Phase 2-4 Natural Heritage Network Study City of Vaughan

Prepared for City of Vaughan
2141 Major Mackenzie Drive
Vaughan, Ontario
L6A 1T1

May 2014

North-South Environmental Inc.
35 Crawford Crescent, Suite U5
P.O. Box 518
Campbellville, Ontario
L0P 1B0

Project Study Team

North-South Environmental Inc.
Brent Tegler (Project Manager)
Mirek Sharp
Sarah Mainguy
Sal Spitale
Richard Czok

LURA
Susan Hall
Nishanthan Balasubramaniam

Orland Conservation
Robert Orland
Kate Potter

R.J. Burnside
Chris Pfohl

Steering Committee
Tony Iacobelli – City of Vaughan (Project Manager)
Alison Munro – City of Vaughan
Melanie Morris - City of Vaughan
Jackie Burkart – MNR
Bohdan Kowalyk – MNR
Sandra Malcic – York Region
Dan Clayton – TRCA
Noah Gaetz - TRCA
Namrata Shrestha – TRCA

Table of Contents

List of Tables

List of Figures

List of Appendices

City of Vaughan NHN Phase 2-4 Study Report

1.0 INTRODUCTION

Vaughan Vision 2020, the City of Vaughan's Strategic Plan, begins by acknowledging the rapid pace of change in the City.

Vaughan is one of Canada's fastest growing cities, with a population of over 250,000. It is projected that the number of residents will increase to 430,000 by 2031.

The next 25 years will see Vaughan beginning the transition from a growing suburban municipality to a fully urban space. This type of transition will require long-term thinking about how best to accommodate and make the most of new opportunities.

Vision 2020 includes a vision and strategic goal that acknowledges the need to value and manage the natural environment.

Vision: *A city of choice that promotes diversity, innovation and opportunity for all citizens, fostering a vibrant community life that is inclusive, progressive, environmentally responsible and sustainable*

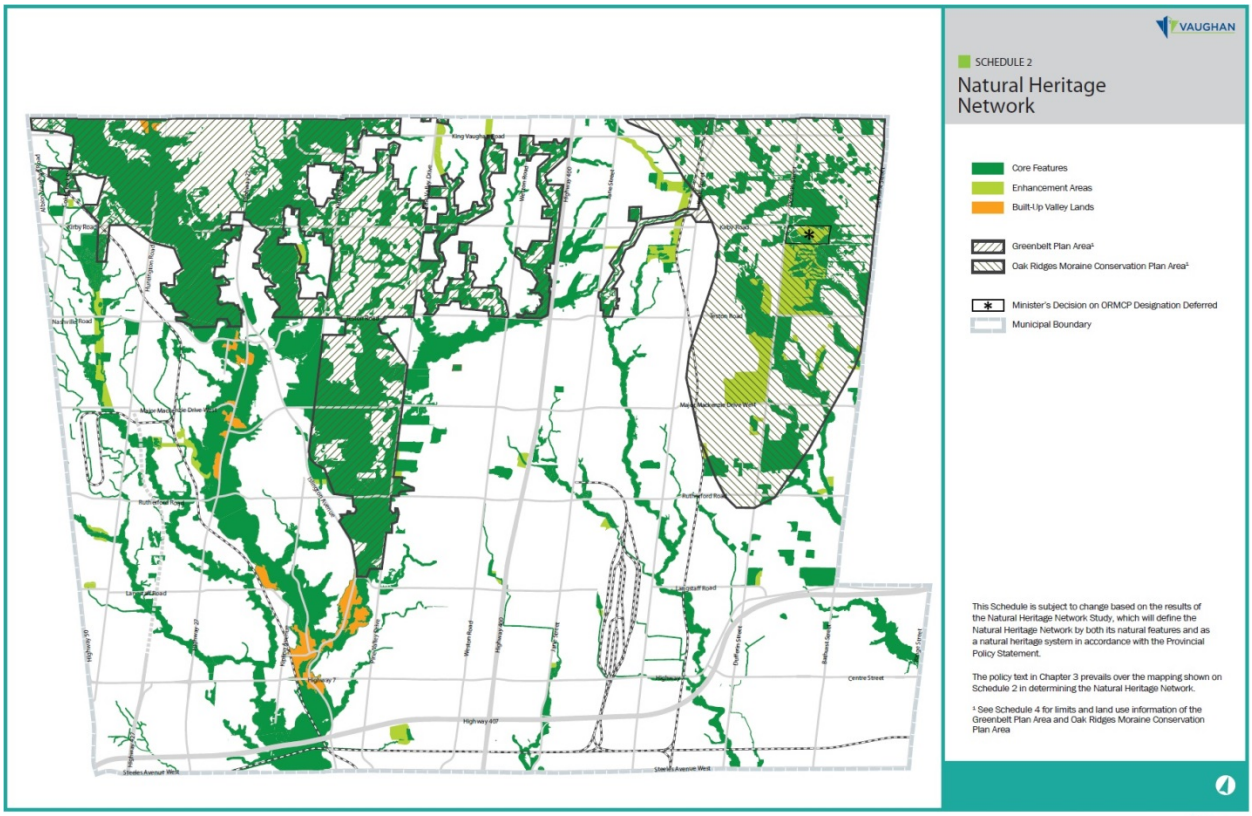
Goal: *Lead and Promote Environmental Sustainability*

Recognizing the pace of growth in urban areas, the Province of Ontario passed the Places to Grow Act (2005) and prepared the Growth Plan for the Greater Golden Horseshoe to provide direction and tools for municipalities to manage growth to optimize benefits and to minimize negative impacts. This includes planning for social, economic and environmental needs. The revised Provincial Policy Statement (PPS 2014) now includes a policy directing municipalities in southern Ontario to identify natural heritage systems "recognizing that *natural heritage systems* will vary in size and form in *settlement areas*, *rural areas*, and *prime agricultural areas*".

Vaughan Tomorrow is the City's growth management program and comprises: Vaughan Vision 2020; Green Directions Vaughan, the City's first Community Sustainability and Environmental Master Plan; and the new Vaughan Official Plan 2010 (VOP 2010), adopted by Council on September 7, 2010 and subject to further modifications on September 27, 2011, March 20, 2012 and April 17, 2012, and approved with modifications by York Region council on June 28, 2012.

The VOP 2010 includes a Council adopted Natural Heritage Network (NHN) that represents an interconnected system of core natural features, enhancement areas and built-up valley lands to protect natural heritage features and ecological functions in a healthy and resilient system ensuring long term protection and management of Vaughan's native biodiversity. The Natural Heritage Network as currently defined in the VOP 2010 is shown in Figure 1.

Figure 1. City of Vaughan Natural Heritage Network (VOP 2010)



The NHN performs the unique function of providing natural areas able to meet the habitat needs of native plant and animals that require high quality habitat for their long term survival. Many species (for example, Spring Peepers, Wood Thrush and Rose Twisted-stalk) cannot be found where there are high noise levels, vehicle exhaust, continuous light at night, poor water quality, barriers to movement, etc. that characterize more built-up urban areas.

The development of a NHN is therefore a long range environmental planning effort intended to protect the habitat necessary to sustain native plants and animals over the long term. The NHN is of particular importance in the context of ongoing urban development in Vaughan, particularly within new community areas.

The NHN is based on the Commitment to Environmental Stewardship as expressed in the VOP (2010):

> *The natural environment is among Vaughan's most important and cherished assets. The Humber and western Don Valley systems are prominent on the City's landscape and the overall health of those systems is reliant on the stewardship provided by Vaughan. The watercourses, woodlands, wetlands and related open spaces and agricultural lands each have an important function in maintaining ecological vitality and diversity in the City. Protecting flood prone areas from inappropriate development is critical to ensuring public safety. Ensuring the quality of our air, water and soil is fundamental to maintaining overall environmental health. We must also recognize the impacts of climate change on our environment and plan for both mitigation and adaptation.*

The NHN *provides for the long-term health of Vaughan's natural environment for the benefit of present and future generations* (VOP 2010). Achieving protection requires a "systems approach" that considers the importance of maintaining and protecting:

- ***ecological features*** in the environment such as woodlands, wetlands and watercourses, *etc.*;
- ***ecological functions*** of the environment such as water storage and water quality enhancement by wetlands, winter deer yards provided by dense cedar woodlands, amphibian breeding habitat in ephemeral forest ponds, open country or grassland habitat for birds provided by meadowlands, *etc*.; and
- ***ecological interactions*** that occur over varying scales of time and space such as animal predation and herbivory, the daily, seasonal and long term movement patterns of plants and animals, and the ecological role of natural disturbance mechanisms such as fire, wind, water, and disease, *etc*.

1.1 Outline of the Natural Heritage Network Study

The Natural Heritage Network Study is being undertaken to provide high quality mapping of ecological features in the City of Vaughan and to establish and apply a clear set of ecological criteria that define Vaughan's NHN. High quality mapping and clearly defined criteria will assist in achieving a consistent and transparent approach to land use planning that meets Vaughan's vision, goals and commitments to environmental sustainability.

Overall there are three main study objectives:

- Assess the biodiversity contribution and ecological functions of the existing NHN;
- Develop a GIS database of the NHN, its constituent parts, and relevant attribute information to provide a clear and transparent rationale for the NHN, which can be used in the development application process; and
- Prepare a strategy to enhance the NHN to meet select ecosystem targets.

NHN Phase 1 Study

The phase 1 study completed in December 2012 assembled the available natural heritage information into a digital geographic database and established a set of criteria to define the NHN based on provincial and municipal policies and guidelines (North-South 2012).

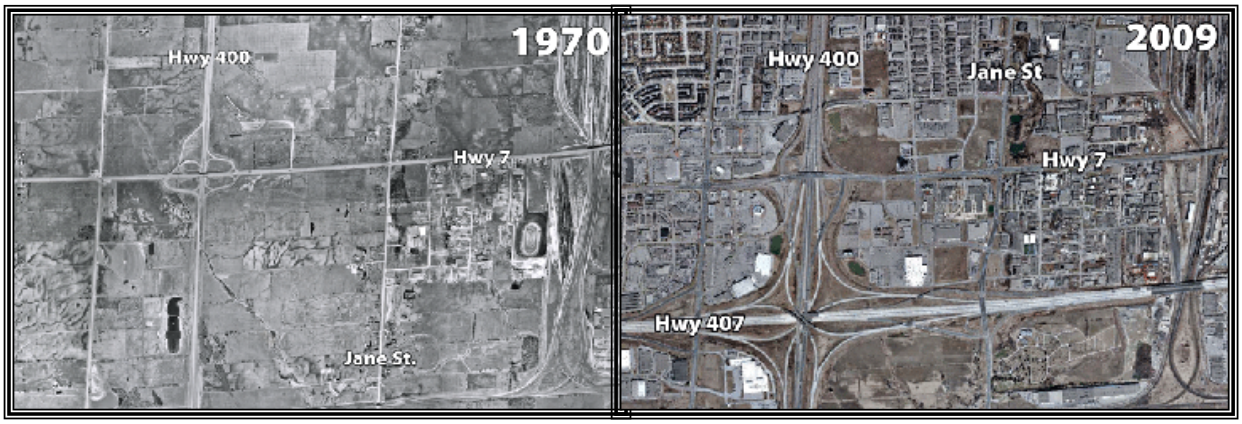
NHN Phase 2-4 Study

To meet these objectives there were four main study components in the phase 2-4 study:

- Field investigations that focus on Headwater Drainage Features (HDF) and Significant Wildlife Habitat (SWH);
- Develop a recommended approach to identify and map a Natural Heritage Network (NHN) for Vaughan;
- Prepare a Land Securement Strategy; and
- Develop and implement a Community Engagement Plan.

2.0 THE CHANGING ENVIRONMENT OF SOUTHERN ONTARIO

Over the past fifty years the extent and intensity of urban development has fundamentally changed the character of southern Ontario within an area extending from Oshawa to Hamilton and northward from Toronto to Newmarket. The change has occurred in large measure as urban development expanded into agricultural lands, which previously separated smaller towns and larger cities.



Over this same time period the approach to protecting natural areas within new areas of urban development has changed substantially. In the 1950's the approach was to maximize the area available for urban development by removing woodlands and wetlands and where possible putting watercourses in concrete channels that in some cases were buried. Through the 1960's and 70's greater effort was made to protect the most significant natural areas through Environmentally Significant/Sensitive Area programs, an approach described as protecting "islands of green". In the 1980's protecting natural areas began to take a "systems approach", considering the need for the protection of larger core protected areas and ecological corridors linking isolated natural areas; an approach requiring the protection of open fields and agricultural lands as "enhancement areas".

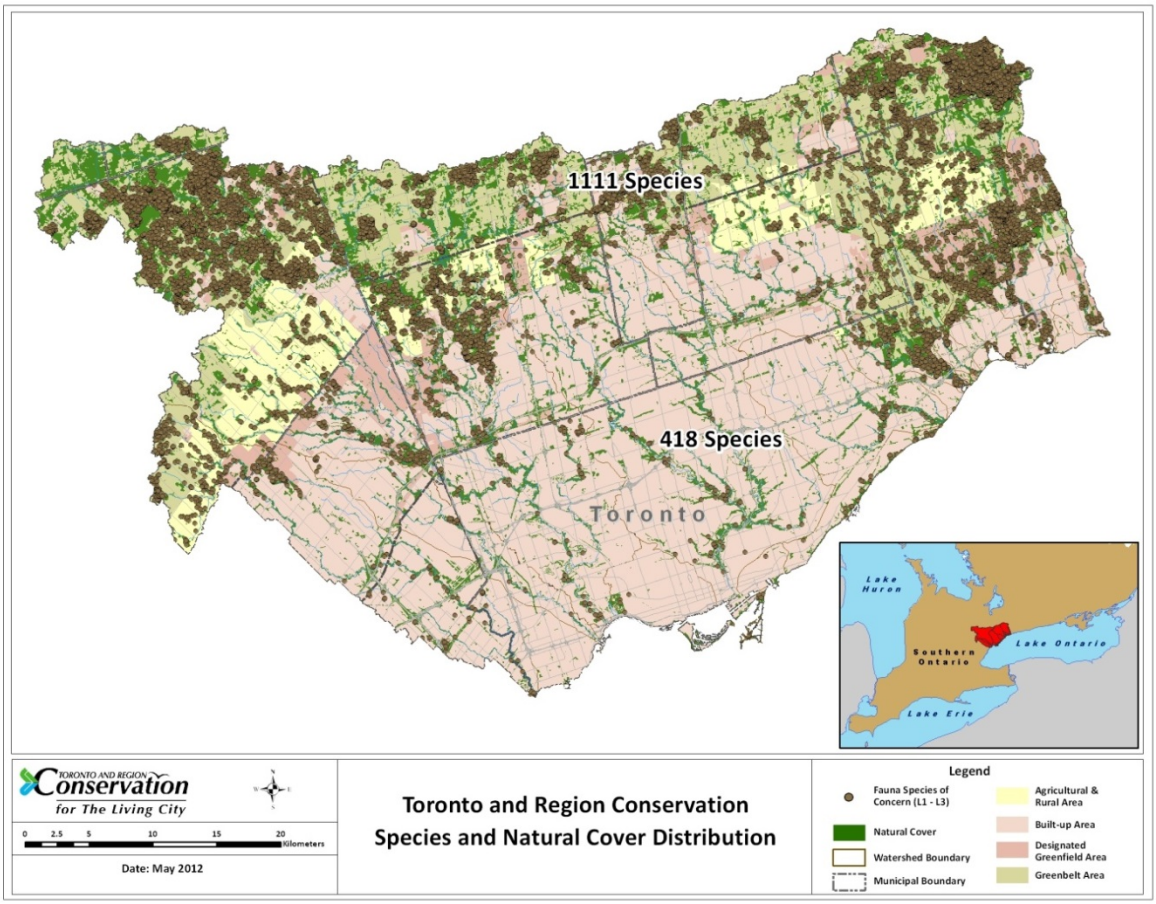
2.1 A "Systems Approach" to Natural Heritage Network Planning

The protection of large, diverse, well connected habitat patches capable of sustaining populations of native plants and animals and facilitating natural movement patterns is the essence of a NHN. A fundamental tenet of biodiversity conservation is that a natural heritage system should be capable of protecting a full range of native plant and animal species and communities indigenous to an area, as well as the biological conditions that support them (Ontario's Biodiversity Conservation Strategy 2011). Increasingly NHN's are also being recognized for the many "ecosystem services" they

provide, such as tree canopies that provide shade and mitigate the heat generated by urban landscapes, groundwater infiltration, habitat for pollinators essential for agriculture, carbon storage to mitigate climate change, filtration of pollutants from air and water, water storage to mitigate flooding, and mental and physical human health benefits.

The identification of a NHN in areas undergoing land use change from rural to urban land uses is extremely important owing to the many substantial environmental impacts inherent in urban environments. In southern Ontario's rural landscapes the plants and animals present are relatively stable, occupying and moving among the available habitat patches in the relatively "soft" agricultural landscape. When urbanization occurs, the agricultural landscape is dramatically transformed to homes, roads, commercial development, places of work, parking areas, etc. This creates a "hard" urban landscape with a variety of negative impacts which can lead to a decline in habitat quality and a reduction in plant and animal diversity. The Toronto Region Conservation Authority has recorded 418 of the more sensitive L1-L3 species in older urban areas of the Greater Toronto Area (GTA) and 1111 sensitive L1-L3 species (266% more) in more rural areas where urban development is less (Figure 2).

Figure 2: TRCA records of species diversity in the Greater Toronto Area



2.2 The Components of a Natural Heritage Network

The components of a NHN include ***core areas***, ***linkages*** and ***enhancements*** identified at a variety of geographic scales including local scales (e.g. small habitat patches and local linkages between woodlands and wetlands) and regional scales (e.g. large habitat patches forming centres for biodiversity and regional scale linkages connecting to the Greenbelt and Oak Ridges Moraine). Recent studies (Chapa-Vargas and Robinson 2013, Cottam *et al*. 2009, Fabian Y. *et al*. 2013, Ritchie *et al*. 2009) show that landscapes with larger amounts of natural cover (*i.e.* the total amount of woodland, wetland, and open habitat) support higher biodiversity, suggesting a NHN should identify components (cores areas, linkages and enhancement areas) that achieve targets intended to protect a high percentage of natural cover within the landscape.

Core Areas
Core areas are remnant natural features such as woodlands and wetlands. They typically occur as "patches" on the landscape and may be very large (100 - 200 ha or more), or relatively small (1-2 ha). The significance or importance of a core area will depend primarily on its size, condition, extent of natural cover in the planning area (in landscapes of low natural cover, lacking large natural features, all core areas of any size may be important enough to include in a NHN), configuration (high interior-to-edge ratio are preferred over those with linear or convoluted shapes), diversity of communities, presence of Species At Risk or Conservation Concern, and areas providing habitat for species with very specific or demanding habitat requirements (e.g., colonial nesting birds or species requiring large areas of habitat). Core Areas often contain important hydrological areas such as headwaters, recharge areas, wetlands and discharge areas.

To ensure the long term protection of biodiversity it is important to identify very large Core Areas (50 to 200 ha) that are capable of sustaining viable populations of area-sensitive species. These large Core Areas have been referred to as "Centres for Biodiversity". Environment Canada (2013) has provided guidance for the size of Core Areas needed to support a high diversity of native species. These large Core Areas act as "reservoirs" that facilitate re-colonization of smaller, marginal Core Areas in the NHN, where populations may be locally extirpated. In some landscapes, such large natural features may be lacking, and they may need to be created through identifying "Enhancement Areas" (see below).

Linkages
A distinguishing characteristic of a NHN is that linkage areas among Core Areas are identified to ensure remnant habitat patches are functionally connected to mitigate the impacts resulting from fragmentation and the barriers to movement that are an inherent part of urbanization. It is helpful to recognize that many species adapted to rural landscapes can migrate and disperse across agricultural fields, even though they may not appear as natural linear linkages. The identification of linkage functions is required to maintain, and where possible enhance, this connectivity. Preferably, linkages will be

identified along existing natural features (e.g., valleylands). However, in some cases, linkage functionality is achieved through the identification of "Enhancement Areas" (see below) that are restored to create suitable habitat.

