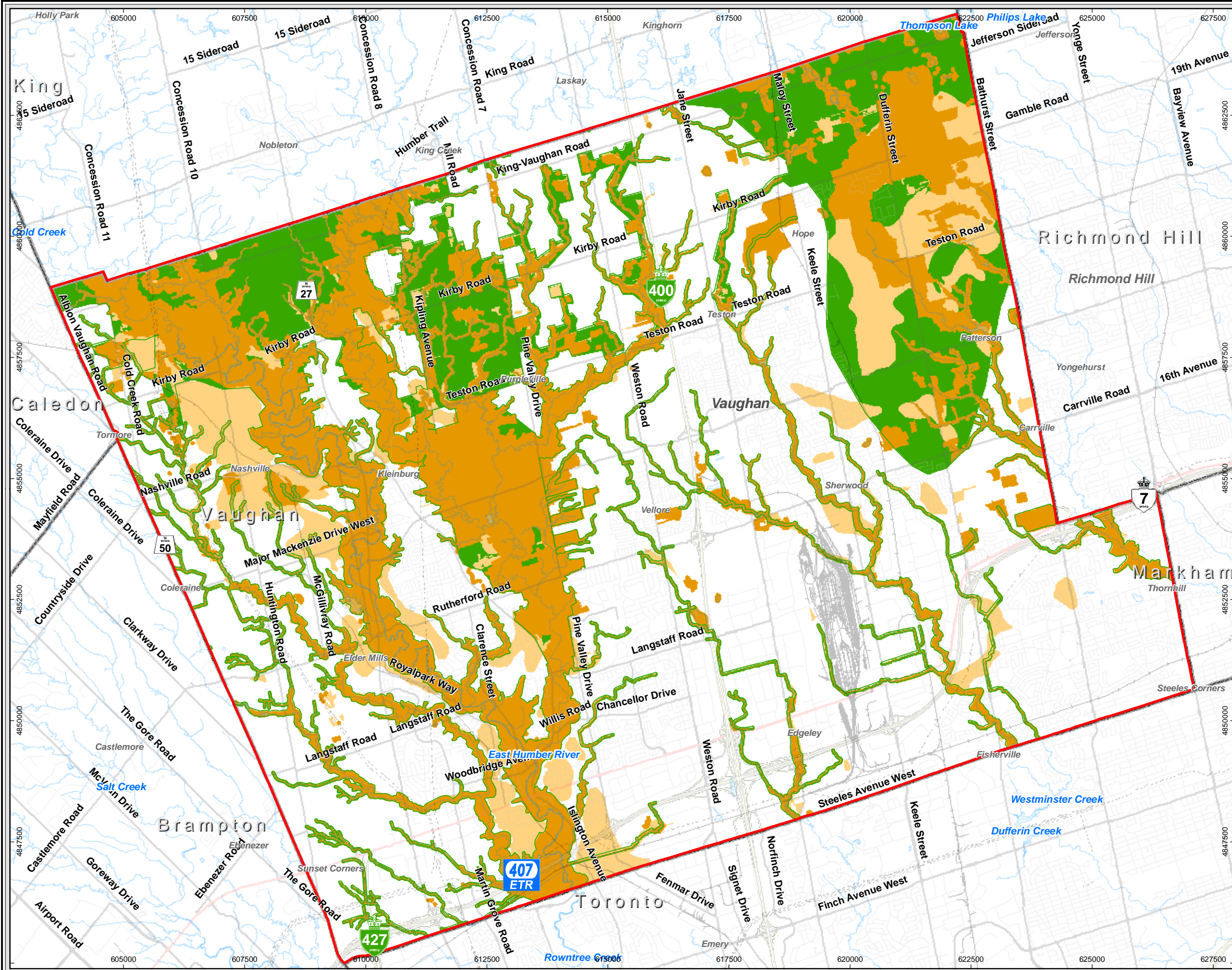
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Project 70894

Gartner Lee

**Figure 4**



Map Document: (N:\Projects\2007\70894\2008\Final\GIS\Spatial\MXDs\Report\MXDs\June-2008\70894\Countryside Concept1-11x17.mxd) 6/17/2008 8:54:14 AM