Linkages may be of varying widths depending on their function. Major linkages that serve to connect features at a Regional or Provincial scale should be wide enough to incorporate habitat that allows the full life cycle for plant and animal species with poor dispersal capability (e.g., non-flying insects, many species of plants, small mammals, etc.) and for habitat-specific species (e.g. area-sensitive woodland species). Such linkages may be 300-600m or more wide. At a local scale, the primary function of linkages may be to allow wildlife to complete important life cycle requirements (e.g., facilitate amphibian movement from ponds to woodlands), and may be narrower (less than 100m).

Enhancement Areas

Enhancement Areas are areas without obvious environmental features, such as old fields, pasture lands, and active agricultural lands, that are included in a NHN to achieve objectives related to Core Area or Linkage habitat enhancement. For example, individual Core Areas may be *enhanced* by including areas that reduce the amount of edge and increase the size of a core to include interior habitat; multiple Core Areas located in close proximity may be enhanced by identifying an enhancement area between the individual cores to form a cluster of features that create a single large Core Area. In many cases, Core Areas comprised of watercourses and valleylands will benefit from the identification of enhancement areas along the watercourse or valleyland to improve ecological functions such temperature regulation, addition of food sources, filtering of surface run-off, etc. as well as the linkage function often associated with these areas. Local and regional scale Linkage Areas in a NHN will include Enhancement Areas necessary to maintain the width and natural habitat required to provide continuous, functional ecological connections.

3.0 COMMUNITY ENGAGEMENT

Community engagement was undertaken with a wide range of stakeholders in a variety of forums to share information about the approach to refine and enhance the NHN and to seek support of and input to the NHN. Below is a brief description of the key community engagement initiatives that have been undertaken, while a complete description including key discussion points is available in Appendix 1.

3.1 Community Stakeholder Workshops

Four stakeholder sessions were held between October 2013 and March 2014 to discuss Vaughan's Natural Heritage Network Study. These sessions were advertised to a wide range of external stakeholders representing: government and agencies (including adjacent municipalities and local conservation authorities), educational institutions, environmental groups, community groups and residents associations, recreational facilities, business and development organizations, local utilities and transit, and arboriculture firms. Workshop sessions included welcoming remarks from Tony Iacobelli (Project Manager, City of Vaughan) and a presentation on the project given by Brent Tegler (North-South Environmental, Project Lead for the consulting team). Susan Hall from Lura Consulting facilitated the community discussions and solicited input from participants. The purpose of the workshops was to obtain input from stakeholders including: (1) existing or potential future initiatives that may contribute to the NHN; (2) opportunities and constraints that influence the NHN; (3) suggestions for evaluating criteria to establish the NHN scenarios.

3.2 City of Vaughan Staff Sessions

A session with City of Vaughan staff was held on October 29th, 2013 to provide an update on Vaughan's NHN Study and to discuss the relationship of the NHN to other studies and projects underway or planned for the City. Seventeen staff members participated from a wide range of departments including Development Planning, Parks Development, Building Standards, Policy Planning, Parks and Forestry, Environmental Sustainability, Transportation Engineering, Asset Management, ITM, Innovation/Continuous Improvement and Engineering Services. The session included welcoming remarks from Tony Iacobelli (Project Manager, City of Vaughan) and a presentation by Brent Tegler (North-South Environmental, Project Lead for the consulting team). Susan Hall from Lura Consulting facilitated the discussions and solicited input from participants. The purpose of the workshops was to obtain input including: (1) existing or potential future initiatives that may contribute to the NHN, such as ongoing or future Master Plan studies; (2) opportunities and constraints; and (3) decision-making criteria to inform the assessment of the NHN against ecosystem targets.

3.3 Community Forum

The City of Vaughan hosted a Community Forum on November 13th, 2013 to seek community input for both the Natural Heritage Network Study (Phase 2-4) and the Climate Action Plan as both projects fall under the *Green Directions Vaughan*, the City's

Community Sustainability and Environmental Master Plan. In total there were 57 participants. The forum was advertised in the local paper, on the City website, distributed to all stakeholders who had participated in earlier sessions, posted on the City`s social media feeds and invitations were issued to an extensive list of residents through the Planning Department. The community forum featured an open house from 6:30 – 7:00 p.m. and marketplace where participants could find out about other programs and projects by the conservation authority, Enbridge, Powerstream, Earth Hour and others. The forum began with welcoming remarks from John MacKenzie (Commissioner of Planning, City of Vaughan), followed by an overview presentation about the two projects given by Susan Hall from Lura Consulting. The remainder of the evening was dedicated to a "world café" format which included the following three stations:

- Climate Action Plan station where there was a brief overview presentation provided by Chris Wolnik and Jeff Garkowski (City of Vaughan and Lura Consulting) about the CAP and participants were encouraged to provide their input to the CAP vision, goals and key actions.
- Land Securement Strategy station, where Kate Potter (Orland Conservation) provided participants with an educational presentation on the variety of options that exist for land securement beyond land purchase. Kate reviewed land securement tools such as land donation, split receipt, conservation severance, bequest, conservation easement agreement and life interest agreement.
- NHN station which included a brief overview presentation by Brent Tegler (North-South Environmental consultant lead for the NHN study) followed by a facilitated discussion.

3.4 Online Public Questionnaire

The online survey was designed to provide participants with an opportunity for input and suggestions on the proposed vision for the NHN, on what might be considered Vaughan's most significant natural heritage assets and what might be the major issues facing the protection, management and enhancement of these assets. The survey also included questions in regard to the proposed approach to developing the NHN and the criteria proposed to evaluate NHN scenarios.

3.5 Landowner Meetings

A series of meetings were held with individual landowners in two rounds, (November/December 2013 and January/February 2014) to provide an opportunity for landowners to discuss in detail work being undertaken in the Phase 2-4 study relevant to their properties. The first session was held to review the objectives of the study, to share data obtained during the 2013 field season and to review natural heritage information that might be available for specific landowner areas. The second round of meetings was held to review and seek input on the draft results of applying criteria to develop the NHN and the approach proposed for NHN scenario testing. Tony Iacobelli (Project Manager, City of Vaughan) and Brent Tegler (North-South Environmental, Project Lead for the consulting team) conducted the meetings.

3.6 York Region Advisory Liaison Group

On May 5th, 2014 City of Vaughan staff presented the findings to date of the Natural Heritage Network Study, including refined mapping details and results of the assessment of significant wildlife habitat to a meeting with the York Region Advisory Liaison Group (YRALG).

The particular discussion topics addressed with the audience representing farmers and owners of agricultural lands included the following:

- The YRALG noted that the Provincial Policy Statement (2014) notes the importance of agriculture in relation to natural heritage. The City responded that either the staff report or consulting team report can indicate that PPS policy 2.1.9 states that "Nothing in policy 2.1 [regarding natural heritage protection] is intended to limit the ability of *agricultural uses* to continue". This is an important consideration for stewardship approaches to improve vegetation protection zones, for example, associated with identified features (such as wetlands, woodlands, and watercourses). Restoration of VPZs could constitute a significant loss of productive land.
- There was a discussion of headwater drainage features, intermittent and/or ephemeral streams and that inclusion of these features in the NHN could be perceived as an additional cost to doing business, such as to erect a building for uses ancillary to agricultural uses. In such a case, permitting for the building may require an Environmental Impact Study.
- The YRALG advised not to identify Enhancement Areas in the Greenbelt Plan and ORMCP areas, but to recognize that the Provincial Plan areas address continued agricultural uses.
- It was noted while there is good uptake of the Environmental Farm Plan program in Ontario (70-80% uptake), it is not known which lands have Environmental Farm Plans in place as the information is not public. It was suggested that this information would need to be gathered through landowner contact as part of a stewardship/securement approach by the City.
- It was noted that setbacks along rural roads provide for vegetation restoration that can be beneficial for linkages and connectivity for wildlife movement.
- Management approaches to maintain significant wildlife habitat for open country species was discussed. Several parts of the City may need to be identified so that one or two areas are maintained in suitable vegetation cover in any given year. Hay, for example, is often grown for several years as the species used for hay (grasses such as Timothy or legumes such as alfalfa) are perennials. Switching the crop to corn, for example, is not suitable for open country species. Yet, identifying several areas of the City for suitable vegetation cover, and generally maintaining agricultural production in the Greenbelt Plan and ORMCP areas of Vaughan, could be a strategy to maintain open country species.

4.0 FIELD STUDIES CONDUCTED IN SUPPORT OF THE NHN STUDY

4.1 Frog Call Surveys

4.1.1 Selection of Amphibian Survey Sites

Surveys to inventory calling frogs were conducted at select locations throughout the City of Vaughan. Selecting locations for point count surveys was in part based on reviewing locations previously surveyed by the TRCA. Those locations surveyed pre-2008 by the TRCA were selected to update this older data and determine if land use changes have resulted in a change in frog presence and abundance.

Additional sites were selected for surveying based on TRCA mapping. Wetlands less than two hectares in size within 100 m of a woodland were identified through GIS as priority sites for amphibian surveys. Additional amphibian breeding sites that had not been previously surveyed by the TRCA were also identified through field reconnaissance. Surveys were also completed on block plan areas where permission was granted and information was provided by the landowners' ecological consultant regarding amphibian habitat.

4.1.2 Amphibian Survey Methods

Three rounds of surveys were completed according to the Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (Bird Studies Canada, 2008). A total of 68 points were surveyed with the number of visits in part dependent on landowner permission. Each visit was conducted in mild temperatures (above 5°C for the first survey, above 10°C for the second survey and above 17°C for the third survey, with little or no precipitation, between sunset and approximately one hour after midnight (surveys were only conducted after midnight as long as temperatures remained warm). Frog abundance was assessed using accepted guidelines as follows:

Code 1: Individuals can be counted; calls not simultaneous
Code 2: Calls distinguishable; some simultaneous calling
Code 3: Full chorus; calls continuous and overlapping

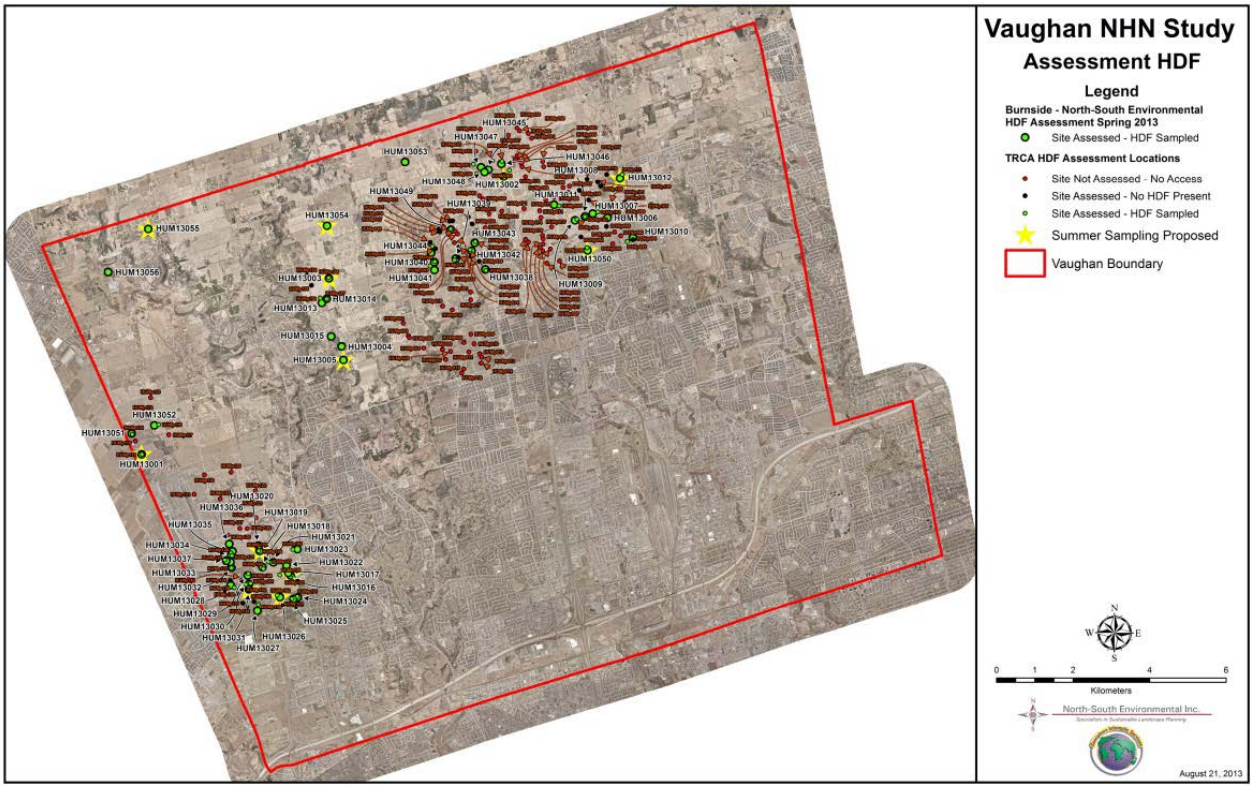
4.2 Headwater Drainage Feature Surveys

Headwater drainage features were surveyed throughout the City of Vaughan on private and public lands. Headwater drainage features are often not mapped as they are located in the upper reaches of watercourse catchments, therefore locations of potential headwater drainage features were selected through Arc Hydro modeling completed by the TRCA. Arc Hydro operates by using GIS to complete geospatial analysis to characterize watersheds. Only those points were surveyed where access was permitted and that met the following criteria:

- The drainage feature had a minimum catchment area of 2.5 ha;
- The feature was relatively permanent in the landscape (i.e. if ploughed, would reappear following subsequent runoff events); and
- The feature had sufficient seasonal flow to have the potential to move bedload.

Fifty-seven points along modelled HDFs were surveyed between April 17th and May 30th, 2013 (Figure 3). Thirty-two additional points were investigated but were deemed not to meet the definition of an HDF. Where more than one point was completed on an HDF, points were spaced at least 250 m apart. A second survey was completed in mid-July at 12 points where there was a potential they could be permanent features (Figure 3). Data was collected based on methods outlined in the Ontario Stream Assessment Protocol, Section 4, Module 9 (Instream Crossing and Barrier Attribution) (April 2013) and Module 10 (Assessing Headwater Drainage Features) (March 2013) produced by the Ministry of Natural Resources and Toronto and Region Conservation Authority.

Figure 3: Location of 2013 Headwater Drainage Feature field site assessments



4.2.1 Headwater Drainage Feature Assessment

The assessment of headwater drainage features (HDFs) was based on the Evaluation, Classification and Management of Headwater Drainage Features Guidelines prepared by the Credit Valley Conservation and the TRCA (January 2014). The evaluation involved the use of orthoimagery, GIS data (e.g. soils mapping, wetland mapping, fish data), data obtained during field investigations and through reviewing environmental reports completed by private landowners including block landowner groups. The assessment of each of the HDFs considered, feature form and flow, aquatic habitat, terrestrial habitat, in stream features, riparian features, vegetation and wildlife up and downstream of the HDF.

The science-based evaluation of each feature was used to classify each HDF into a management recommendation: *Protection, Conservation, Mitigation, Maintain Recharge, Maintain Terrestrial Linkage*, and *No Management Required*. Incorporation of a HDF into the NHN should be considered on a site specific basis with consideration of cumulative impacts at the larger landscape level. Those features which are classified as *Protection* were recommended to be incorporated into the NHN and be protected and/or enhanced in situ. Where a feature was classified as *Conservation*, it was recommended they also be included in the NHN; however, there may be considerations for relocation and/or enhancement of the HDF and its riparian zone corridor although the HDF must remain connected downstream.

Classification of each HDF into management recommendations was completed by following the flow chart illustrated on Figure 2 of the HDF Guidelines (2013). The following describes how each category was applied to each HDF in order to come up with a management recommendation.

Hydrology

Hydrology is classified into three categories: *Limited or Recharge*, *Valued or Contributing* and *Important*. The classification of an HDF as a hydrology category is described in Table 1.

Table 1. Hydrology classification taken from Table 4 of HDF Guidelines (Toronto and Region Conservation Authority and Credit Valley Conservation 2013).

Assessment Period	TRCA Hydrology Classification		
	Limited or Recharge	**Valued or Contributing**	**Important**
Spring freshet (late March – mid-April)	FC = 1 or 2 AND FT = 4 or 7	FC = 3, 4, or 5 AND FT = 1, 2, 3, 4, 5, 7 or 8; OR if wetland (FT = 6) occurs upstream	
Late April – May	FC = 1 or 2 AND FT = 4 or 7	i. FC = 1 or 2 AND FT = 1, 2, 3 or 4 OR if wetland (FT = 6) occurs upstream; OR ii. FC = 3, 4, or 5 AND FT = 4, 5 or 7 OR if wetland (FT = 6) occurs upstream	
July - August			FC = 2, 3, 4 or 5 AND FT = 1, 2, 3, or 8; OR FT = 6 AND FC = 2

Note: The following categories are hierarchical with highest level of function increasing from left to right. The highest level of function satisfied according to the conditions outlined above is to be used to classify hydrology for features. Assessments may be completed for important features earlier in the season, but flow conditions need to be confirmed in summer in order to satisfy the criteria for this class.

OSAP Flow condition codes (FC): 1= no surface water (dry), 2 = standing water, 3 = interstitial flow, 4 = surface flow minimal (<0.5l/s), 5 = surface flow substantial (>0.5l/s)
OSAP Feature type codes (FT): 1 = defined natural channel (visible banks), 2 = channelized (historically natural channel, now straight with banks), 3 = multi-thread (> 1 channel), 4 = no defined feature (overland flow only), 5 = tiled drainage (buried stream/pipe with outlet), 6 = wetland, 7 = swale, 8 = roadside ditch (channelized running parallel with roadway), 9 = online pond outlet
*Springs and seeps can be assessed based on data from the Upstream and Downstream Site Features from the field sheet

Fish Habitat
Fish habitat is classified into two categories: *Important* and *Valued*. The classification of these categories is as follows:

1. Important Fish Habitat
    a. Fish present year round
2. Valued Fish Habitat
    a. Seasonal habitat (e.g. migration, spawning, feeding, cover) and indirect habitat to sensitive species (RSD) (i.e. if natural channel that would provide ephemeral habitat to RSD for feeding, etc.)

Recharge Hydrology
Recharge hydrology was determined through base mapping of Ontario soils from OMAFRA by cross referencing the HDF point with sandy or sandy loam soils with good drainage.

Riparian Vegetation
Riparian vegetation is either considered as *Important* or not and is considered *Important* if it contains the following attributes: FT = 6 or Riparian Vegetation = 5, 6, or 7 where it covers >50% of the area within 40 m upstream and downstream of the point (see Table 2).

Table 2. Riparian Vegetation classification taken from HDF Guidelines (Toronto and Region Conservation Authority and Credit Valley Conservation 2014).

Riparian Vegetation Code	Description	Observation
1	None	Over 75% of the soil has no vegetation; includes hard surfaces such as roads and buildings
2	Lawn	Grasses that are not allowed to reach a mature state due to mowing
3	Cropped Land	Planted or tilled in preparation for agricultural crops; plants typically arranged in rows (due to machine-planting); may be subject to periodic tillage
4	Pasture/Forage Crops	Grasses and forbs that are not allowed to reach a mature state due to grazing by livestock.
5	Meadow	Less than 25% tree/shrub cover; characterized by grasses, forbs and sedges

Riparian Vegetation Code	Description	Observation
6	Scrubland	More than 25% and less than 60% trees and shrubs interspersed with grasses and forbs (a transitional area between meadow and forest, with trees generally less than 10 cm in diameter at breast height)
7	Forest	More than 60% of the canopy is covered by the crowns of trees
8	Wetland	Dominated by water tolerant wetland plants including rushes, and water tolerant trees or shrubs

Terrestrial Habitat
Terrestrial habitat is classified into three categories: *Important, Valued* and *Contributing*. The classification of these categories is as follows:

1. Important
    a. FT = 6 with breeding amphibians*
2. Valued
    a. FT = 6 acting as stepping stone for amphibians but no breeding amphibians (look for wetlands within 400 m)
3. Contributing
    a. Riparian Vegetation = 5, 6, 7 within 0-10 m that functions as riparian habitat along corridor with sampling point connecting two habitat features to facilitate movement of wildlife through corridor

4.3 Breeding Bird Surveys

The focus of breeding bird surveys was on identifying SWH for breeding birds, particularly SWH related to successional areas and smaller forest patches. Though wetlands and large forest habitats can be considered SWH, they were considered a lower priority as generally they already met the criteria to be included in the NHN.

4.3.1 Selection of Breeding Bird Survey Sites
TRCA Ecological Land Classification (ELC) mapping, where available, was initially used to select habitat for surveying based on size. Additional habitat patches were selected in the field based on ground-truthing of aerial photography.

Selection of Areas to be Investigated as SWH for Open-country and Thicket-nesting Birds
Areas selected for bird surveys were initially focused on finding SWH for thicket-nesting and open-nesting bird species. Criteria shown in MNR Draft SWH Ecoregion 6E Criterion Schedule and Draft SWH Ecoregion 7E Criterion Schedule (MNR 2012) (Appendix 2) were used to guide the habitat on which to focus. While it is understood that these criteria are in draft form, they provide useful concrete guidance in initial screening for SWH. Ecoregion schedules include criteria related to size and those

related to indicator species. Initial selection focused on habitat patches that met ecoregion criteria for size. The habitats of highest priority were the following:

- Cultural meadows greater than 30 ha
- Cultural thickets greater than 10 ha

The initial screening also included obtaining information on presence of certain bird species from previous surveys, as Ecoregion schedules include criteria related to the presence of thicket- and grassland-dependent bird species. Bird surveys conducted by TRCA were available for the study area, so they were screened for the presence of indicator species noted in the past.

Priority bird species identified in the draft Ecoregion criteria for determination of open-country SWH are shown in Appendix 2. The presence of two or more of these listed species indicates SWH in both Ecoregion 6E and 7E. In addition to listed species, the presence of species listed as Special Concern under the Endangered Species Act, 2007 or species evaluated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Threatened or Endangered (even though not yet listed) can also be considered indicators of SWH. The species noted on the Ecoregion schedules that meet these criteria was Short-eared Owl. Common Nighthawk has been designated a species of Special Concern and therefore was considered in this study as an indicator species of open-country SWH.

Priority bird species identified in the draft Ecoregion criteria for determination of thicket SWH in Ecoregion 6E and are shown in Appendix 2. Patches of cultural thicket supporting one indicator species plus two common species meet the criterion for SWH. The 2012 draft Ecoregion criteria included two species of Special Concern that could also be used as indicators of SWH: Golden-winged Warbler and Yellow-breasted Chat. However, these two species have since been designated Endangered under the ESA. Therefore they cannot be used as indicators of SWH. There are no species of Special Concern found in thicket habitats in the Vaughan area.

In addition to criteria related to size and species, there are some habitat criteria that are also provided for evaluation of SWH. To qualify as open-country SWH, grasslands should not include Class 1 or 2 agricultural lands, and should include lands not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years). Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. To qualify as thicket SWH, habitat must consist of shrubland or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years).

However, since it was not always possible to evaluate the condition of the habitat from roadsides, a conservative approach was taken that mapped as SWH all habitat that qualified because of the size and presence of indicator species. In addition, the exemption for Class 1 and 2 agricultural lands was not taken into consideration as the

protection afforded within an NHN would only come into play if the land use changed from agricultural to urban, when the lands would no longer be useful for agriculture.

Surveys were focused on areas where bird surveys had not already been completed by TRCA, or where TRCA had completed surveys before 2005. However, a few surveys were completed in larger patches where access was available in order to provide a context for surveys in smaller habitat patches that could only be surveyed from the road

Selection of Areas to be Investigated as SWH for Woodland Area-sensitive Birds
Selected smaller forests were investigated to determine whether there were smaller clusters of forest habitat that together would support species that are considered area-sensitive. Surveys therefore included forest clusters that considered together would comprise at least 20 ha; where at least one patch was a minimum of 10 ha, and as long as individual patches were smaller than 20 ha. The rationale for this was that forests over 20 ha are considered significant woodlands and would thus be included in the NHN. In addition, larger forests have generally been surveyed by TRCA. An additional habitat criterion noted in Ecoregion schedules, that the interior forest habitat should be >200 m from the forest edge, was not considered in selection of habitat for surveying as the purpose of woodland surveys was to determine whether larger clusters of forest supported area-sensitive species.

TRCA's data were examined for the presence of woodland area-sensitive bird species. Woodland area-sensitive species considered indicators in the Ecoregion Schedules for both 7E and 6E are shown in Table 3 of Appendix 2. In addition to indicator species, the presence of species listed as Special Concern under the Endangered Species Act, 2007 or species evaluated by the Committee on the Status of Endangered Wildlife in Canada as Threatened or Endangered (even though not yet listed) can also be considered indicators of SWH. Canada Warbler was listed in Ecoregion schedules as the only species that meets this criterion. However, as of 2013, two additional species have been designated Special Concern: Wood Thrush and Eastern Wood-Pewee. Thus, SWH mapped in this study includes forest patches that supported Wood Thrush and Eastern Wood-pewee.

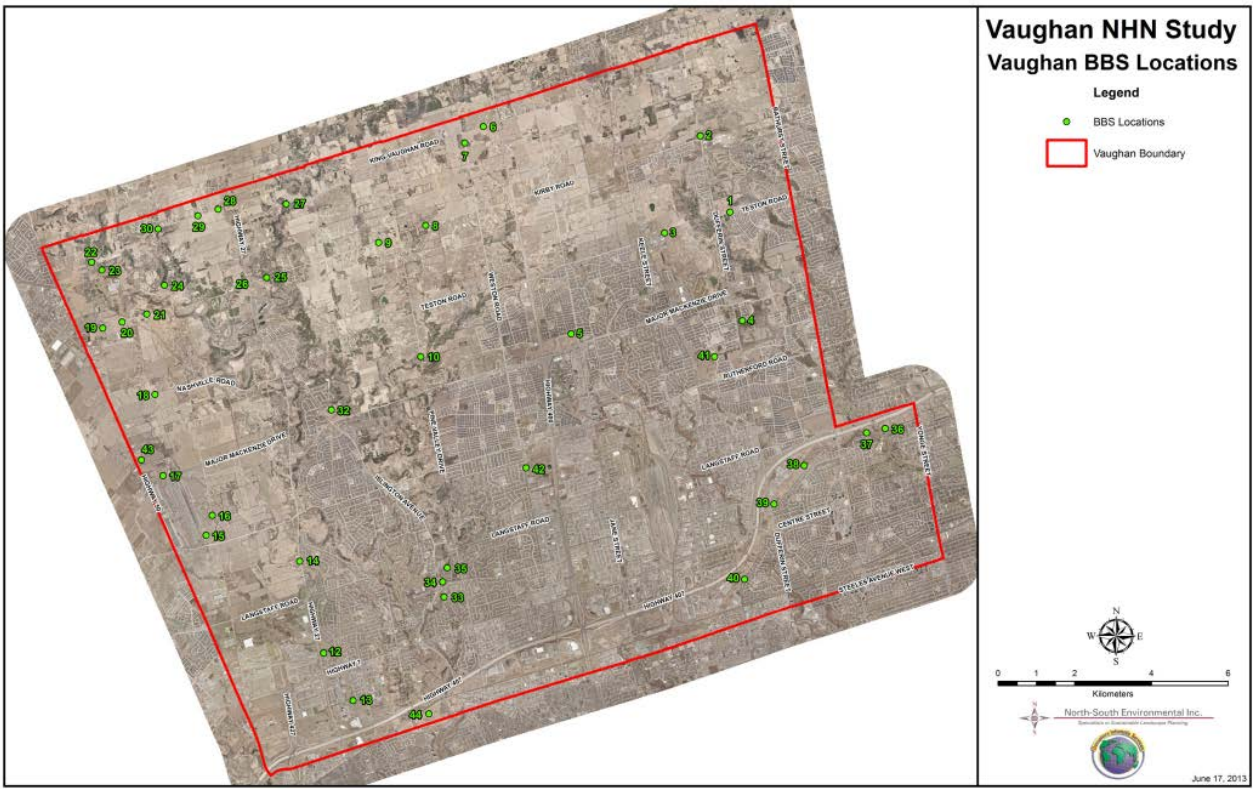
4.3.2 Breeding Bird Survey Methods

Landowner contact was initiated for properties that were a priority for surveys. However, there were very few sites where permission was granted to access the site. Site surveys were conducted within sites if permission could be obtained, but most were conducted from roadsides.

Fifty-one point count surveys were conducted according to Environment Canada protocols for point counts. Points from which surveys were conducted are shown in Figure 4. Two surveys were conducted at 45 of the points, in the early part of the season (June 4th to 8th) and the late part of the season (June 18th to 19th). Six additional points were surveyed only on one occasion, as a result of permissions being granted at later dates. All surveys were conducted between 5:00 a.m. and 9:30 a.m., in fair

weather with wind less than 4 on the Beaufort Scale. Each point count consisted of passive listening for 10 minutes. All birds heard or seen during each ten minute point count were noted.

Figure 4: Location of 2013 point count surveys for breeding birds in Vaughan



4.3.3 Delineation of Patches

Patches of Significant Wildlife Habitat were initially identified on the basis of the presence of indicator species for each of the habitats in question (open-country, thicket and woodland), using both TRCA and NSE 2013 data. If the patch met the criteria according to the species present, it was then delineated through interpretation of its boundaries on aerial photography, assisted by TRCA mapping (if available) or, for woodlands, woodland patch mapping. The presence of indicator species coupled with the minimum patch sizes shown in Ecoregion schedules (30 ha for open-country habitat, 10 ha for thicket habitat and 30 ha for woodland habitat) was used to designate the patches as SWH for open-country species, thicket species and woodland species. No size criterion was required to designate habitat as SWH on the basis of Special Concern species listed under the ESA or species evaluated as Threatened or Endangered by COSEWIC.

Two area-sensitive grassland species considered Threatened under the ESA were noted widely within meadows in the study area: Bobolink and Eastern Meadowlark. Despite their area-sensitivity, these species are not considered indicators of significant open-country habitat because their habitat is regulated by the Endangered Species Act, 2007. However, because most surveys were conducted from roadsides, there was the potential for some of the species that inhabit the same habitat as Bobolink and Eastern Meadowlark to be overlooked if they were at a distance from the roadside that they could not be heard. Therefore, habitats where Bobolink and Eastern Meadowlark occurred were considered areas of potential SWH and so these patches were mapped and have been provided in the digital database provided to the City for future reference.

Barn Swallow is also considered a Threatened species under the Endangered Species Act. This species depends on human-made structures for breeding. Eight records of Barn Swallow were noted, but the habitats were not mapped as the breeding locations were likely in neighbourhoods adjacent to natural areas. Habitat for Barn Swallow would not be considered SWH, as it is regulated under the ESA.

4.4 Bluff Surveys

Bluff communities have the potential to contain rare plants (e.g. prairie species) and animals (e.g. Bank Swallow) and as such were surveyed along a reach of the Humber River by canoe between the northern limit of Vaughan and Nashville Road. The survey was completed on September 19th, 2013. Bluff communities were identified according to the Ecological Land Classification (Lee et. al. 1998) description.

Bank Swallow have recently been designated as Endangered under the ESA. Bluff habitat for these species is thus regulated by the ESA.

5.0 ANALYSIS OF FIELD DATA

5.1 Significant Wildlife Habitat

The Significant Wildlife Habitat Technical Guide (SWHTG) (2000; Appendix Q) provides guidance for evaluating Significant Wildlife Habitat (SWH), however, the SWHTG does not include detailed criteria to aid in the identification of SWH. More detailed draft criteria for evaluating SWH have been developed by the Ministry of Natural Resources (MNR) for some areas of the province; (see Appendix 2 for *Draft Significant Wildlife Habitat Ecoregion 6E Criterion Schedule and the Draft Significant Wildlife Habitat Ecoregion 7E Criterion Schedule,* MNR 2012). These draft criteria were used with the available spatial data (e.g. woodland, wetland, meadowland, successional woodland, orthoimagery, etc.) and species location data (North-South Environmental field data 2013 and TRCA data) for Vaughan to identify SWH; the criteria for eco-region 6E were applied to those areas within the Oak Ridges Moraine, and the criteria for eco-region 7E were applied to the remainder of Vaughan.

The SWH analysis has identified and delineated "Confirmed SWH" and this information has been added to the digital database used in defining the NHN in Vaughan.

5.1.1 Analysis of Amphibian SWH (Woodland and Wetland)

The Significant Wildlife Habitat Technical Guide (SWHTG) (2000; Appendix Q) provides guidance for evaluating woodland amphibian breeding habitat. However, it lacks concrete criteria for identifying significant wildlife habitat. Draft criteria for evaluating significant wildlife habitat for both amphibian woodland and wetland habitat are provided in the Draft Significant Wildlife Habitat Ecoregion 6E Criterion Schedule and the Draft Significant Wildlife Habitat Ecoregion 7E Criterion Schedule (MNR 2012). These draft criteria were used to identify significant wildlife habitat where the criteria for eco-region 6E were applied to those areas within the Oak Ridges Moraine, and the criteria for eco-region 7E were applied to the remainder of Vaughan.

Both data obtained from surveys completed by North-South in 2013 and data obtained from the TRCA were used in evaluating features as significant wildlife habitat for amphibians. TRCA data from 2005 and 2008 were deemed acceptable if the current habitat (e.g. woodlands, wetlands and breeding ponds and their surroundings) appeared unaltered based on a review of orthoimagery of the features present at the time of the surveys. The abundance of frogs calling can change daily as well as annually based on climatic differences (e.g. temperature, precipitation); as such, the highest abundance code was used in the analysis, including data obtained in 2008, if the habitat had not been altered since the time of earlier surveys.

Woodland amphibian breeding habitat was identified in Ecoregion 7E where two or more of the listed frog species were present (Table 3) with at least 20 individuals recorded. In Ecoregion 6E (the Oak Ridges Moraine) woodland amphibian breeding habitat was identified where one or more of the listed frog species was noted. The habitat included the woodland and wetland ELC polygons combined where the

wetland/pond was within 120 metres of the woodland. A presumed travel corridor connecting the woodland and wetland/pond breeding habitat was also included as part of the significant wildlife habitat.

Where the wetland was over 120 metres from a woodland, was at least 500 m^2, and sufficient numbers and diversity of amphibians were present, the habitat was evaluated as wetland amphibian breeding habitat. Wetland amphibian breeding habitat was identified in Ecoregion 7E where two or more of the listed frog species (Table 3) with at least 20 individuals was recorded. In Ecoregion 6E, wetland amphibian breeding habitat was identified where three or more of the above listed frog species was recorded with at least 20 individuals. The ELC ecosite wetland area and the shoreline are considered the significant wildlife habitat where the wetland/pond was at least 500 m^2.

Table 3. Criteria used to evaluate amphibian woodland and wetland significant wildlife habitat.

Significant Wildlife Habitat	Frog Species	Criteria for Eco-region 7E	Criteria for Eco-region 6E
Amphibian Woodland	• Gray Treefrog • Spring Peeper • Western Chorus Frog • Wood Frog	Two or more of the listed species with at least 20 individuals	One or more of the listed species with at least 20 individuals
Amphibian Wetland	• Gray Treefrog • Western Chorus Frog • Northern Leopard Frog • Pickerel Frog • Green Frog • Mink Frog • Bullfrog	Two or more of the listed frog species with at least 20 individuals	Three or more of the listed frog species with a least 20 individuals

5.1.2 Significant Wildlife Habitat Based on Breeding Bird Species

Table 4 provides a summary of types of SWH within the Vaughan study area, derived as a result of field surveys in 2013 as well as TRCA surveys. The number of habitat polygons and the areas of polygons are also summarized in Table 4. The following sections provide a description of the derivation of each type of SWH.

Table 4. Significant Breeding Bird Habitats noted within the Vaughan Study Area

Type of Habitat	Total Area (ha)	Number of Patches	Average Area of Patches (ha)	Size Range of Patches (ha)
SWH Area Sensitive Open Country Breeding Birds	46.27	1	46.3	46.27
SWH Special Concern Open Country Breeding Birds (Common Nighthawk)	19.16	1	19.2	19.16
SWH Threatened Woodland Bird Species (Wood Thrush)	1144.22	31	36.9	3.9 to 110.8
SWH Area-sensitive Woodland Bird Species	638.63	9	71.0	23.1 to 130.5
SWH for Area-sensitive Woodland Bird Species and Threatened Woodland Species	515.94	7	73.7	41.8 to 130.5
SWH Shrub/Early Successional Breeding Birds	998.94	8	124.9	34.4 to 385.6
SWH for Shrub/Early Successional Breeding Birds and Threatened Grassland Bird Species	142.34	1	142.3	34.4 to 203.9
Habitat for Threatened Grassland Bird Species (Bobolink and Eastern Meadowlark) – Potential SWH	1143.99	56	20.4	0.24 to 114.4

5.1.3 SWH for Area Sensitive Open Country Breeding Birds

Only one patch of open–country breeding bird SWH was noted in the study area. This area was designated on the basis of the presence of both Grasshopper Sparrow and Vesper Sparrow, noted by TRCA in 2012, within a habitat patch of approximately 46 ha.

One other open-country indicator species, Savannah Sparrow, was noted widely within the study area. However, as noted in the Methods section, two indicator species are required to indicate SWH. Savannah Sparrow is considered area-sensitive by MNR, but it is on the lower end of the spectrum of area-sensitivity, and is very flexible in terms of habitat: it can nest in croplands such as wheat and corn fields (personal experience). Other indicator species, which include Upland Sandpiper, Grasshopper Sparrow, Vesper Sparrow and Northern Harrier, were rarely noted within the study area (Upland Sandpiper was not noted within the study area by TRCA or by NSE). Northern Harrier were noted occasionally, but they range widely while foraging so even though there was one occasion that a northern Harrier was noted in a habitat where Savannah Sparrows were noted, there was no evidence that the Northern Harrier was breeding so this patch was not delineated as SWH.

This habitat also supported two area-sensitive grassland species for which habitat is regulated by the Endangered Species Act, 2007 and thus cannot be considered

indicator species of SWH: Bobolink and Eastern Meadowlark. However, the presence of these species is a further indication that the habitat is important for area-sensitive grassland bird species.

5.1.4 SWH for Special Concern Open-Country Breeding Birds

Common Nighthawk, a species of Special Concern under the ESA, was noted conducting breeding displays within the power line corridor at the southeast corner of the study area, just south of Highway 407. This species breeds on gravelly surfaces on the ground and on rooftops, and conducts displays in open areas. It forages on aerial insects in a variety of habitats. The power line corridor provides suitable foraging habitat and breeding habitat is likely present within or in close proximity to the power line corridor.

5.1.5 Habitat for Threatened Area-sensitive Grassland Species

As noted in section 4.3.3, Eastern Meadowlark and Bobolink cannot be considered indicator species of SWH, as they are regulated by the ESA. However, their presence is an indication that the habitat is suitable for area-sensitive grassland species, which includes all species considered indicators of SWH for open-country species by MNR. Savannah Sparrows were also frequently found in these habitats. There is the potential for additional indicator species in these habitats, especially since the 2013 surveys were conducted from roadsides and not all parts of the habitat could be surveyed.

5.1.6 SWH for Shrub/Early Successional Breeding Birds

Eight patches of SWH for thicket-nesting species were noted, mainly on the basis of finding the indicator species Brown Thrasher plus two of the common species: primarily Willow Flycatcher, Eastern Towhee and Field Sparrow, with occasional Black-billed Cuckoo. Only one Clay-coloured Sparrow (also considered an indicator species) was found within the study area, and this area did not support additional qualifying species.

The patch sizes for these habitats were on average larger than other types of SWH noted within the study area. One reason for this may have been that the polygons were sometimes difficult to delineate, as thicket habitat tended to occur as patches interspersed with small patches of woodland, wetland and open field. In one case, Eastern Meadowlark and Bobolink were noted in open areas among patches of thicket in a large natural area that supported many thicket indicator species.