**Legend**

- Watercourse (TRCA)
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- Railway
- Freeway
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- Ramp
- Vaughan
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- Special Policy Areas
- Sensitive Lands & Current Regulatory Setbacks
- Countryside
- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

1:75,000  
UTM Zone 17N, NAD 83

Vaughan OP

**Countryside Concept 1**

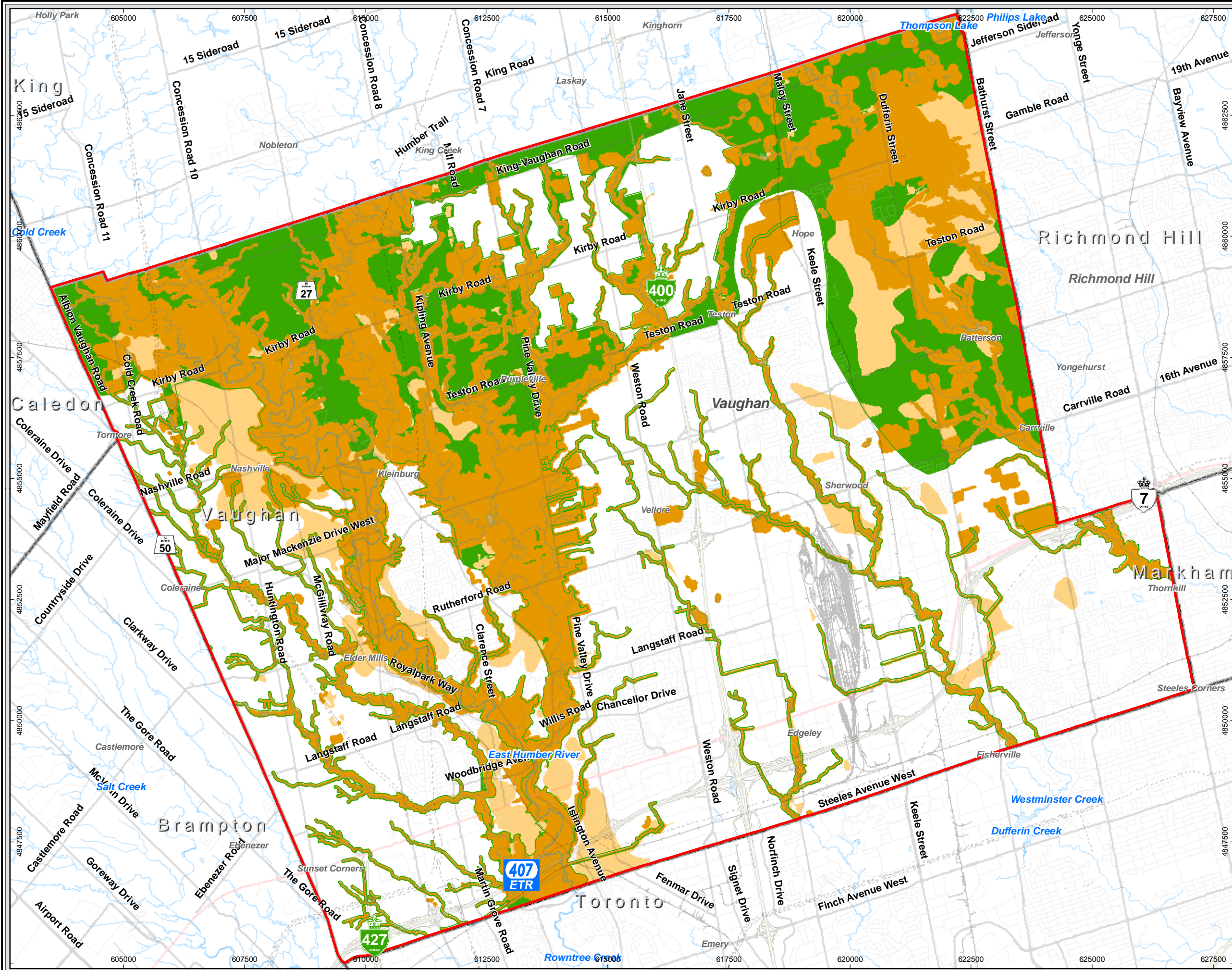
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Project 70894

Gartner Lee

**Figure 5**



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**Legend**

- Watercourse (TRCA)
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- Railway
- Freeway
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- Vaughan
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- Sensitive Lands & Current Regulatory Setbacks
- Countryside
- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

1:75,000  
UTM Zone 17N, NAD 83

Vaughan OP

**Countryside Concept 2**

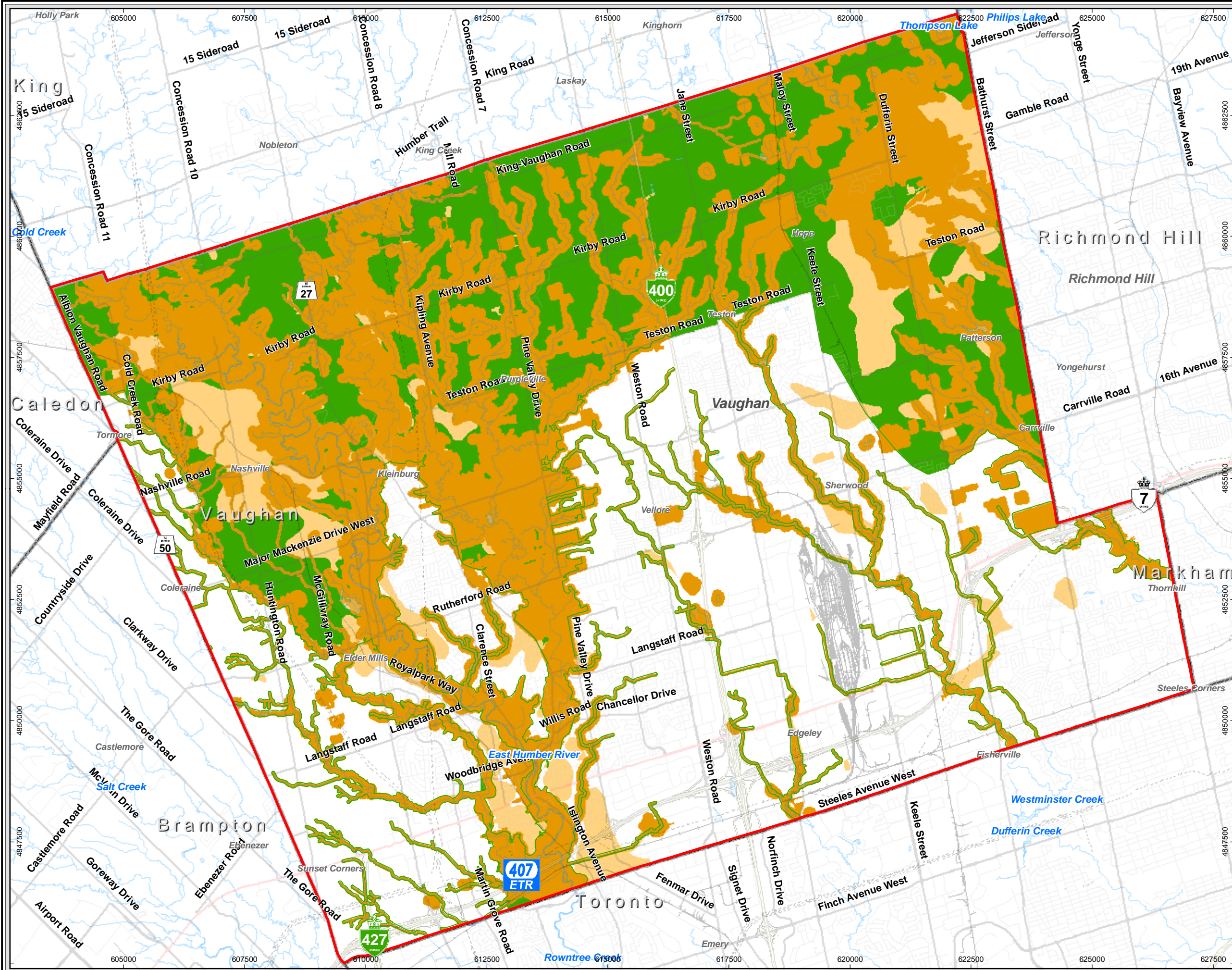
June 2008  
Project 70894

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**Figure 6**



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**Legend**

- Watercourse (TRCA)
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- Railway
- Freeway
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- Waterbody
- Cartographic Wetland