5.1.7 SWH for Area-Sensitive Woodland Breeding Birds

Area-sensitive woodland breeding birds were noted rarely within the 2013 surveys, indicating that the clusters of smaller forest patches studied in 2013 did not readily support area-sensitive woodland species. The lack of area-sensitive species may have also been partly because most surveys in 2013 were conducted from roadsides. The only woodland area-sensitive birds noted in 2013 surveys were Red-breasted Nuthatch (two records) and Scarlet Tanager (one record), and these birds were not found with other area-sensitive species.

Most of the delineation of woodland area-sensitive bird SWH incorporated larger forests studied by TRCA. TRCA's surveys incorporated some of the largest forests in Vaughan. The most common area-sensitive bird species found by TRCA were Ovenbird (51 records), Scarlet Tanager (45 records), Red-breasted Nuthatch (25 records), Black-throated Green Warbler (12 records), Veery (7 records), Winter Wren (4 records) and Yellow-bellied Sapsucker (1 record).

5.1.8 SWH for Special Concern and Rare Woodland Species

Thirty-one patches of woodland supported Wood Thrush (Table 4), a species recently designated Threatened in Canada by COSEWIC and considered Special Concern under the ESA. This species is not considered area-sensitive by MNR, though it is often found in larger and more mature forest patches (personal experience). Most, though not all, habitats occupied by area-sensitive woodland species were also occupied by Wood Thrush. Conversely, however, most habitats occupied by Wood Thrush were not occupied by area-sensitive birds.

Numerous patches of woodland habitat supported Eastern Wood-pewee, which was very recently designated as a species of Special Concern under the ESA. Eastern Wood-pewee is very common in the study area so habitat that supported this species in addition to Wood Thrush or area-sensitive species was not identified separately. Eastern Wood-pewee and Wood Thrush are identified as priority landbird species for conservation planning in the *Ontario Landbird Conservation Plan* (Ontario Partners in Flight 2008).

5.2 Headwater Drainage Feature Analysis

North-South Environmental completed comprehensive analysis of HDF including field data collection in spring and summer 2013 and data analysis following the revised TRCA/CVC HDF Guidelines (2013). The analysis results have been provided to Vaughan as part of the digital GIS database for future reference. Analysis results provide one of the following management recommendations:

- Protection
- Conservation
- Mitigation
- Maintain Recharge
- Maintain Terrestrial Linkage
- No Management Required

For those HDF which, through comprehensive field data collection and analysis, receive a management recommendation of "protection", "conservation" or "maintain terrestrial linkage" it is recommended that these HDF be included in the NHN for Vaughan. For those HDF which receive other management recommendations, but particularly "mitigation" and "maintain recharge", it is recommended that any proposed development should maximize the implementation of Low Impact Development (LID) measures as recommended by Conservation Authorities (CVC/TRCA 2010) to reduce the impact of development on surface water flow, ground water infiltration and evapotranspiration.

Based on the HDF field studies and analysis completed as a part of this project the following recommendations are made to strengthen future HDF studies:

- A single field visit is insufficient to make a final management recommendation, particularly in regard to Hydrology Classification, early and late spring field sampling as well as summer field sampling are needed to fully characterize the conditions of HDF.

- A desktop exercise using orthoimagery (and other available digital/hard copy data) is recommended prior to field analysis in addition to post field analysis to consider additional information such as presence of riparian habitat, digital soils information, vicinity to wetlands, vicinity to known amphibian habitat, and movement corridor function between wetlands/woodlands, ponds and forests.

- Agricultural tilling/plowing removes evidence of a channel (if present) making the determination of "Feature Type" difficult (or erroneous). We recommend sampling be completed prior to spring tillage/plowing. If this is not possible we recommend an effort may be made to look upstream/downstream beyond the area of tillage and/or similar adjacent HDF to make an accurate determination of Feature Type.

- Agricultural land use may remove and prevent the development of wetland vegetation. We recommend evidence of upstream wetland vegetation or strong evidence of downstream wetland vegetation should be taken into consideration in determining the "potential" presence of a wetland feature.

- We recommend data sheets include the following sections to record additional data important to determining a management recommendation (including data that may be compiled from additional sources such as orthoimagery)
  - fish presence with comment line to note species [information used to determine hydrology]
  - benthic insects present with comment line to note species [information used to determine hydrology]
  - amphibian presence with comment line to note species present and recommendation requiring amphibian survey [information may be used in determining terrestrial habitat classification]
  - presence of habitat (wetland, woodland, thicket) upstream, downstream, and adjacent and the estimated distance [information may be used in determining terrestrial habitat classification in regard to stepping stone function for amphibians and movement corridor function for other wildlife]
  - check box to recommend summer sampling for presence of flow and/or standing water in a wetland (include footnote outlining requirement for summer sampling based on Flow Condition of 5 recorded during spring base flow sampling and/or presence of a wetland with obligate wetland species) [information used to determine hydrology]

6.0 DIGITAL DATA AVAILABLE IN THE GIS DATABASE

Digital data from a wide variety of sources was assembled to provide the foundation for development of the NHN. Sources of data included:

- data from the Province's digital data warehouse - Land Inventory Ontario (LIO);
- data made available by York Region;
- data made available by the Toronto Region Conservation Authority;
- digital data from the City of Vaughan; and
- data collected field studies conducted for the NHN study.

A variety of types of data are in the GIS database including:

- information on the natural environment such as information on woodlands, wetland and watercourses, crest of slope, etc.;
- information regarding designated areas such as provincially designated Areas of Natural and Scientific Interest (ANSI) or Provincially Significant Wetlands (PSW); and
- information regarding existing land use designations such as the provincial Greenbelt Natural Heritage System and Oak Ridges Moraine Core and Linkage Area, York Region's Greenlands, and City of Vaughan Open Space and property boundaries.

In some cases the available digital data was updated to reflect current conditions in Vaughan. For example, areas of woodland in the digital database that are no longer present due to removal for urban development were removed to update the digital database. The complete list of available digital data is shown in Table 5.

Table 5. Digital Data available in the City of Vaughan digital data set.

DIGITAL DATA	SOURCE(S)	DESCRIPTION
Forest/Woodlands	York Region, LIO, TRCA	Woodland identified through interpretation of aerial imagery and field investigations Significant woodlands identified based on York Region criteria
Wetlands	LIO, TRCA	Wetlands identified through interpretation of aerial imagery and field investigations. Provincially Significant Wetlands identified based on Provincial criteria
Meadowlands	TRCA	Meadowlands identified through interpretation of aerial imagery and field investigations.
Flora & Fauna	TRCA, NSE	Point locations of species observations based on field studies undertaken by TRCA and North-South Environmental (NSE)

DIGITAL DATA	SOURCE(S)	DESCRIPTION
Significant Wildlife Habitat	NSE, TRCA	As determined through analyses described in this report based on Draft Significant Wildlife Habitat Ecoregion 6E Criterion Schedule and the Draft Significant Wildlife Habitat Ecoregion 7E Criterion Schedule (MNR 2012)
Watercourses	LIO, TRCA	Watercourses identified through interpretation of aerial imagery and field investigations.
Waterbodies	LIO, TRCA	Waterbodies identified through interpretation of aerial imagery and field investigations.
Crest of Slope	TRCA	The crest of slope was identified digitally using a Digital Elevation Model (DEM)
Oak Ridges Moraine	York Region	Includes Oak Ridges Moraine Core and Linkage Areas
Greenbelt Plan	York Region	Includes Greenbelt Natural Heritage System
York Greenlands	York Region	Includes areas designated York Greenlands in Vaughan
Areas of Natural and Scientific Interest	LIO	Includes Earth Science and Life Science Areas of Natural and Scientific interest within the City of Vaughan
Environmentally Significant Areas	TRCA	Includes areas designated Environmentally Significant by the TRCA
City of Vaughan Zoning	Vaughan	Includes existing property boundaries and zoning maintained by the City of Vaughan

7.0 CRITERIA USED TO IDENTIFY A NHN FOR VAUGHAN

The criteria used to determine areas included in Vaughan's NHN are based on ecological principles intended to achieve the goal established for the NHN while also conforming to policies of the Province, York Region and the City of Vaughan.

> *To identify a Natural Heritage Network (NHN) consisting of core areas & enhancement areas that form a robust, linked ecological system of resilient natural habitats providing long term protection of native biodiversity.* (NHN Goal statement)

The criteria used in identifying what natural features and areas in Vaughan are included within the NHN are described below. Criteria are applied to the available digital data set (see Section 6) following one of three methods briefly described as:

1. criteria are applied directly to digital data to identify NHN areas without any further modification (e.g. Areas of Natural and Scientific Interest);
2. criteria are applied to digital data and a vegetation protection zone or buffer of a specified width is added to natural heritage features, to identify NHN areas; or
3. digital data are analyzed based on the criteria described below to identify an area for inclusion in the NHN.

Protection of species at risk as required by the Federal Species at Risk Act (2002) and Provincial Endangered Species Act (2007), including the protection of habitat for Endangered and Threatened species and Fish Habitat, is addressed through the policies in the VOP 2010 in accordance with appropriate federal and/or provincial legislation. As a result, NHN criteria are not established specifically to map habitat of Endangered and Threatened species and Fish Habitat, although such habitat is often included in the natural features identified below.

7.1 Woodlands

Criteria: All woodland patches greater than 0.5 ha in size are included in the NHN. Within the Greenbelt NHS and Oak Ridges Moraine Core and Linkage areas a 30 metre vegetation protection zone is added, in all other areas a 10 metre vegetation protection zone is added.

Justification: Approximately 88% of the original woodland cover has been removed in the City of Vaughan. This substantial reduction in native woodlands is more critical because the remaining woodland patches are much smaller, they often lack interior conditions, and they are often highly disturbed due to unsustainable logging, agricultural grazing and recreational use practices. As a result, woodland conservation is a high priority and there is need for programs to increase woodland cover.

Policy Implications: There are no policy implications as the criteria above to define woodlands as part of the NHN are consistent with policy 3.2.3.4(c), in which it is noted that Core Features of the NHN include "*woodland*s including those identified as *significant*, with a minimum vegetation protection zone as measured from the *woodland*s

dripline of 10 metres, or 30 metres for those *woodland*s within the Oak Ridges Moraine and Greenbelt Plan Areas". Policy 3.3.3.3 provides tests to determine if development and/or site alteration can occur in a woodland in the Urban Area, in which case woodland enhancement is required in accordance with policy 3.3.3.4.

VOP 2010 policies are consistent with the woodlands policies in the York Region Official Plan, namely policies 2.2.44, 2.2.45, and 2.2.47-49.

7.2 Wetlands

Criteria: All wetlands within Vaughan are included within the NHN. A 30 metre vegetation protection zone is added to all wetlands.

Justification: Over 85% of the original wetlands have been removed in the City of Vaughan. Wetlands are among the most important biological communities providing critical breeding habitat, and seasonal and overwintering habitat to hundreds of species. As well wetlands perform important hydrologic functions of water storage, attenuation and infiltration. Protecting and restoring wetland habitat and functions is a critical part of protecting Vaughan's natural heritage. VOP 2010 policy 3.3.2.2 recognizes that non-evaluated wetlands shall be assessed for significance.

Policy Implications: It is noted in VOP 2010 policy 3.2.3.4(b) that Core Features of the NHN include "*wetland*s, including those identified as provincially *significant*, with a minimum 30 metre vegetation protection zone". Hence, the criteria above is consistent with VOP 2010 policy 3.2.3.4(b). Furthermore, VOP 2010 policy 3.3.2.2 provides for flexibility regarding wetland protection in stating that "prior to *development* or *site alteration* approval, non-evaluated *wetland*s that may be impacted shall be assessed for their significance, in accordance with criteria provided by the Province, and to determine their importance, functions and means of protection to the satisfaction of the City." In addition, VOP 2010 policy 3.2.3.11 identifies the principle for habitat compensation to consolidate the NHN and provide flexibility for development design in stating that "minor modifications to the boundaries and alignment of **Core Features**, as identified on Schedule 2, may be considered if environmental studies, submitted as part of the *development* process to the satisfaction of the City and in consultation with the Toronto and Region Conservation Authority, provide appropriate rationale for such minor modifications and include measures to maintain overall habitat area and enhance ecosystem function."

VOP 2010 policies are consistent with the wetlands policies in the York Region Official Plan, namely policies 2.2.35, 2.2.36, 2.2.37, 2.2.39 and 2.2.42.

Section 8.7 of the TRCA's "*The Living City Policies*" addresses development and interference in relation to wetlands. The VOP 2010 policies are generally consistent with this section of "*The Living City Policies*", although the latter provide more tests for the justification of development in or adjacent to wetlands.

7.3 Crest of Slope

Criteria: All areas within the crest of slope are included within the NHN. Within the Greenbelt NHS a 30 metre vegetation protection zone is added, in all other areas a 10 metre vegetation protection zone is added.

Justification: Valleylands are complex, dynamic riverine landscapes that change over time due to the action of running water. The large valley systems of the Don River and Humber River formed in part in association with high water flow that occurred over 10,000 years ago as glaciers retreated. In southern Ontario valleylands represent some of the most significant continuous natural areas remaining protecting terrestrial communities such as forests, thickets, meadowlands, and cliff communities and aquatic communities such as wetlands, seasonally flooded areas, cut-off river channels such as oxbows, and a variety of active main and secondary braided river channels.

The City recognizes that the information regarding crest of slope estimates the valley top of bank and/or stable slope. The evaluated top of bank and/or stable long term slope may differ from the crest of slope when more detailed assessment is undertaken as part of a development application.

Past development has occurred below the top of bank in certain parts of Vaughan. These areas are recognized and mapped as Built-up Valley Lands in the NHN.

Policy Implications: It is noted in VOP 2010 policy 3.2.3.4(a) that Core Features of the NHN include "*valley and stream corridor*s, including provincially *significant* valleylands and permanent and intermittent streams, with a minimum 10 metre vegetation protection zone, or a 30 metre vegetation protection zone for those *valley and stream corridor*s within the Oak Ridges Moraine and Greenbelt Plan Areas". It is recognized by the City that the crest of slope information is: (i) not available for all valley features (i.e. valley corridors that "can visually be identified from its surrounding landscape" according to the definition in VOP 2010); and (ii) an estimate of the valley limits. VOP 2010 policy 3.3.1.3 directs that the precise limits of valley and stream corridors are determined to the satisfaction of the City and the TRCA. Hence, additional policy text is not required to ensure that valleylands are properly delineated and to accommodate changes to the NHN as depicted on Schedule 2 of the VOP 2010.

Sections 7.3.1.4 and 7.4.3.3 of the TRCA's "*The Living City Policies*" provide further details regarding the delineation of valley and stream corridors and planning measures relating to the valley and stream erosion hazard. The VOP 2010 policies are consistent with "*The Living City Policies*".

7.4 Watercourses

Criteria: All open, natural watercourses are included within the NHN. Watercourses considered Headwater Drainage Features (HDF) with a management recommendation of "Protection", "Conservation" or "Linkage" based on TRCA/CVC

HDF Guidelines (2013) are also recommended for inclusion in the NHN (see discussion of HDF in Section 5.2). A 30 metre vegetation protection zone is added to either side of the high water mark of all watercourses.

Justification: Watercourses and the associated riparian corridor provide important habitat for a wide range of terrestrial and aquatic plants and animals. The linear, connected nature of a watercourse means these areas also provide important ecological movement corridors and the water conveyed by a watercourse is important to associated wetlands and waterbodies that intersect the watercourse along its length.

HDF constitute the majority of the total catchment area (70% to 80%) within a watershed (Gomi, et al., 2002) and it has been suggested that 90% of a river's flow may be derived from catchment headwaters (Kirby 1978).

Policy Implications: It is noted in VOP 2010 policy 3.2.3.4(a) that Core Features of the NHN include "*valley and stream corridor*s, including provincially *significant* valleylands and permanent and intermittent streams, with a minimum 10 metre vegetation protection zone, or a 30 metre vegetation protection zone for those *valley and stream corridor*s within the Oak Ridges Moraine and Greenbelt Plan Areas". The available watercourse data may include watercourses that are ephemeral and/or headwater drainage features (ill-defined, non-permanently flowing drainage features that may not have defined bed or banks). In addition, headwater drainage features occur on the landscape that have not been mapped and delineated on Schedule 2.

As a result, it is recommended to amend the VOP 2010 as provided below.

- Add the following text regarding watercourses as policy 3.3.1.5 in Section 3.3.1 of the VOP 2010:

  That *watercourses* may need to be confirmed by the City and the Toronto and Region Conservation Authority through field investigation. *Headwater drainage features* (HDFs) shall be identified and managed in accordance with TRCA's "Evaluation, Classification and Management of Headwater Drainage Features Guideline", as may be updated.

- Renumber policy 3.3.1.5 to 3.3.1.6 and renumber policy 3.3.1.6 to 3.3.1.7

Add the following definitions to Section 10.2.2 (Definitions) of the VOP 2010:

Headwater Drainage Feature (HDFs): Ill-defined, non-permanently flowing drainage features that may not have defined bed or banks; they are zero-order intermittent and ephemeral channels, swales and rivulets, but do not include rills or furrows (also see *watercourse)*. HDFs that have been assessed through TRCA's Evaluation, Classification and Management of Headwater Drainage

Features Guideline, as requiring protection, conservation or mitigation, are subject to TRCA's Regulation.

Watercourse: An identifiable depression in the ground in which a flow of water regularly or continuously occurs (*Conservation Authorities Act*) - also see *headwater drainage feature.*

Together with existing VOP 2010 policy 3.3.1.5 (to be renumbered to policy 3.3.1.6) regarding modification to watercourses and VOP 2010 policy 3.2.3.11 regarding modifications to Core Features, the policy framework covers instances to include watercourses in the NHN that may not have been mapped as well as modification to watercourses that are included in the NHN.

7.5 Waterbodies

Criteria: All natural waterbodies are included within the NHN. A 30 metre vegetation protection zone is added to either side of the high water mark of all waterbodies.

Justification: Natural waterbodies often occur in association with wetlands or as open water features providing unique habitat for aquatic plants and animals. Areas of deeper water are particularly important to provide overwintering habitat for some species and the larger aquatic habitats needed for fish, waterfowl and aquatic mammals. In some cases it may be difficult to discern "natural" from "anthropogenic" waterbodies given the history of settlement and landscape alteration. Hence, in the event a waterbody is part of a development application, it is anticipated that a more detailed assessment will be undertaken to determine the origin of the waterbody and the ecological features and functions associated with the waterbody as part of determining an appropriate protection and/or restoration strategy.

Policy Implications: VOP 2010 policy 3.2.3.4 does not specifically include waterbodies as Core Features, although kettle lakes are specifically noted in VOP 2010 policy 3.2.3.4(g).

It is noted in section 3.4 of the Natural Heritage Reference Manual (OMNR 2010), regarding identification of a natural heritage system, that:

- Waterbodies, including wetlands, often represent a relatively small percentage of the total land area, yet they can be disproportionately more valuable than other areas.
- It is recommended that measures be taken to protect water features, wetlands and other areas of hydrological importance (e.g., headwaters, recharge areas, discharge areas) within natural heritage systems.

The term, waterbodies, is not defined in the Natural Heritage Reference Manual (OMNR 2010), but Table B-1 in Appendix B includes a description of waterbodies in relation to the identification of fish habitat as follows:

Where no detailed fish habitat mapping has been completed, all waterbodies, including permanent or intermittent streams, headwaters, seasonally flooded areas, municipal or agricultural surface drains, lakes and ponds (except human-made off-stream ponds) should be considered fish habitat unless it can be demonstrated to the satisfaction of the approval authority under the Planning Act that the feature does not constitute fish habitat as defined by the Fisheries Act.

Surface water feature is defined in the Provincial Policy Statement (2014)

Surface water feature*: means water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics.*

The York Region Official Plan (ROP 2010) defines sensitive surface water features and waterbody as provided below.