**DRAFT**

Basemapping from Ontario Ministry of Natural Resources

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UTM Zone 17N, NAD 83

Vaughan OP

**Countryside Concept 3**

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Project 70894

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**Figure 7**

# Appendices

Draft

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# Appendix A

## Benefits of Natural Cover

<b>Environmental Benefits</b>
<ul style="list-style-type: none"><li>• Improve air quality: Vegetation, especially trees, filter pollution and particulates from the air. Airborne particles are trapped on leaf surfaces and filter gaseous pollutants such as carbon monoxide, sulphur dioxide and nitrogen oxides. The greater the leaf surface area the greater their filtering capacity. Conifers have a greater surface area than deciduous trees and do not shed their needles in the winter, which makes them very effective year round. However, they are generally more sensitive to air pollution and deciduous trees are better at absorbing gases, therefore having both is important.</li></ul>
<ul style="list-style-type: none"><li>• Microclimate regulation: Urban areas are usually warmer than surrounding landscapes due to the 'urban heat island effect', which is created by the presence of large areas with heat absorbing surfaces, decreased wind, and human activities that produce heat. Trees need heat to drive evapotranspiration, thereby lowering ambient temperatures in their vicinity. Trees adjacent to buildings also reduce the cost of cooling in the summer and heating in the winter by providing shade and windbreak services.</li></ul>
<ul style="list-style-type: none"><li>• Carbon sinks: During photosynthesis trees produce oxygen and store carbon, having the capability to reduce climate change.</li></ul>
<ul style="list-style-type: none"><li>• Water quality improvement: Vegetation behaves as a natural filter as it intercepts fertilizers, pesticides and other pollutants from flowing into surface water and into recharge areas. Roots of trees and other plants also reduce soil erosion by holding soil in high winds and flood events.</li></ul>
<ul style="list-style-type: none"><li>• Reduction of stormwater runoff and flooding by intercepting water and encourage groundwater recharge.</li></ul>
<ul style="list-style-type: none"><li>• Trees improve water and habitat quality in streams by providing shade and lowering water temperature.</li></ul>
<ul style="list-style-type: none"><li>• Fallen tree leaves provide a nutrient source to soil and aquatic environments.</li></ul>
<ul style="list-style-type: none"><li>• Habitat for migratory birds and other wildlife species.</li></ul>
<ul style="list-style-type: none"><li>• Reduction of soil erosion: Plant roots hold soil in high winds and flooding events.</li></ul>
<ul style="list-style-type: none"><li>• Pest control provided by species that take residence in forest ecosystems.</li></ul>
<b>Social Benefits</b>
<ul style="list-style-type: none"><li>• Recreational uses.</li></ul>
<ul style="list-style-type: none"><li>• Cultural: aesthetic, artistic, educational, spiritual</li></ul>
<ul style="list-style-type: none"><li>• Reduced noise pollution by buffering sound.</li></ul>
<ul style="list-style-type: none"><li>• Improved mental and physical health.</li></ul>
<b>Economic Benefits</b>
<ul style="list-style-type: none"><li>• Resource harvesting: Timber supply, berries, mushrooms.</li></ul>
<ul style="list-style-type: none"><li>• Increased property value of homes adjacent to natural area.</li></ul>
<ul style="list-style-type: none"><li>• Reduced costs to health care by improving air and water quality.</li></ul>
<ul style="list-style-type: none"><li>• Reduced costs of water treatment by improving water quality and infiltration.</li></ul>