Sensitive Surface Water Features*: Water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics, that are particularly susceptible to impacts from activities or events including, but not limited to, water withdrawals, and additions of pollutants.*

Waterbody: *Lakes, woodland ponds, etc. which provide ecological functions. For the purposes of determining significant woodlands, waterbody generally does not include small surface water features such as farm ponds or stormwater management ponds, which would have limited ecological function.*

Given the information in the Provincial guideline documents, the ROP 2010 and TRCA's Living City Policy document, it is recommended to amend the VOP 2010 as described below.

- Amend VOP 2010 policy 3.2.3.4(h) to include the term 'sensitive surface water features' as follows, which is consistent with ROP 2010 policy 2.2.1(m):

  Sensitive surface water features (including waterbodies), seepage areas and springs not already captured in *valley and stream corridor*s and a 30 metre minimum vegetation protection zone for those seepage areas and springs in the Oak Ridges Moraine Conservation and Greenbelt Plan Areas.

- Amend policy 3.3.5.1 by adding a subparagraph as follows:

  Prohibiting development and site alteration within sensitive surface water features and their vegetation protection zone unless it is demonstrated through

an environmental impact study that the development or site alteration will not result in a negative impact to the ecological and/or hydrological functions of the sensitive surface water feature.

- Add the following definitions from the ROP 2010 to Section 10.2.2 (Definitions) of the VOP 2010:

  Sensitive Surface Water Features: Water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, wetlands, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics, that are particularly susceptible to impacts from activities or events including, but not limited to, water withdrawals, and additions of pollutants.

  Waterbody. Lakes, woodland ponds**:** which provide aquatic habitat and ecological functions.

7.6 Areas of Natural and Scientific Interest

Criteria: All Areas of Natural and Scientific Interest (ANSI) are included in the NHN. This includes Earth Science ANSI's and Life Science ANSI's.

Justification: ANSI's are areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education (PPS 2014).

Policy Implications: There are no policy implications as the NHN criteria for ANSIs are consistent with policy 3.2.3.4(f) and Section 3.3.6 of the VOP 2010.

7.7 Environmentally Significant Areas

Criteria: All Environmentally Significant Areas (ESAs) are included within the NHN.

Justification: Sites identified as ESAs support areas considered to be some of the most critical and/or sensitive natural heritage features and functions important to protecting biodiversity within the City of Vaughan.

Policy Implications: There are no policy implications as the NHN criteria for ESAs are consistent with policy 3.2.3.4(f) and Section 3.3.6 of the VOP 2010.

7.8 Significant Wildlife Habitat – Amphibians

Criteria: Amphibian Breeding Habitat - Woodland (MNR 2012)

Justification: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations

Criteria: Amphibian Breeding Habitat – Wetlands (MNR 2012)

Justification: Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.

Policy Implications: There are no policy implications as the NHN criteria are consistent with policy 3.2.3.4(d) and section 3.3.4 of the VOP 2010.

7.9 Significant Wildlife Habitat - Birds

Criteria: Open Country Bird Breeding Habitat (MNR 2012)

Justification: This wildlife habitat is declining throughout Ontario and North America. Species and records show Open Country breeding birds have declined significantly over the past 40 years based on CWS (2004) trend records.

Criteria: Shrub/Early Successional Bird Breeding Habitat (MNR 2012)

Justification: This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.

Criteria: Woodland Area-Sensitive Bird Breeding Habitat (MNR 2012)

Justification: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area-sensitive interior forest song birds.

Policy Implications: There are no policy implications as the NHN criteria are consistent with policy 3.2.3.4(d) and section 3.3.4 of the VOP 2010.

7.10 NHN Enhancement Areas

Enhancement Areas are NHN areas without obvious natural heritage core features, enhancement areas may be present among and between core features or they may represent potential open habitat core areas. Enhancement Areas are identified for inclusion in the NHN to achieve a variety of ecological objectives which may include:

- providing ecological linkage functions (Linkage Enhancement Areas);
- protection of the Critical Function Zones (CFZ)for wetlands (CFZ Enhancement Areas);
- meeting specific habitat requirements for target species such as area sensitive species (Target Species Enhancement Areas); and

- contributing to the size and quality of core areas by reducing edge effects and establishing or increasing "interior habitat conditions" (Interior Habitat Enhancement Areas).

Criteria: *Linkage Enhancement Areas* are defined based on maintaining a minimum width along a linkage corridor. Local corridors have a minimum width of 50 to 200 metres while regional corridors have a minimum width of 300 to 400 metres (Section A.2.3.5 Natural Heritage Reference Manual, MNR 2010).

Justification: Ecological linkage among natural heritage features such as woodlands and wetlands is critical for wildlife functions that include daily, seasonal or long-term movement within the landscape, such as:

- daily movement patterns related to foraging, predation, avoidance, and resting, etc.;
- seasonal movement to support breeding in ponds and foraging in woodlands; and
- long-term dispersal and/or re-colonization movement among habitat patches to sustain meta-populations.

Criteria: *Interior Habitat Enhancement Areas* are defined based on achieving minimum habitat patch size required for interior habitat. Interior habitat for area sensitive woodland species is generally considered to be associated with a minimum patch size of 10 to 25 ha or with a minimum 100 m buffer around all woodland sides. Interior habitat for area sensitive open country species is associated with a minimum patch size of 20 to 40 ha.

Justification: Many of the remaining woodlands patches present do not have "interior woodland" and as such these woodlands may not be able to provide the same ecological functions that support high biodiversity which once existed in the undisturbed growth woodlands that dominated southern Ontario, particularly where urban development surrounds woodland patches. The ability to protect the full range of native woodland species diversity increases as the size of core areas increases, and as their shape becomes more regular (circular or square). Core areas that fall below certain size thresholds are incapable of providing suitable habitat for a large number of species that require large areas of habitat. These are frequently referred to as "area-sensitive" species. This is largely attributed to environmental conditions along the edges of cores (edge effects) that create light levels, soil and air moisture levels, ambient wind and temperature that are significantly different from conditions that characterize the "core interior". Edge effects have been shown to penetrate 100 to 300^{+} metres into a forest patch. Thus to obtain one hectare of "interior conditions" buffered by the minimum 100 edge, requires a circular patch size of approximately nine hectares. However, one hectare of interior habitat does not provide sufficient habitat for the many area-demanding species common to southern Ontario and of the historic vegetation that sustained these species prior to European colonization, as such patch sizes much larger than nine hectares are required.

Criteria: *Critical Function Zone (CFZ) of Wetlands Habitat Enhancement Areas* are protected based on "a good understanding of the local biophysical context, hydrologic regime and the species using the given wetland, as well as the nature and extent of their non-wetland habitat requirements of these species" (Environment Canada 2013). Based on current scientific knowledge, the literature increasingly indicates that the habitat requirements for wildlife that depend on wetlands tend to result in the widest and most varied CFZs and these generally are in the order of 100 metres or more (see Table 3 in Environment Canada 2013).

Justification: Environment Canada (2013) provides the following description of the CFZ: "non-wetland areas within which biophysical functions or attributes directly related to the wetland occur. This could, for example, be adjacent upland grassland nesting habitat for waterfowl (that use the wetland to raise their broods). The CFZ could also encompass upland nesting habitat for turtles that otherwise occupy the wetland, foraging areas for frogs and dragonflies, or nesting habitat for birds that straddle the wetland-upland ecozone (e.g., Yellow Warbler). A groundwater recharge area that is important for the function of a wetland but located in the adjacent lands could also be considered part of the CFZ. Effectively, the CFZ is a functional extension of the wetland into the upland."

Criteria: *Target Species Enhancement Areas* are identified based on habitat requirements considered necessary to sustain specific significant species. The NHN has identified three such areas. Three areas have been identified based on the requirements of Open Country Breeding Birds, the criteria used for two of the Enhancement Areas are based on the minimum habitat (40 ha) required to sustain Area Sensitive Open Country breeding birds and one area is defined based on the presence of suitable habitat for a Special Concern Open Country Breeding Bird (Common Nighthawk).

Justification: Suitable wildlife habitat for many species is declining throughout Ontario as evidenced by the increasing number of Species at Risk identified by the Ministry of Natural Resources. For Open Country breeding birds records show these have declined significantly over the past 40 years based on CWS (2004) trend records.

Note: At this time, Enhancement Areas to augment interior woodland conditions or to protect the CFZ of wetlands are not identified either in the urban area designations or in the Greenbelt Plan or Oak Ridges Moraine Conservation Plan areas. Rather, the criteria and justification for interior woodland enhancement and enhancement to protect the CFZ of wetlands is provided in this report and can be incorporated into the Terms of Reference for appropriate studies, such as a Master Environment and Servicing Plan (MESP) or environmental impact study (EIS) for appropriate development applications.

8.0 PROPOSED SCHEDULE MODIFICATIONS

The VOP2010 Schedule 2 Natural Heritage Network (Figure 5) will be updated to reflect current conditions in the City of Vaughan. This will include the removal of some areas of the NHN based on existing or approved development, as well as the addition of some areas based on the application of criteria described in Section 7.

To provide greater understanding of Schedule 2, three additional supporting Schedules are proposed for the VOP 2010 as follows:

- Schedule 2a Hydrologic Features and Valleylands (Figure 6);
- Schedule 2b Woodlands (Figure 7); and
- Schedule 2c Significant Wildlife Habitat (Figure 8).

The information proposed for presentation within each schedule is shown in the legends below.

Schedule 2A – Hydrologic Features and Valleylands

Legend

- Provincially Significant Wetlands
- Other Wetlands (may include evaluated wetlands that are not Provincially Significant or non-evaluated wetlands[1])
- Surface Water Features[2] (headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs)
- Crest of Slope Screening Layer for Valleylands[3]

[1] non-evaluated wetlands shall assessed for their significance, in accordance with criteria provided by the Province, and to determine their importance, functions and means of protection to the satisfaction of the City.
[2] to be confirmed through the application of policies of this plan
[3] to be confirmed on a site specific basis

Schedule 2B – Woodlands

Legend

- Woodlands (> 0.5 ha)

Schedule 2C – Significant Wildlife Habitat[1,2]

Legend

- SWH Amphibian Breeding Habitat – Woodlands
- SWH Amphibian Breeding Habitat – Wetlands
- SWH Special Concern Open Country Breeding Birds
- SWH Area Sensitive Open Country Breeding Birds
- SWH Shrub/Early Successional Breeding Birds
- SWH Area-Sensitive Woodland Breeding Birds

[1] Significant Wildlife Habitat (SWH) determined through the application of Ministry of Natural Resources *Draft* SWH Ecoregion 7E Criterion Schedule (February 2012)

[2] Schedule 2C does not show all SWH in the City of Vaughan. Site-specific assessments may identify additional significant wildlife habitat in accordance with criteria established by the Province.

Figure 5: Schedule 2 Natural Heritage Network

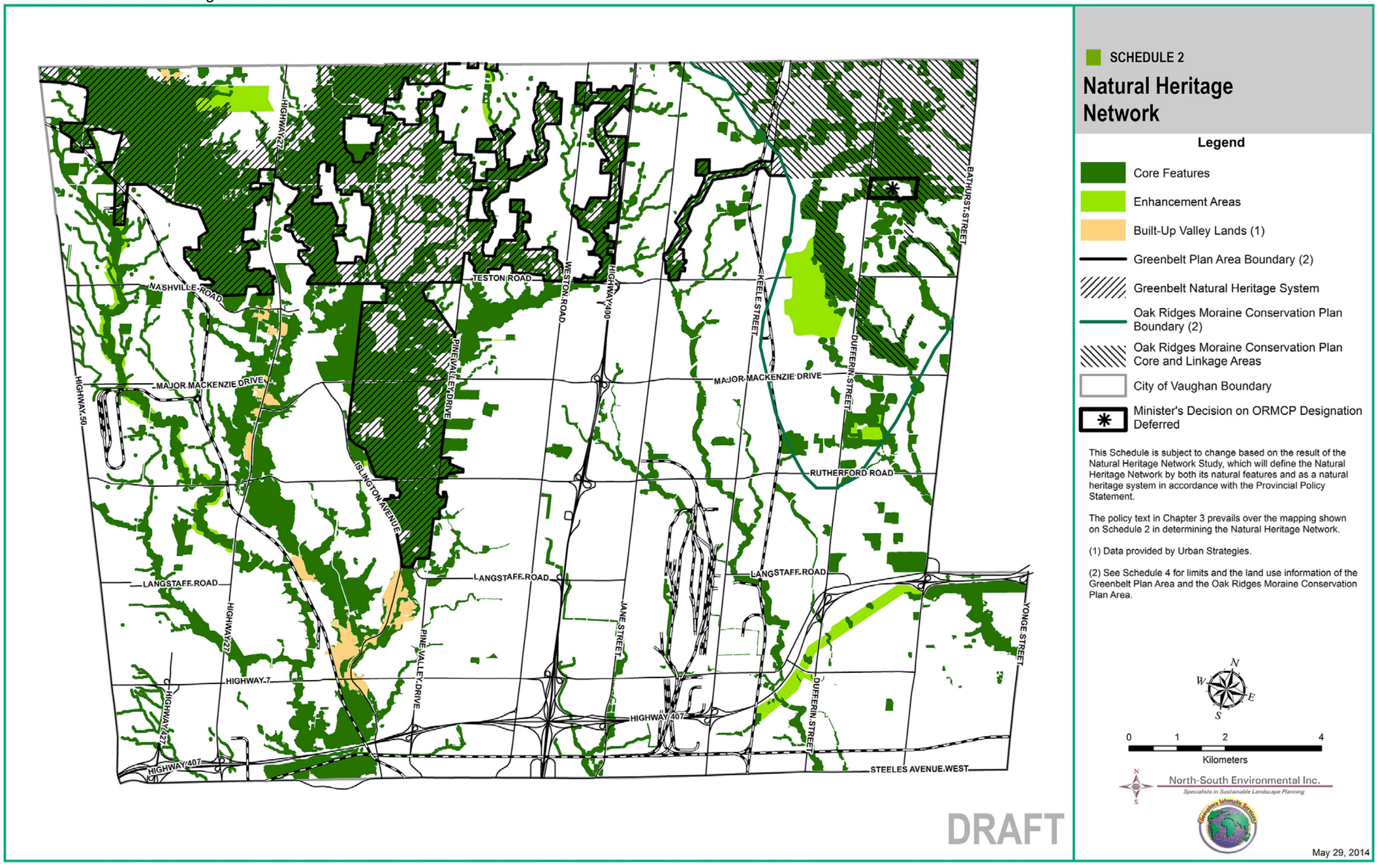


Figure 6: Schedule 2a Hydrologic Features and Valleylands

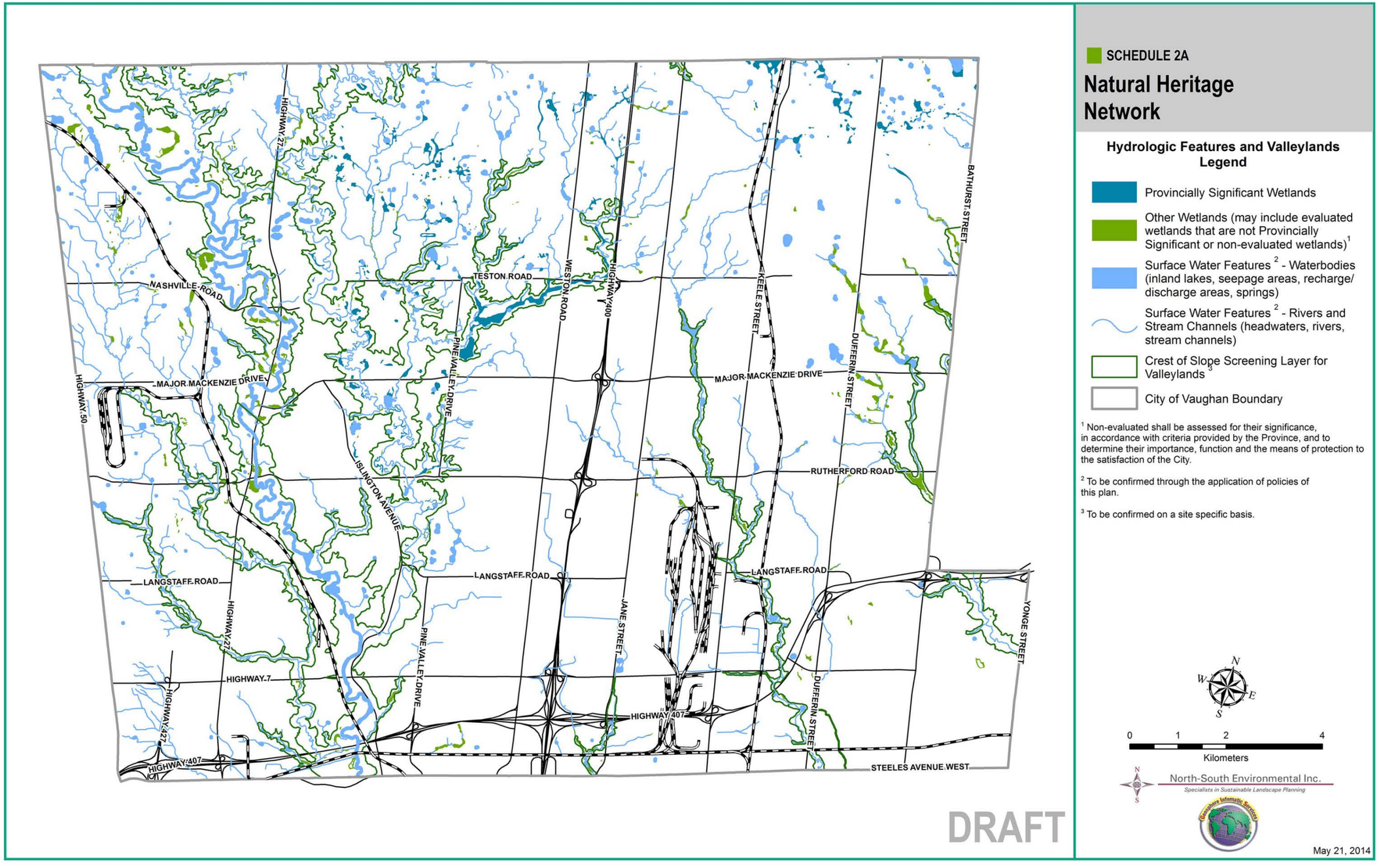


Figure 7: Schedule 2b Woodlands

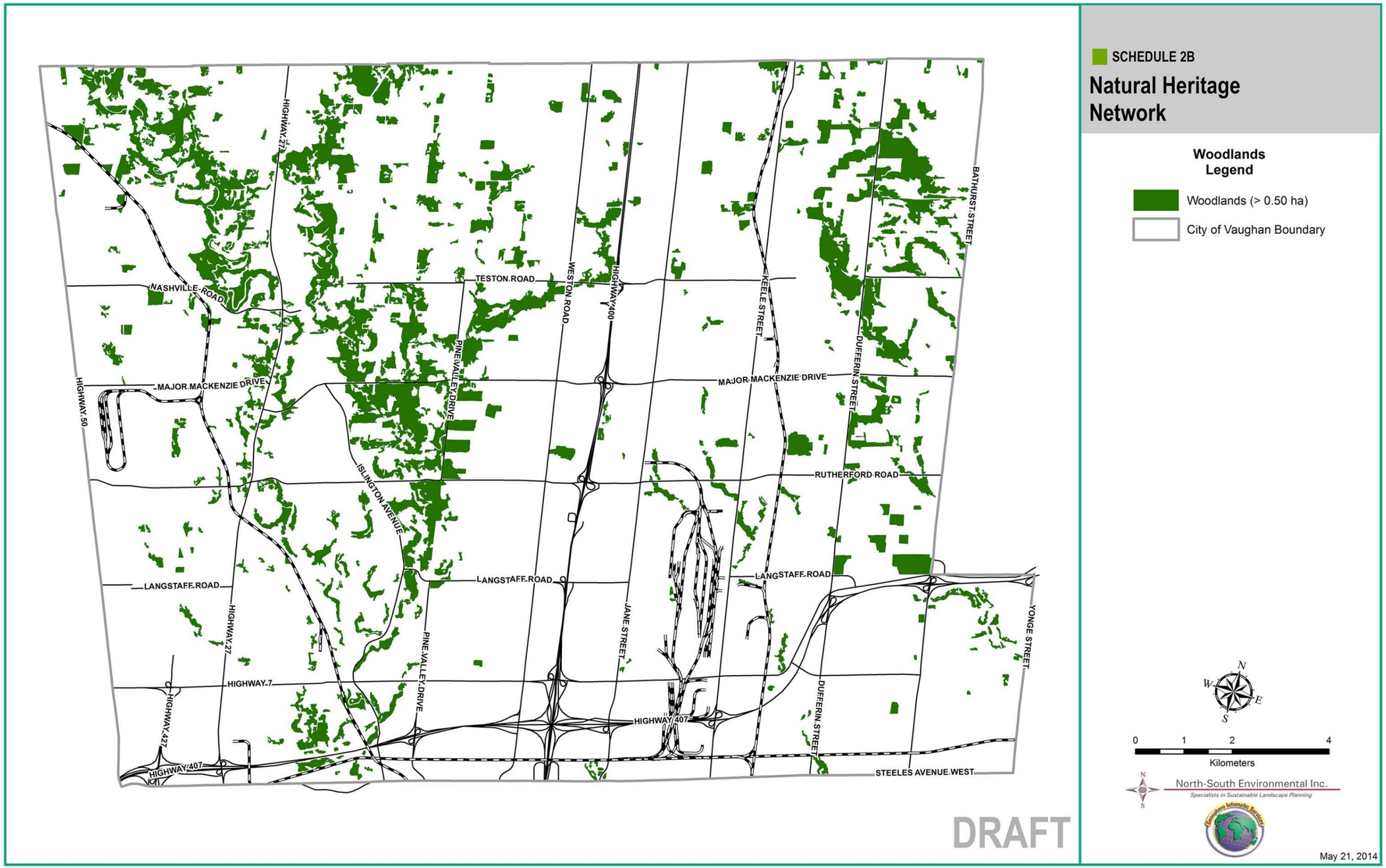
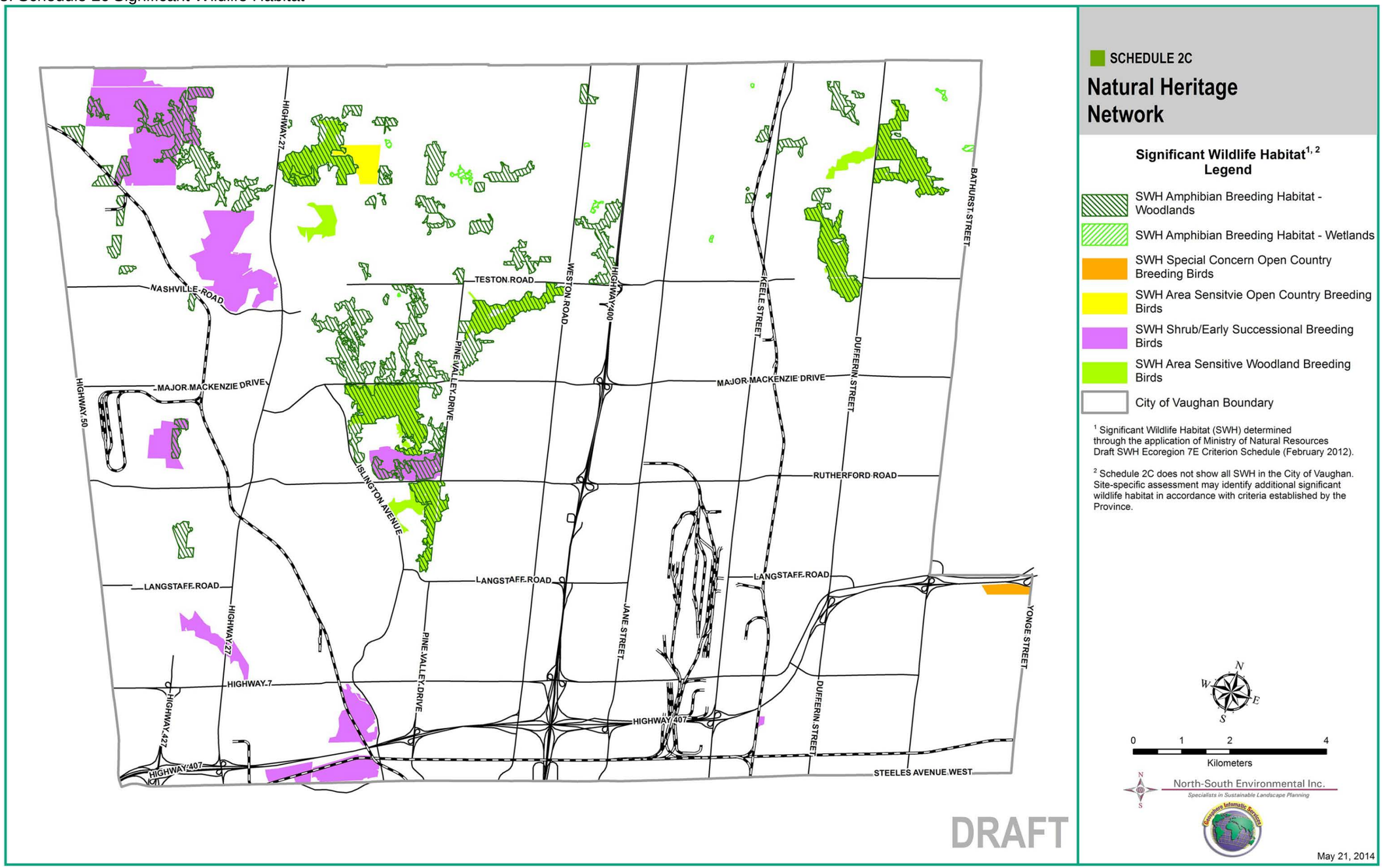


Figure 8: Schedule 2c Significant Wildlife Habitat



9.0 SCENARIO TESTING OF VAUGHAN'S NHN

Scenario testing is a means to assess the ability of Vaughan's NHN to achieve ecosystem targets aimed at protecting viable habitat that will provide long term protection of native biodiversity. Scenario testing involves an assessment of natural heritage features and functions as they currently exist within the NHN and the evaluation of scenarios that enhance the existing features and functions to better achieve certain ecosystem targets. Table 6 provides an assessment of baseline conditions within the NHN

The following ecosystem targets were established in the NHN Phase 1 study and they are based on guidelines from the Canadian Wildlife Service (CWS) publication "How much habitat is enough?" (Environment Canada 2013).

Woodland Cover

CWS Forest Habitat Guideline	Forest Habitat in Vaughan
At least 30% forest cover	11 %
At least 10% of forest cover should be interior forest >100 m from edge	0.5 %
At least one large contiguous forest within each watershed (>200 ha)	Humber Watershed largest forest – 152 ha Don Watershed largest forest – 92 ha

Wetland Habitat

CWS Wetland Habitat Guideline	Wetland Habitat in Vaughan
At least 10% wetland habitat	1.5%
Protection of a Critical Function Zone (CFZ) of 100 m from edge of wetland	40 % of 100m CFZ protected by natural cover (woodland, successional & meadow)

Riparian Habitat

CWS Riparian Habitat Guideline	Riparian Habitat in Vaughan
75 % cover along streams	30 % of stream length in Vaughan have forest cover within 3 m of stream banks
30 m buffer along streams	45 % of stream length has some forest cover within a 30 m buffer along stream banks

Table 6 provides baseline conditions in Vaughan against which ecosystem targets may be tested. Achieving ecosystem targets can projected through scenario testing that considers potential contributions to core features of the NHN such as:

- Improving habitat within the existing NHN (i.e. disturbed valleylands and similar 'open space' lands protected through development approvals) can substantially increase progress to select ecosystem targets, such as overall woodland cover. This will have an overall benefit in the provision of ecosystem services, but does not address ecosystem targets related to interior woodland or the Critical Function Zone of wetlands.

- Restoration of Greenbelt Plan lands in areas of planned urban development, such as the Hwy 400 North Employment Lands and New Community Areas, also improves overall woodland cover and incrementally improves the Critical Function Zone of select wetlands. Much of the Greenbelt Plan area in the City of Vaughan has been identified to include wetlands, such as the recently evaluated East Humber Provincially Significant Wetland Complex.
- Making the assumption of habitat restoration for the minimum vegetation protection zone of natural features (Note: in the Greenbelt Plan and ORMCP areas this is only a scenario for the purposes of the NHN Study, the City encourages agricultural practices in the Provincial Plan areas and recognizes, as in policy 2.1.9 of the PPS, that the NHN is not intended to limit the ability of agricultural uses to continue). However, the significant improvement in advancing measures towards select ecosystem targets makes stewardship and conservation land securement of importance for the City to balance agricultural uses and natural heritage improvements in these areas. NHN improvement is not necessarily limited to habitat restoration in the Greenbelt Plan and ORMCP areas as changes to farming practices may: provide habitat, such as for open country species; provide functionally connected landscapes between woodlands; and improve overall water quality while still limiting impacts on agricultural uses.

Examples showing approaches to achieving ecosystem targets defined for Vaughan through restoration of natural vegetation are provided in Figures 9 to 12, which add to existing areas of woodland, wetland and riparian cover. Within the NHN identified for Vaughan, including areas within the Greenbelt NHS and Oak Ridges Moraine Core and Linkage Areas, there are areas available for restoration. These areas may include the Vegetation Protection Zone identified for core features such as woodlands, wetlands and watercourses (Figure 9), areas within valleylands where core features are not present (Figure 10), NHN Linkage Enhancement Areas (Figure 11) and suitable areas within the Greenbelt and Oak Ridges Moraine (Figure 12).

Table 6: Scenario testing of NHN baseline conditions of existing natural heritage features and functions

NHN Statistics (January 2014)	Vaughan ha / #	Vaughan %	NHN ha / #	NHN %
Total Area	27,435	100	7,053	25.7%
Woodland Cover	3,113.30	11.3%	2,976	10.8%
Interior Woodland (minimum 100m edge)	140	0.5%	134	0.5%
Largest Woodland Patch - Don Watershed	92			
Largest Woodland Patch - Humber Watershed	152			
# of Woodland Patches - Vaughan	662			
# of Woodland Patches - Don Watershed	194			
# of Woodland Patches - Humber Watershed	475			
# of Woodland to Woodland Linkage Patches (30m minimum separation)	428	64.7%		
Wetland Cover	422	1.5%	408	1.5%
Wetland CFZ - 100m	3,340	100.0%	2,127	63.7%
Wetland CFZ - 200m	6,921	100.0%	3,545	51.2%
Natural Cover within Wetland CFZ - 100m	1,458	43.7%	1,330	39.8%
Natural Cover within Wetland CFZ - 200m	2,568	37.1%	2,287	33.0%
# of Wetland to Woodlands Linkage Patches (30m minimum separation)	429	72.5%		
Meadows	1,563		928	
Successional Woodlands	2,29		137	
Riparian Zone	2,912	100.0%	2,256	77.5%
Natural Cover within Riparian Zone	1,379	47.3%	1,295	44.5%

Figure 9: Potential restoration areas shown in yellow are within the Vegetation Protection Zone of woodland (green), wetland (blue) and riparian areas (blue watercourse line).

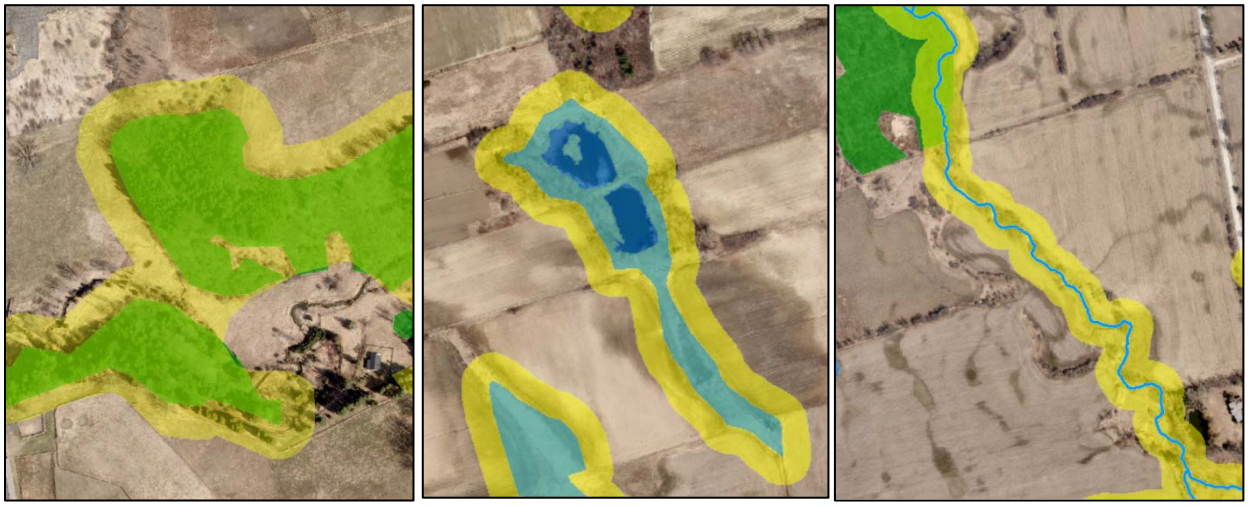


Figure 10: Potential restoration areas shown in orange have been identified to maintain a minimum width along an ecological linkage corridor associated with NHN Cores Area shown in red

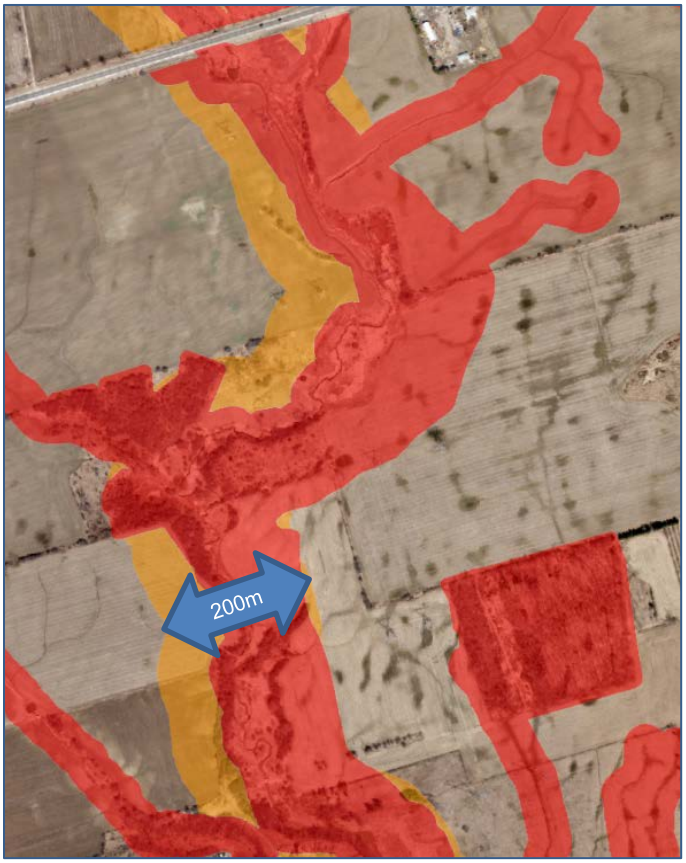
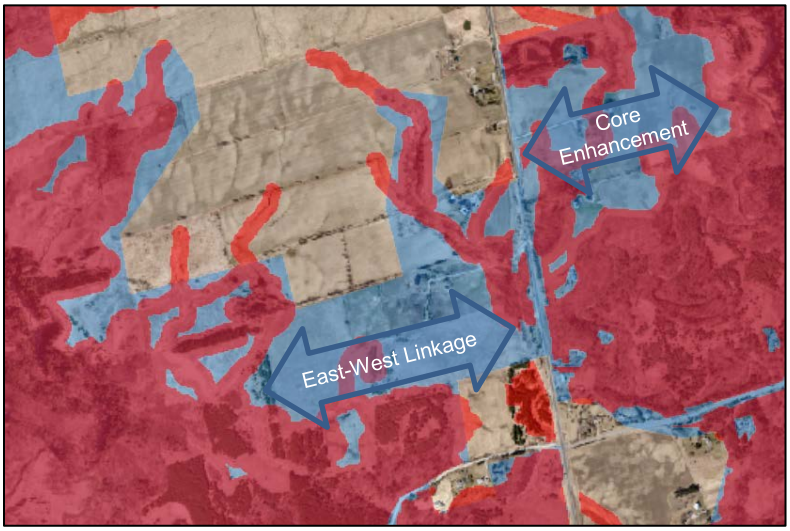


Figure 11: Potential restoration areas shown in yellow within valleylands defined by crest of slope (orange line) to restore native floodplain communities such as bottomland woodland (green areas).

Figure 12: Potential restoration areas shown in blue within the Greenbelt Natural Heritage System may contribute to regional ecological linkage and the establishment of large habitat patches contributing to NHN Core Areas shown in red. While Enhancement Areas have not been specifically delineated in the Greenbelt Plan or Oak Ridges Moraine Conservation Plan areas, this figure depicts examples of potential restoration areas that serve as an east-west linkage and core woodland enhancement.



10.0 LAND STEWARDSHIP STRATEGY

This City of Vaughan Conservation Land Securement Strategy is a comprehensive conservation land securement planning document that includes recommendations and implementation guidelines for establishing on-the-ground program delivery in Vaughan.

Conservation land securement is the legal acquisition of natural areas or natural heritage lands through a range of land securement methods to facilitate long-term protection of land in perpetuity. It requires a willing seller/donor and a willing buyer/recipient. Such lands are generally held in public or non-profit ownership with the goal to maintain, if not protect, restore and enhance the natural features and their contribution to a larger ecological system. These lands typically result in the formation of parks, trails, conservation areas, nature reserves, etc. Conservation land securement differs from land procurement which is the acquisition of land that could be considered 'disposable' land assets (although disposition of portions of parcels may be advisable in unique cases).

The advantage of conservation land securement is that there are a range of securement methods available to the City, its partners, and the landowner that can adapt to each securement project on a case-by-case basis. This creates a win-win solution that will benefit the environment and all parties.

Conservation land securement can be done by any organization where their focus is solely on land securement (i.e. a land trust) or on larger conservation issues (i.e. a Conservation Authority). Conservation land securement could also be one component of a larger, public benefit mission (i.e. a municipality or provincial government), provided that the government body commits to the long-term protection of such properties. Conservation land securement can be facilitated on an ad-hoc basis; however this is not an efficient use of limited resources within an organization. Implementation of the Strategy can take several years to foster relationships with landowners and coordinate the work necessary to initiate each securement project. Considering the diverse range of conservation land securement tools and processes, an experienced staff member or consultant is typically required to oversee implementation of the strategy. See Table 1 for the basic steps of a conservation land securement project. The complete Conservation Land Securement Strategy (Orland Conservation 2014) proposed for Vaughan is provided under separate cover.

11.0 CONCLUSIONS AND NEXT STEPS

The NHN Study deliverables, including proposed amendments to select policies and Schedule 2 (Natural Heritage Network) of the VOP 2010, will be integrated into corporate objectives by:

- Providing a comprehensive database of natural features and areas, as part of a connected natural heritage system, for use in the review of development applications and as a baseline of digital data in a Geographic Information System (GIS) for ongoing tracking and monitoring;
- Providing further details for evaluation of the NHN and environmental aspects in Master Environment and Servicing Plans (MESPs) and Environmental Impacts Studies (EIS) related to development applications;
- Informing the subwatershed studies and Secondary Plans for the New Community Areas;
- Informing the City's input to the GTA West (Transportation Corridor) Study;
- Informing the City's input to the upcoming provincial review of the Greenbelt Plan and the Oak Ridges Moraine Conservation Plan; and
- Providing the framework for a work plan to improve the NHN over time, such as through actions related to ecological restoration, habitat management, landowner liaison for stewardship activities, and securing funding for stewardship and land securement objectives.