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# Appendix B

## Wetland Benefits

Environmental Benefits
Climate regulation – wetland vegetation helps reduce the heat island effect.
Water storage – wetlands store a significant amount of water, and release it slowly over a long period of time. This helps to maintain adequate flow during dry periods and ameliorates the effects of flooding.
Water cleansing – wetlands have been described as “nature’s kidneys” because of their ability to filter suspended solids, nutrients and toxins from their receiving waters.
Nutrient cycling – nutrients from the receiving waters are utilized by wetland plants, and are then released when the vegetation decays. Nutrient cycling supports a healthy food chain and promotes biomass storage.
Social Benefits
Recreation – bird watching, photography, hiking, biking
Scientific information – specimens for museums and botanical gardens encourage a greater understanding of nature, and products used in the pharmaceutical industry (the majority of today’s drugs were originally derived from natural sources).
Appreciation of nature – benefits physical, emotional and psychological health
Economic Benefits
Flood control – because wetlands have the capacity to absorb and store water, they reduce flood damage
Erosion control – wetland vegetation along shorelines, streams and rivers reduces erosion by stabilizing the substrate with a network of roots.
Clean water – natural wetlands filter and absorb suspended solids, nutrients and toxins from the receiving waters. Wetlands can also be built for the sole purpose of treating secondary and tertiary sewage waste, and industrial effluent.
Commercial and Subsistence production – berries, fish, birds

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# Appendix C

## Environmental, Social and Economic Benefits of Corridors

<b>Environmental Benefits</b>
• Vegetated riparian strips maintain water quality in streams by reducing runoff, erosion and deposition of nutrients, sediment and other pollutants
• Decrease pollution and contamination of groundwater and provide additional recharge areas.
• Treed corridors behave as carbon sinks as trees produce oxygen and store carbon in the process of photosynthesis.
• Increase effective size of core areas that provide a diversity of habitats for plant and wildlife species.
• Increased species immigration rates: increase or maintain species richness and diversity, increase species populations of some species, prevent inbreeding depression and maintain genetic variation.
• Provide predator escape cover for movement between patches.
• Provide alternate refugia from large disturbances.
• Stepping-stone refuges for migratory waterfowl.
• Accommodate range shifts due to climate change.
<b>Social Benefits</b>
• Recreational opportunities such as hiking and bird watching.
• Human Health improvements due to enhanced ecosystem functions such as air and water quality improvements.
• Education Opportunities
• Aesthetic Improvements
<b>Economic Benefits</b>
• Can behave as windbreaks in an agricultural matrix thereby reducing soil erosion and increasing crop productivity.
• Increased values of properties adjacent to vegetated corridors.
• Reduced cost of stormwater control.
• Reduced health costs to system by facilitating improvements to air and water quality.
• Reduced cost of water treatment.



# Appendix D

## Summary of Environmental, Social and Economic Benefits Provided by Natural Heritage Features

Benefits	Hydrogeology	Aquatic	Wetlands	Terrestrial	Corridors
<b>Environmental</b>					
Climate regulation			X	X	X
Toxin absorption		X	X	X	
Water storage	X	X	X	X	
Water quality improvement	X	X	X	X	
Nutrient cycling		X	X	X	X
Food chain support		X	X	X	X
Habitat		X	X	X	X
Flood control	X	X	X	X	
Air quality improvement			X	X	X
Maintenance of genetic diversity					X
Migration and species movement conduits					X
<b>Social</b>					
Aesthetic		X	X	X	
Recreation		X	X	X	X
Research	X	X	X	X	X
Education	X	X	X	X	X
Relaxation and mental health		X	X	X	
Physical health		X	X	X	
Symbolic value		X	X	X	X
Pharmaceutical products		X	X	X	
<b>Economic</b>					
Tourism		X	X	X	
Subsistence and commercial production		X	X	X	
Small businesses		X	X	X	
Water quality and quantity		X	X	X	



## Appendix E. Specific Benefits Incurred from Three Natural Heritage Concepts

Category	Measure	System				
		Alternate 3	Alternate 2		Alternate 1	
		Benefit	Measure	Benefit	Measure	Benefit
<b>Hydrology</b>	No buffer required		No buffer required		No buffer required	
<b>Fisheries</b>	Tributaries in hot spots have a <b>100 m</b> buffer capturing a wide valley system	Best for water quality: capable of filtering out larger volumes of sediments, nutrients from intense adjacent land use or steeper slopes. This buffer would be used to capture entire systems (i.e.: Valleys). (Environment Canada)	Tributaries in hot spots have a <b>50 m</b> buffer from edge of stream	More efficient for removal of excess nutrients and sediments, improved water quality. Many fish species are completely dependent on various wetland types (i.e. marshes) and watercourses. Larger buffers can be important in providing increased protection to the wetland functions and attributes. (Environment Canada)	Tributaries in hot spots have a <b>30 m</b> buffer from bankfull	Adequate for water quality in most cases, i.e. very little slope, filter out some sediments and excess nutrients, low adjacent land use intensity (Environment Canada)
<b>Wildlife/Fisheries</b>	Species at risk have a <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population. (MNR NHRM)	Species at risk have a <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population. (MNR NHRM)	Species at risk have a <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population. (MNR NHRM)
<b>Aquatic</b>	Hot spots have a <b>30 m</b> buffer from the bankfull  Crest of Slope <b>10 m</b> buffer	Larger adjacent lands are required for high value resources in intense land use areas. Critical for removing excess nutrients and sediments. Good for water quality (Environment Canada)  TRCA	Hot spots have a <b>30 m</b> buffer from the bankfull  Crest of Slope <b>10 m</b> buffer	Larger adjacent lands are required for high value resources in intense land use areas. Critical for removing excess nutrients and sediments. Good for water quality (Environment Canada)  TRCA	Tributaries outside of hot spots have a <b>15 m</b> buffer from the bankfull  Crest of Slope <b>10 m</b> buffer	Minimum will provide for adequate filtering of excess nutrients and sediments from adjacent land use. Note: 15 m for warm water, 30 meters for cold (MNR 1987, Environment Canada)  TRCA
<b>Designated Areas</b>	Provincially Significant Wetlands <b>500 m</b> buffer from the edge  Unevaluated wetland communities <b>100 m</b> buffer (all wetland communities including swamps).	Best option that will provide over 90% of function for the wetland (MNR 2003). Beneficial cover for wildlife. I.e. majority of waterfowl, turtles nest within the buffer. Spacing also makes it difficult for predators to locate nests (excellent for SAR/concern) (MNR 2003). Best for water quality: sediment and nutrient removal, accounts for large slopes if present. (Environment Canada)  Known that development within buffer has a reasonable probability of affecting ecological functions of wetlands (NMR NHRM). This buffer provides good water quality (removal of excess nutrients and sediments, including on slopes) (Environment Canada). Area utilized by wildlife requiring both wetland and upland habitat. (MNR 2003)	Provincially Significant Wetlands <b>120 m</b> buffer from the edge  Unevaluated wetland communities <b>30 m</b> buffer (all wetland communities including swamps).	Area utilized by wildlife requiring both wetland and upland habitat. Provides good removal of sediments and excess nutrients from surrounding area (MNR 2003)  Adequate water quality, little habitat for wildlife (nesting, foraging)	Provincially Significant Wetlands <b>30 m</b> buffer from the edge  Unevaluated wetland communities <b>15 m</b> buffer (30 m on The Moraine) (all wetland communities including swamps).	Provides some water quality control (sediment/nutrient removal), area utilized by limited quantity of wildlife (MNR 2003)  Provides minimum water quality, no enhanced wildlife function.