Immediate next steps include obtaining further public input prior to the finalization of the NHN study and proposed amendments to select policies and schedules of the VOP 2010. Ongoing implementation efforts include mid-term and long-term actions such as documented below.

- The City of Vaughan Environmental Management Guideline will be updated to incorporate key results of the NHN Study.
- The NHN Study emphasized refinement of the criteria and mapping of Core Features and Enhancement Areas of the NHN. As a result, refinement of the Built-up Valley Lands component of the NHN is required given changes to Core Features. This is also a component of ongoing tracking and monitoring of NHN improvement over time.
- Identify aspects of the Conservation Land Securement Strategy for implementation using stewardship and securement approaches to complement NHN securement through the development review process.

12.0 REFERENCES

AECOM. 2010. Natural Heritage in the City.

AGRA Earth and Environmental. 2001. Kleinburg – Nashville Community Plan: Natural Environment – Background Study Report.

AMEC Earth and Environmental. 2002. Focus Rural Area Woodland Ecosystem Assessment.

City of Vaughan. 2004. Regional Road 27 Valley Corridor Study - Valley Corridor Management Plan.

City of Vaughan. 2001. Tableland Woodlot Protection Strategy. Prepared by J.H. Stevens, Planning and Development Consultants.

CVC/TRCA. 2009. Evaluation, Classification and Management of Headwater Draingage Features: Interim Guidelines. Updated March 2009. Credit Valley Conservation and Toronto and Region Conservation.

Environment Canada. 2013. How Much Habitat is Enough? Second Edition. Canadian Wildlife Service, Environment Canada.

Gartner Lee. 1993. City of Vaughan Subwatershed Study – Existing Environmental Conditions.

OMNR. 2012a. Provincially Significant East Humber River Wetland Complex. Ontario Ministry of Natural Resources.

OMNR. 2012b. *Draft* Ecoregion schedules for designation of Significant Wildlife Habitat. Ontario Ministry of Natural Resources.

OMNR, 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition.

OMNR, 2000. Significant Wildlife Habitat. Technical Guide. Ontario Ministry of Natural Resources.

Ontario Ministry of Natural Resources. 2000. Inventory of the Life Science Maple Uplands & Kettle Wetlands and Earth Science Oak Ridges Moraine Maple Spur Areas of Natural and Scientific Interest, City Of Vaughan, Ontario.

Ontario Partners in Flight. 2008. Ontario Landbird Conservation Plan: Lower Great Lakes/St. Lawrence Plain, North American Bird Conservation Region 13. Ontario Ministry of Natural Resources, Bird Studies Canada, Environment Canada. Draft Version 2.0

TRCA. 2007. Toronto and Region Terrestrial Natural Heritage System Strategy. Toronto and Region Conservation.

TRCA. 2013. Evaluation, Classification and Management of Headwater Drainage Features Guidelines. Toronto and Region Conservation and Credit Valley Conservation.

APPENDIX 1: COMMUNITY ENGAGEMENT

Appendix 1: Community Engagement

Community Stakeholder Workshops

- Community sessions - Monday October 21, 2013 - 1:00 p.m. 3:00 p.m. and 5:00 p.m. - 7:00 p.m. at City of Vaughan
- Environmental Non-Government Organizations (ENGOs) session – Monday, March 3rd, 2014, 1:00-3:00 p.m., at City of Vaughan
- Sustainable Vaughan – March 24, 2014
- Kleinburg Area Ratepayers Association (KARA) – March 27, 2014

OVERVIEW

Five stakeholder sessions were held between October 21st, 2013 and March 27, 2014 to discuss Vaughan's Natural Heritage Network Study. These sessions were advertised to a wide range of external stakeholders representing: government and agencies (including adjacent municipalities and local conservation authorities), educational institutions, environmental groups, community groups and residents associations, recreational facilities, business and development organizations, local utilities and transit, and arboriculture firms. Numerous individuals from eleven organizations participated in the sessions. Each session began with welcoming remarks from Tony Iacobelli (Project Manager, City of Vaughan), followed by a presentation on the project given by Brent Tegler (North-South Environmental, Project Lead for the consulting team). The meeting with Sustainable Vaughan was attended by Tony Iacobelli and two representatives of Sustainable Vaughan. Susan Hall from Lura Consulting facilitated the community discussions and solicited input from participants. The purpose of the workshops was to obtain input from stakeholders including: (1) existing or potential future initiatives that may contribute to the NHN; (2) opportunities and constraints that influence the NHN; (3) suggestions for evaluating criteria to establish the NHN scenarios.

The key themes and discussion points from the stakeholder workshops are summarized below. Much of the discussions were focused on clarifying the scope of the study including understanding the natural heritage features and enhancement areas.

[insert key points from KARA and ENGO sessions]

KEY DISCUSSION POINTS

Opportunities

- **Official Plan:** The NHN plan will provide an opportunity to clearly identify planning practices for natural heritage. It should be part of the Official Plan and be connected to recommendations in the secondary and block plans.
- **Greenbelt and Oak Ridges Moraine:** The Greenbelt and Oak Ridges Moraine have helped Vaughan manage growth and are helping to preserve natural heritage land.

Constraints

- **Utility Corridors:** One participant asked if there will be regulatory development limits imposed for utility corridor development as part of the NHN. Tony clarified that the regulatory limits are outlined in the City of Vaughan Official Plan.
- **Land Securement:** One participant asked if the City of Vaughan will be purchasing land for the NHN. The consulting team will be providing an overall

strategy to address land securement options, including easements, land donations and stewardship agreements. If land securement is a priority for Vaughan, the NHN plan could recommend setting up a fund to purchase land as one of its goals.

Evaluation Criteria

Participants suggested the following elements should be considered as part of the evaluation criteria to select the NHN scenarios:

- Environmental linkages;
- Quality of forest cover;
- Buffers on a site specific basis;
- Impacts of disease and infections;
- Impacts of invasive species; and
- Clearly define the woodlot criteria and requirements.

Additional Discussion Points

- **Fill regulations**: One participant asked if fill regulated areas are included in the NHN. Tony indicated that the perspective of the NHN is ecological and that the NHN is based on the Toronto and Region Conservation Authority (TRCA) limits on fill regulated areas as identified in their guidelines.
- **Species at risk**: One participant asked how the NHN will address species at risk. Brent indicated that any delineation of the NHN will not detract from the Species At Risk legislation. Vaughan has conducted studies on species at risk that will guide the development of the NHN.
- **Enhancement areas:** One participant asked if meadowlands were becoming a significant component of enhancement areas. Brent and Tony indicated that meadowlands are one of the areas that the City is reviewing for the NHN in relation to significant wildlife habitat as defined in accordance with Provincial guidelines.

STAFF SESSION

- Wednesday November 30th, 2013 – 9:30 a.m. - 11:30 a.m. at City of Vaughan

OVERVIEW

A staff session was held on October 29th, 2013 to provide an update on the Vaughan NHN Study and to discuss the relationship of the NHN to other studies and projects underway or planned for the City. Seventeen staff members participated from a wide range of departments including Development Planning, Parks Development, Building Standards, Policy Planning, Parks and Forestry, Sustainability, Transportation Engineering, Asset Management, ITM, Innovation/Continuous Improvement and Engineering Services.

The session began with welcoming remarks from Tony Iacobelli (Project Manager, City of Vaughan), followed by a presentation by Brent Tegler (North-South Environmental, Project Lead for the consulting team). Susan Hall from Lura Consulting facilitated the discussions and solicited input from participants. The purpose of the workshops was to obtain input including: (1) existing or potential future initiatives that may contribute to the

NHN; (2) opportunities and constraints; and (3) decision-making criteria to inform the assessment of the NHN against ecosystem targets.
The key themes and discussion points from the staff session are summarized below.

KEY DISCUSSION POINTS

Linkages to Other City Plans and Projects

Staff indicated there are a number of existing and planned initiatives that are linked to the NHN such as:

- **Vaughan Transportation Master Plan** (complete) that includes comprehensive city-wide GIS map including all planned transportation initiatives until 2031. A key consideration from the transportation perspective is that a lot of the projects are not driven by the City, but by the province and region.
- **York Region Transportation Master Plan and 10-year capital roads program** (updating in 2014) will be beneficial to review and consider if the timing aligns.
- **GTA West Corridor** project will have impacts.
- **Water /Wastewater Master Plans** (complete). There are no major trunks that will cross the NHN areas identified. Individual projects may need Class Environmental Assessments and would have consideration of the environmental and ecological impacts to the NHN as part of that process. New maps will be available in January, 2014 that may be of benefit.
- **Regional Water and Wastewater Class EA projects** should also be considered.
- **Stormwater Management Master Plan.** The City currently has 100 ponds and has an additional 110 ponds planned. The existing ponds are documented in City database in GIS format. Cooling trenches have been used in association with SWM ponds for thermal regulation.
- **ITM** is currently updating GIS maps for the City currently.
- **Archeology and History.** The City is working with York Region to map sites with high archeological potential in GIS formats. Archeological sites cannot be shared as they are confidential.
- **Woodlot Management Strategy** (being developed) that should be considered.
- **Sustainability.** There are a number of projects underway that can support the NHN.

Constraints

The NHN and land securement elements (e.g. easements) do not apply under the building code, this needs to be addressed through zoning or site planning agreement process which would permit development to continue and support the NHN areas.

Opportunities

A key recommendation is to engage community members and neighbourhood groups (e.g. adopt a park program, restoration and stewardship activities, etc.) in implementation.

Additional Discussion Points

- **Approvals**: One participant asked if there are any provincial approvals needed for the NHN. Tony clarified that the NHN is approved through the Official Plan Amendment.
- **Landowner Buy-In**: One participant asked about the need for landowner buy-in to the process. Tony and Brent indicated that discussions are taking place with landowners and their representatives for the blocks planned for development. Stakeholder consultation is also underway for other groups as well.
- **Operations and Finance:** One participant asked if there will be operation standards for maintenance to be performed in the NHN study areas. Another asked if the study will include estimates for capital and operating costs. Tony indicated that the costing is not part of the scope of work for this phase of the project and that costing will be part of Program of Work (e.g.: review impact assessments, tracking NHN database, land stewardship piece, etc.). This will likely be noted in the staff report for further assessment to determine a budget for a program of effort related to managing the NHN.
- **Stormwater Management:** One participant asked if there will be recommendations relating to stormwater management design and operations as part of the NHN study. Brent indicated that the team acknowledges there are ecological functions in stormwater management pond that should be considered and that these ponds may be contributing to some of the wetland functions that naturally exist (recognizing these as secondary functions). Tony indicated that stormwater management ponds are identified currently in Schedule 2 as Enhancement Areas, but will likely be removed from the revised NHN

COMMUNITY FORUM

- November 13th, 2013 - 6:30 to 9:00 p.m., City of Vaughan

OVERVIEW

The City of Vaughan hosted a Community Forum to seek community input for both the Natural Heritage Network Study (Phase 2-4) and the Climate Action Plan as both projects fall under the *Green Directions Vaughan*, the City's Community Sustainability and Environmental Master Plan. In total there were 57 participants. The forum was advertised in the local paper, on the City website, distributed to all stakeholder who had participated in earlier sessions, posted on the City`s social media feeds and invitations were issued to an extensive list of residents through the Planning Department. The community forum featured an open house from 6:30 – 7:00 p.m. and marketplace where participants could find out about other programs and projects by the conservation authority, Enbridge, Powerstream, Earth Hour and others. The forum began with welcoming remarks from John MacKenzie(Commissioner of Planning, City of Vaughan), followed by an overview presentation about the two projects given by Susan Hall from Lura Consulting. The remainder of the evening was dedicated to a world café format. The first station was dedicated to the Climate Action Plan where there was a brief overview presentation provided by Chris Wolnik and Jeff Garkowski (City of Vaughan and Lura Consulting) about the CAP and participants were encouraged to provide their input to the CAP vision, goals and key actions.

The second station was dedicated to Land Securement, where Kate Potter (Orland Conservation) provided participants with an educational presentation on the variety of options that exist for land securement beyond land purchase. Kate reviewed the features of land donation, split receipt, conservation severance, bequest, conservation easement agreement and life interest agreement.
The third station was dedicated to the NHN and included a brief overview presentation by Brent Tegler (North-South Environmental consultant lead for the NHN study) followed by a facilitated discussion.

KEY QUESTIONS AND DISCUSSION POINTS FOR THE NHN

NHN Draft Vision Statement

One participant asked what defines resiliency. This should include resiliency to climate changes and increases to biodiversity.

Greenbelt

- One participant asked if the core features in the Greenbelt are treated the same as those outside of the Greenbelt. Brent indicated that they are treated the same but those outside of the Greenbelt require environmental impact study if they are within the area of influence or 'adjacent lands'.
- One participant felt that the Greenbelt does not necessarily mean longevity in terms of preservation and that the NHN should be connected and supportive of the Greenbelt areas.

Enhancement areas

One participant asked if enhancement areas cover all other areas. Brent indicated that they do not and that different features perform different functions. Enhancement areas currently identify lands with a different underlying designation, such as for development or agriculture, but are intended to be evaluated to determine how much of an Enhancement Area should be a Core Feature.

Data sources

- A few of participants asked about the data sources used to create the NHN map. Brent explained that the maps were created from existing digital sources and orthomaps. He indicated that the open space layer is using historical data that doesn't show features within the boundaries. The meadowlands layer was created through interpretation of TRCA data at a high level.
- Brent indicated that mapping is an iterative process and if there are any errors the City is interested in gathering that information.

Meadowlands

A few participants asked how meadowlands would be considered in the NHN. Brent indicated that the study team is still considering meadowlands. The NHN could include large significant areas of meadow that provides habitat and ecological functions, such as for significant wildlife habitat. This is a piece of the NHN that requires further discussion.

Restoration

One participant noted they would like restoration to be included in the NHN.

Evaluation Criteria:

- A number of participants noted that increasing the forest cover is an important evaluation criterion in developing the NHN scenario.

- Participants asked how much forest cover does Vaughan currently have and asked if the NHN should focus on areas that already have some protection through other legislation (Greenbelt or Oak Ridges Moraine) or whether the NHN should focus on those areas not currently protected. Brent indicated that the City currently has 11% forest cover and that the study will look at both strategies to build on existing protection as well as areas that are not currently protected.
- Wetlands are an important part of the natural heritage of Vaughan and participants noted they should be protected.
- Wetland design criteria for stormwater management ponds should be considered. There are opportunities to test new innovations that can bring value to the NHN.
- Increased connectivity is an important criterion as well as increasing the interior forest area.

Costs

- A few participants cautioned that there are costs associated with natural heritage protection and restoration activities. Consideration needs to be given both the actual costs of restoration, the opportunity costs to developers, the natural services costs for restoration.
- A few participants also cautioned that the costs for these activities can increase the cost of housing and affordability of homes particularly given density targets.

ONLINE PUBLIC QUESTIONNAIRE

OVERVIEW

Ten members of the public participated in the online survey that was made available at the public meeting November 13th, 2013 and remained open until December 31st, 2013. The survey was designed to provide participants with an opportunity to provide comments and suggestions on the proposed vision, identify opportunities and constraints facing the NHN, and provide input to the scenario criteria.
The key themes emerging from the online survey are summarized below.

Vision

- Four participants indicated that they liked the vision statement.
- Two respondents asked that enhancement areas be removed and another suggested that it needs to be clearly defined.

Assets and Opportunities

- The following key assets were identified for further protection:
    - valleys of the three major river systems;
    - ANSIs;
    - wetlands;
    - existing hedgerows made up of native mature trees and regenerating understorey;
    - woodlots that are composed of understorey, mid-storey;
    - canopy growth;
    - very large existing linked corridor system (western part of Vaughan);
    - large tract (NE Vaughan); and
    - heritage protection of Maple, Kleinberg and Woodbridge.

- One respondent suggested the City continue to work closely with the conservation authority to protect, manage and enhance the NHN.
- One respondent indicated more lands should be protected through the NHN to support and buffer core areas.
- One respondent noted the opportunity lies in part with political leaders to define the NHN as part of what makes Vaughan a great place.

Gaps and Constraints

- Four respondents noted development pressures.
- One respondent noted that there is a challenge to promoting the value of the NHN when seeking to protect it at the expense of other infrastructure expenditures. There is an opportunity to create a comprehensive NHN publicity campaign.
- One respondent noted gaps in protection along the Humber River where there are portions that are publically owned & managed conservation. There is an opportunity to fill gaps and convert the full length to public ownership.
- One respondent noted the replacement value of trees is not recognized.
- One respondent noted that enhancement areas are speculative.
- One respondent noted financial constraints to achieving a properly managed NHN. There are opportunities to invest in protection of our natural features today to ensure a healthier environment to live & sustain our lives tomorrow.
- One respondent noted the GTA West Corridor as a constraint.

Evaluation Criteria

Survey participants were asked to identify which of the following criteria they felt are important for the NHN.

- **Forest Cover**
    - 8 of 10 respondents noted that increasing forest cover and the amount of interior forest cover are important criteria.
    - Respondents indicated that increases should occur with a particular focus along streams and rivers, beside larger existing forests, connect smaller woodlands to larger ones and areas that fill gaps in woodlands to increase overall habitat.
    - Respondents indicated that forest cover should increase in areas that provide: (1) buffers between or next to developments; (2) trail linkages for travel by foot or bicycle; and (3) linkages to existing parks and trails.
    - The majority of respondents indicated that increased interior forest cover should: (1) be beside existing larger tracts of forest; (2) connect smaller woodlands to larger woodlands; (3) provide more habitat for specific species that need woodland habitat; and (4) fill gaps in woodlands to increase overall habitat.
- **Wetland Cover**
    - 9 of 10 respondents felt that increasing wetland cover is important in the City of Vaughan and that this should include areas that add to and enhance headwater streams, as well as areas beside valleylands that improve wetland cover as part of stormwater management practices.
    - The majority of respondents also supported increasing wetland cover in areas that restore wetlands to their historical locations and enhance areas that add to and enhance existing wetlands.

- **Critical Function Zones**
  - 8 of 10 respondents felt that it is important to establish Critical Function Zones around wetlands to maintain water quality and to maintain wildlife habitat for wetland species and that critical function zones should be used for wetlands that are located in valleys, in Greenbelt Plan areas, in Oak Ridges Moraine Conservation Plan areas and in association with woodlands or wetlands which are located in close proximity to woodlands.
- **Riparian Zone**
  - 9 of 10 respondents felt that riparian cover should be increased in the City of Vaughan with particular emphasis along headwater streams, as well as streams associated with cold and cool-water fish species.

LANDOWNER MEETINGS

- October 2nd to October 10th in 2013; and
- February 24th to 26th in 2014

OVERVIEW

Twelve landowner meetings were held in two rounds between October 2nd to October 10th in 2013 and between February 24th to 26th in 2014 to discuss Phase 2-4 of Vaughan's Natural Heritage Network Study Strategy. The number of participants at each meeting ranged from 6 to 15. The first meetings were held to discuss the objectives of the study and identify issues and opportunities that shape the study. The second round of meetings were held to review and seek input on the development of proposed NHN scenario criteria. Tony Iacobelli (Project Manager, City of Vaughan) and Brent Tegler (North-South Environmental, Project Lead for the consulting team) conducted the meetings. .

The key themes and discussion points from the meetings are summarized below.

SUMMARY

- The evaluation of HDF were discussed, including specific reaches of watercourses as well as the overall evaluation framework. The City's consulting team had previously shared the raw data from the HDF field investigations where permission to enter lands had been provided by the landowners. Landowners expressed interest that information provided by them according to appropriate standards and procedures would be interpreted in the NHN mapping.
- There was discussion of the criteria for the determination of significant wildlife habitat.
- The role of active restoration was discussed in relation to the development approvals process and the Greenbelt Plan lands.
- Potential changes to the VOP 2010 in terms of policy or schedule modifications were discussed, with reference to specific policies in some cases.

ABORIGINAL GROUPS

The City of Vaughan contacted First Nations and Metis organizations by telephone and E-mail according to the protocol in the draft York Region First Nation and Metis Consultation Tool. The Consultation Tool is a component of Amendment 6 to the York Region Official Plan, including the York Region Archaeological Management Plan, adopted February 20, 2014, establishing specific policies to ensure the responsible management of archaeological resources, as required by Provincial policy and legislation.