## Appendix E. Specific Benefits Incurred from Three Natural Heritage Concepts

Category	Measure	System					
		Alternate 3		Alternate 2		Alternate 1	
		Measure	Benefit	Measure	Benefit	Measure	Benefit
<b>Vegetation</b>	Rare vegetation communities <b>50 m</b> buffer from the edge of the significant portion of the habitat.		Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population (MNR NHRM).	Rare vegetation communities <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population (MNR NHRM).	Rare vegetation communities <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Protection of their habitat is critical in order to slow or prevent the extirpation of a species from the province, or potentially on a global basis. The larger the buffer area provided, will allow for the maintenance, enhancement and dispersal of the population (MNR NHRM).
	All Woodlots <b>50 m</b> buffer		Best protection for the woodlot, larger woodlots are more likely to contain a greater diversity of plant and animal species and are better buffered against harmful edge effects of agriculture, urban activities and provide the only habitat for woodland-dependent species. (MNR NHRM, LSRCA 2007)	All Woodlots <b>20 m</b> buffer	Provides some protection to woodland vegetation, tree species and woodlot structure, canopy height, age and closure, projected rooting zones and influences on tree health of windthrow, sunscald, salting and adjacent uses. (MNR NHRM, LSRCA 2007)	All Woodlots <b>10 m</b> buffer	Provides minimum buffer to protect forest from winthrow damage, does not contribute to foraging, nesting habitat in a significant way. (Note: smaller woodlots are more susceptible to blowdown, drought, disease, insect infestations, and invasions by non-native species). (MNR NHRM, LSRCA 2007)
	Meadows with interior, or are >10 ha <b>50 m</b> buffer from the edge		Provide for greater biodiversity. Oak ridges Moraine MNR (2004) identified grasslands greater than 10 ha as "Specialized Habitat" which is significant for guilds or communities of wildlife species that require this type of habitat to maintain their population (LSRCA 2007).	Meadows with interior <b>20 m</b> buffer from the edge	Provides adequate protection to the meadow from adjacent land use practices. More likely grassland will become usable habitat for bird species which require larger areas. (LSRCA 2007)	Meadow >10 ha in size or with interior <b>10 m</b> buffer from the edge	Provides some protection to the Meadow. Smaller buffer can put the meadow at greater risk to adjacent land uses, meadows <10 ha in size are unlikely to be of much use to wildlife (LSRCA 2007)
	Meadows adjacent to riparian areas or forests <b>10 m</b> buffer.		Combine with other Meadows?	Meadows adjacent to forest <b>20 m</b> buffer	Combine with other Meadows?	Meadows adjacent to forest <b>10 m</b> buffer	Combine with other Meadows?
<b>Wildlife</b>	Veg patches/forest with SAR or Provincially. rare species <b>50 m</b> buffer from the edge of the significant portion of the habitat.		Same as species at risk section in this table	Veg patches/forest with SAR or Provincially. rare species <b>50 m</b> buffer from the edge of the significant portion of the habitat.	Same as species at risk section in this table	Veg patches/forest with SAR or Provincially. rare species <b>10 m</b> buffer from the edge of the significant portion of the habitat.	Same as species at risk section in this table
	Amphibian hotspot areas <b>50 m</b> buffer		Same as aquatic + wetlands section in table	Amphibian hotspot areas <b>50 m</b> buffer	Same as aquatic + wetlands section in table	Amphibian hotspot areas <b>50 m</b> buffer	Same as aquatic + wetlands section in table
	Area sensitive bird species <b>50 m</b> buffer from the edge		Provides good protection against adjacent land-use practices. Important to maintain as much habitat as possible for area sensitive species, as many require large areas to be successful; 200 ha woodland patches support 80% of sensitive species, 100 ha 60%, few were supported at the 50 ha patch level. Also are important as stopover and staging habitat along migrating bird routes. (Environment Canada)	Area sensitive bird species <b>50 m</b> buffer	Provides good protection against adjacent land-use practices. Important to maintain as much habitat as possible for area sensitive species, as many require large areas to be successful; 200 ha woodland patches support 80% of sensitive species, 100 ha 60%, few were supported at the 50 ha patch level. Also are important as stopover and staging habitat along migrating bird routes. (Environment Canada)	Area sensitive bird species <b>50 m</b> buffer	Provides good protection against adjacent land-use practices. Important to maintain as much habitat as possible for area sensitive species, as many require large areas to be successful; 200 ha woodland patches support 80% of sensitive species, 100 ha 60%, few were supported at the 50 ha patch level. Also are important as stopover and staging habitat along migrating bird routes. (Environment Canada)