The Consultation Tool includes a contact database with over 40 individual contacts for 14 First Nation or Metis organizations. The following consultation meetings were arranged based on the responses to the City's correspondence.

Williams Treaty First Nation, March 26, 2014, Office of the Mississaugas of Scugog Island

The meeting included representative from Chippewas of Georgina Island, Curve Lake First Nation, Hiawatha First Nation and Mississaugas of Scugog Island. The presentation by the City demonstrated the information collected and assessed to refine the NHN. Discussion points included:

- The importance of water from headwater drainage features to the main stem of rivers;
- The traditional knowledge and recent experience with habitat restoration of the black oak savannah, primarily of Alderville First Nation and Mississaugas of Scugog Island.

Nation Huron Wendat, April 28, 2014, Webinar

City staff and a representative from Nation Huron Wendat convened a webinar so that GIS information regarding refinements to the NHN could be viewed in the online webinar format.

APPENDIX 2: SIGNIFICANT WILDLIFE HABITAT CRITERIA

Appendix 2. Significant Wildlife Habitat Criteria (Note: Only examples of areas most likely to have potential significance in Vaughan and may be currently outside the NHN are provided)

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)

Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Waterfowl Stopover and Staging Areas (Terrestrial) Rationale; Habitat important to migrating waterfowl.	American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	Fields with sheet water during Spring (mid March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH.	Studies carried out and verified presence of an annual concentration of any listed species • Any mixed species aggregations of 100Í or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependant on local site conditions and adjacent land use is the significant wildlife habitat. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates).	• Criteria for terrestrial sites not described by SWHTG
Waterfowl Nesting Areas	please see Table 3: specialized habitat for wildlife				
Raptor Wintering Area Rationale; Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl Special Concern: Short-eared Owl	Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM; CUT; CUS; CUW.	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering sites need to be > 20 ha with a combination of forest and upland. Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; • At least 10 individuals and two listed spp. • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birdsÍ.	• Significant sites are generally the only known sites in the planning area; significant sites may be one of only a few in the area. • Most significant sites support several species of concern; significant sites support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • Large sites (e.g., at least 20 ha) are more significant than smaller sites. • Least disturbed sites may be more significant. • Sites located near other open field areas,

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)					
Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					with adjacent woods are more significant. • Sites with better habitat (e.g., abundant prey and perches; a tendency toward less snow accumulation due to exposure to strong prevailing winds) are probably more significant. • Significant sites may have been used for several years and/or at least 60% of winters.
Reptile Hibernaculum Rationale; Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake Special Concern: Milksnake Eastern Ribbonsnake Lizard: <u>Special Concern</u> (Southern Shield population): Five-lined Skink	For all snakes, habitat may be found in any ecosite in central Ontario other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats. Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator. The existence of rock piles or slopes, stone fences, and crumbling foundations assist in identifying candidate SWH. For Five-lined Skink, ELC	For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures.	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct). • <u>Note</u>: If there are Special Concern Species present, then site is SWH	• All sites of locally rare or uncommon species should be considered significant • representative hibernacula for common species should be protected • Most significant sites support two or more species of concern; significant sites may support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • the least disturbed and most diverse habitats are likely more significant

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)					
Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
		Community Series of FOD and FOM and Ecosites: FOC1 FOC3			
Bullfrog Concentration Areas	Please see table 3 in this appendix: specialized habitat for wildlife		•		
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff) Rationale; Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Bank Swallow Cliff Swallow Northern Rough-winged Swallow	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles (Bank Swallow and N. Rough-winged Swallow). Cliff faces, bridge abutments, silos, barns (Cliff Swallows). Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation.	Studies confirming: • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs or 50 bank swallow and rough-winged swallow pairs during the breeding season.	• Sites that have been used the longest are important; • The number of nests is important; • Sites that support provincially rare species are more important than those that support regionally rare species • Suggested number of nests that should be considered significant: Cliff Swallow, 8; Bank Swallow, 100; Northern Rough-winged Swallow, 10
Migratory Butterfly Stopover Areas Rationale: Butterfly	Painted Lady White Admiral Special Concern Monarch	Combination of ELC Community Series; need to have present one Community Series from each	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario. • The habitat is typically a	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days a site is used by Monarchs,	• Large sites are usually the most significant because they contain the greatest diversity of plant species • Significant sites are generally the only known sites in the planning area; significant sites may be one of only a few

Table 1: Examples of criteria for SWH provided by the SWHTG (Section 8.3 & Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: seasonal concentrations of animals. (For details see Draft Ecoregion Schedule 6E and SWHTG)					
Seasonal Concentration Areas	Wildlife Species (Draft Ecoregion Schedule 6E)	CANDIDATE SWH (DRAFT Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.		land class: Field: CUM CUT CUS Forest: FOC FOD FOM CUP Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes	multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day; significant variation can occur between years and multiple years of sampling should occur. • MUD of >5000 **or** >3000 with the presence of Painted Ladies or White Admirals is to be considered significant.[i]	in the area. • Most significant sites support two or more species of concern; significant sites may support one species. • Sites with the greatest number of species are more significant. • Sites with the highest number of individuals are more significant. • Large sites are more significant than smaller sites. • Sites with a variety of habitat types (e.g., forest, grassland) are often more significant than sites with homogeneous habitat. • Sites within 5 km of Lake Ontario and Lake Erie shoreline are most significant. • Least disturbed sites may be more significant. • Sites that have been traditionally used for at least 10 years are more significant.

Table 2. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Rare Vegetation Communities.(For detail see Draft Ecoregion Schedule 6E and SWHTG)					
Rare Vegetation Community	CANDIDATE SWH (Ecoregion Schedule 6E)			CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
	ELC Ecosite Code	Habitat Description	Detailed Information	Defining Criteria	
Sand Barren Rationale; Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	Any sand barren area, no minimum size.	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)Í.	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant
Savannah Rationale: Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.	No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.	Field studies confirm one or more of the Savannah indicator species listed in Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant
Tallgrass Prairie Rationale: Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.	No minimum size to site Í. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.	Field studies confirm one or more of the Prairie indicator species listed in Appendix N should be present Note: Prairie plant spp. list from Ecoregion 6E should be used • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).	• All provincially rare vegetation communities (S1 to S3 as listed by NHIC) should be considered significant
Other Rare Vegetation	Provincially Rare S1, S2	Rare Vegetation Communities	ELC Ecosite codes that	Field studies should confirm if an ELC	• All provincially rare vegetation

Table 2. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Rare Vegetation Communities.(For detail see Draft Ecoregion Schedule 6E and SWHTG)					
Rare Vegetation Community	CANDIDATE SWH (Ecoregion Schedule 6E)			CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
	ELC Ecosite Code	Habitat Description	Detailed Information	Defining Criteria	
Communities Rationale: Plant communities that often contain rare species which depend on the habitat for survival.	and S3 vegetation communities are listed in Appendix M of the SWHTG . Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	may include beaches, fens, forest, marsh, barrens, dunes and swamps.	have the potential to be a rare ELC Vegetation Type as outlined in appendix M The OMNR/NHIC will have up to date listing for rare vegetation communities.	Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. • Area of the ELC Vegetation Type polygon is the SWH.	communities (S1 to S3 as listed by NHIC) should be considered significant • Communities that represent < 3% of remaining natural area and/or are found in only five or fewer locations within the municipality might be considered locally significant communities.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Waterfowl Nesting Area Rationale; Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands	A waterfowl nesting area extends 120 m from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites.	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects	• This category falls under Habitat of Seasonal Concentrations of Animals in the SWHTG • Most significant sites are the only known sites in the planning area; significant sites may be one of only a few in the area. • Most significant sites support several species of concern; significant sites support one species. • Sites with the greatest number of species are more significant. • Sites with nesting and brood habitat for American Black Ducks should be considered significant • All nesting areas for Gadwall, Green-winged Teal, Northern Pintail, Northern Shoveler, and American Wigeon should be considered significant • Sites with the highest number of individuals are more significant. • Larger sites of suitable habitat (e.g., grasslands adjacent to wetlands, ponds, lakes for many species) are more significant. • Most significant sites have better habitat (e.g., optimal vegetation structure, stable water levels, abundant cover, and a wetland/water body within 150 m). • Sites providing safe movement of broods from nest to wetland/water body (i.e., no roads) are more significant. • Sites with lower rates of nest predation are more significant. • Sites with little disturbance (e.g., haying, cattle grazing) are more significant.
Turtle Nesting Areas Rationale; These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	Midland Painted Turtle Special Concern Species Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m) or within the following ELC Ecosites: MAM2 MAM3 MAM4 MAM5 MAM6 MAM1 MAM2 MAM3 SAS1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles[Í] • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH • Travel routes from wetland to	• Larger sites are most significant because fewer nests are likely to be lost to predation and larger areas are more likely to be important to larger numbers of turtles. • Nesting areas adjacent to permanent water bodies and large wetlands, and removed from roads are more significant because of increased likelihood of nesting success and hatchlings reaching the water; as well as reduced road mortality. • Higher, well-drained sites are more important than poorly drained, low-lying areas at risk of inundation by water. • Sites with good exposure to sunlight are more significant. • Generally nesting areas of preferred substrate (e.g., sands and gravels) are preferred to sites over other substrates. • Presence of several nests or adult females observed during the nesting season, within a single area indicates a significant habitat. • Sites with evidence of use by several species are more significant. • Sites with traditional use are more significant.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
		SAM1 SAF1 BOO1 FEO1	shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.	nesting area are to be considered within the SWH.	• Nesting habitats used by rare species are more significant. • More significant sites are less prone to nest predation (e.g., they are not located in highly active wildlife corridors). • Most significant nesting habitats are connected to other turtle habitats (e.g., wetland) by corridors permitting relatively safe movement of these reptiles.
Amphibian Breeding Habitat (Woodland). Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians	• Presence of a wetland, lake, or pond within or adjacent (within 120m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat	Studies confirm; • Presence of breeding population of 1 or more of the listed species with at least 20 individuals (adults, juveniles, eggs/larval masses).	• Greatest significance is ascribed to ponds that support a high diversity of species, species of conservation concern, and high numbers of amphibians; but there is little discussion of ponds that support woodland amphibian breeding that are located outside woodlands • Ponds supporting high species diversity are more significant. • Ponds supporting rare amphibian species are more significant than ponds supporting only common species. • Ponds with a good diversity of emergent and submergent aquatic vegetation are most significant. • Presence of shrubs and logs increase significance of pond for some amphibian species because of increased structure for calling, foraging, and escape and concealment from predators. • More significant areas will have closed canopy forest providing shaded, moist understorey and abundance of downed woody debris for cover habitat. • Breeding ponds with shortest distance to forest habitat are more significant because of reduced risk to moving amphibians and are more likely to be used. • Prefer unpolluted waters. □
Amphibian Breeding Habitat (Wetlands) Rationale; Wetlands supporting breeding for these amphibian species are	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog	ELC Community Classes SW, MA, FE, BO, OA and SA.	• Wetlands and pools (including vernal pools) >500m^2 (about 25m diameter) isolated from woodlands (>120m), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNR mapping	Studies confirm: • Presence of breeding population of 1or more of the listed salamander species or 3 or more of the listed frog or toad species and with at least 20 breeding individuals (adults, juveniles, eggs/larval masses) **or;** • Wetland with confirmed	• The SWHTG included only Bullfrog concentration areas, which are discussed under Habitat for Seasonal Concentrations of Animals • in areas where bullfrogs have declined and there is potential for population recovery, even small concentrations of bullfrogs may be significant. • Sites supporting low densities of bullfrogs may be significant if they are near the limits of the species' range • Sites that have supported bullfrogs for at least 10 years are significant

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)					
Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
extremely important and fairly rare within Central Ontario landscapes.	Green Frog Mink Frog Bullfrog		and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation.	breeding Bullfrogs are significant.	
Open Country Bird Breeding Habitat (noted under Species of Conservation Concern in Ecoregion Schedules) Rationale; This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow Special Concern Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years). Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH.	• Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant. • Largest grasslands in the municipality are likely most significant with those >30 ha most likely to support and sustain diversity of these species. • Grasslands with a variety of different layers of vegetation at different heights likely provide more habitats and support more bird species and are consequently more significant. • Roadless, relatively undisturbed sites with no history of disturbance from grazing, forestry operations during the last 20 years are most significant. • In general, early successional grasslands that are not being used for agricultural production are more significant that similar grasslands that are used for agriculture (e.g., crops, cattle grazing). • Sites with the least amount of adjacent residential development are more significant. • Sites that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are highly significant. • Specialized habitats with the poorest current representation within the planning area are significant. • Sites providing several identified significant wildlife habitats (e.g., raptor nest sites, rare vegetation community, habitat for species of conservation concern) are most significant.
Shrub/Early	Indicator Spp:	CUT1	Large field areas succeeding	Field Studies confirm:	• shrub-nesting, area-sensitive species not noted in SWHTG but they were

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Successional Bird Breeding Habitat (noted under Species of Conservation Concern in Ecoregion Schedules) Rationale; This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records	Brown Thrasher Clay-coloured Sparrow Common Spp. Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	to shrub and thicket habitats>10ha in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years). Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. •	• Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat.	not specifically ruled out as criteria for SWH • Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant.
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat Rationale; Nest sites are fairly uncommon in Eco-region 6E and are used annually by these species Many suitable nesting locations may be lost due to increasing	Osprey Special Concern Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms).	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with	• Most significant nesting habitats are adjacent or close to relatively clear and shallow (< 1 m) water bodies with productive fish populations. • Presence of large, sturdy trees near shoreline • Most significant nesting habitats have numerous large conifer and/or deciduous trees in good condition along the shoreline providing birds with good visibility and clear flight line to the nest. • More significant sites will have no disturbance from human activities within 200 m of the nest during the nesting season. • Some Ospreys may tolerate some disturbance but more significant sites and sites of more sensitive birds should not be disturbed after onset of nesting. • Most significant habitat contains several nests within a single area (e.g., within 1 square km) • Sites with current evidence of use are most significant. • Sites with traditional use are most significant (many nests are used for several consecutive years).

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
shoreline development pressures and scarcity of habitat. Possible occurrences have been noted in the Maple ANSI area and additional functions (e.g. foraging habitat) should be considered if development is proposed adjacent to this part of the NHN.				large trees within this area is important. • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for > 3 years or suspected of not being used for >5 years before being considered not significant.	• Potential nesting habitats that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are significant. • Sites threatened with degradation or loss are more significant than similar, but currently unthreatened sites.
Woodland Area-Sensitive Bird Breeding Habitat (Classified as Habitat for Species of Conservation Concern in Draft Ecoregion Schedules) Rationale: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Special Concern: Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. Interior forest habitat is at least 200 m from forest edge habitat.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.	• Sites supporting area-sensitive species of birds that are rare or uncommon, and/or exhibiting population declines provincially are most significant. • Largest natural forest stands in the municipality are likely most significant with those >30 ha being most likely to support and sustain a diversity of these birds. • Most significant forest stands should contain at least 10 ha of forest interior excluding at least a 200m buffer around the forest interior. • Smaller interior habitats may still be significant where no larger examples exist. • Sites with an abundance of large (e.g., >40 cm DBH, >25 m tall), mature trees are more significant for certain nesting raptor species as well a number of songbird species. • Forests and grasslands with a variety of different layers of vegetation at different heights likely provide more habitats and support more bird species and are consequently more significant. • Uneven-aged forests are generally more significant than even-aged forests because they provide more forest structure. • Sites with largest contiguous canopy cover and fewest gaps in the canopy are likely most significant. Natural gaps (e.g., windthrown trees, woodland ponds) are preferred to man-made gaps (e.g., roads). • Gaps should be < 20 m including roads and rights-of-way.

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species Schedule (Ecoregion 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
Though these areas would almost certainly be incorporated into the NHN, additional function should be considered if development is proposed adjacent to this part of the NHN.					• Roadless, relatively undisturbed sites with no history of disturbance from grazing, forestry operations during the last 20 years are most significant. • Sites with history of only light grazing and/or forestry operations over the last 20 years are potentially significant if properly managed. • Uneven-aged forest stands are often more significant than even-aged forest stands because they may be less intensively managed, and generally contain a natural representation of species. • Forest stands with a history of little or no forest management may be most significant. • Sites with the least amount of adjacent residential development are more significant. • Sites that could be lost or severely degraded and cannot be replaced by similar sites in the planning area, are highly significant. • Specialized habitats with the poorest current representation within the planning area are significant. • Sites providing several identified significant wildlife habitats (e.g., raptor nest sites, rare vegetation community, habitat for species of conservation concern) are most significant.
Special Concern and Rare Wildlife Species Rationale: These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • Habitat form and function needs to be assessed from the assessment of vegetation types and an area of significant habitat that protects the rare or special concern species identified.	• called habitat for species of conservation concern in the SWHTG • habitats that support large populations of a species of concern (in the broad sense) should be considered significant • Habitats of the rarest species are more significant than those of less rare species. For example, habitats for species ranked S1and S2 should be considered more significant than habitats for species ranked S3. • Species ranked as vulnerable by the OMNR should also be considered significant. • Less rare species and their habitats in the planning area may be deemed species of conservation concern by the municipality based on such factors as the number of known occurrences, total extent of remaining habitat, degree of threat or risk to habitat, and/or local interest in a particular species. • The habitat for species experiencing the greatest declines is most significant. • The habitat for declining species that has the lowest representation in the planning area is more significant. • Those habitats that provide the best opportunity for the long-term sustainability of the declining species are most significant (e.g., large well-protected sites; sites that best meet the species' habitat requirements; sites with good connections to other similar habitats). • Habitat for those species with the poorest representation within the

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)					
Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					• planning area is more significant. • These species and their habitats are significant even if well represented in the planning area, due to high provincial responsibility for their protection. • Those habitats that provide the best opportunities for the long-term sustainability of the target species are most significant (e.g., large well protected sites; sites that best meet the species' habitat requirements; sites with good connections to other similar habitats). • Sites that provide habitat that best meets the survival requirements of the target species and that also include a natural buffer zone are most significant (i.e. most likely to sustain species/population over the long term). • Sites that contain the fewest non-native species of potential threat to the target species are significant. • Undisturbed or least-disturbed habitats (e.g., no/few deleterious impacts from roads, human activities) are significant. • Sites capable of producing a large number of individuals of a single species of conservation concern are significant. • Highly diverse sites that support one or more species of conservation concern are most significant. • Habitats supporting large populations of a several species of conservation concern are most significant. • Habitat supporting large populations of a single species is significant. • Large sites supporting large populations of several species of conservation concern are most significant. • Large sites are generally more significant than most comparable but smaller sites. • Sites large enough to ensure long-term support and viability of species of conservation concern are significant. • Sites with large areas of suitable habitat that are also connected to other potentially suitable habitat and/or natural areas are most significant. • Habitats that provide the best opportunity for long-term protection are usually more significant than similar habitats with little opportunity for protection or facing an uncertain future due to potential threats (e.g., habitat found in a large natural area vs. an isolated site close to an expanding residential development). • Habitats threatened with degradation or loss are more significant than similar, but currently unthreatend habitats, if they can be protected. • Habitats of species currently experiencing severe population declines in Ontario (e.g., grassland bird species) due to habitat loss are most

Table 3. Examples of criteria for SWH provided by the SWHTG (Section 8.3 and Appendix Q) and Draft Ecoregion Schedule 6E (OMNR 2012) for evaluation of SWH: Specialized Habitat for Wildlife.(For detail, mitigation and protection measures etc., see Draft Ecoregion Schedule 6E and SWHTG)

Specialized Wildlife Habitat	Wildlife Species (Ecoregion Schedule 6E)	CANDIDATE SWH (Ecoregion Schedule 6E)		CONFIRMED SWH (Ecoregion Schedule 6E)	SWH (SWHTG)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria	Defining Criteria
					significant. • Habitats of species currently experiencing significant population declines in the municipality are significant. • Poorly represented habitats for species of conservation concern are significant. • Habitats that could be lost or severely degraded and cannot be replaced by similar habitats in the planning area, are highly significant. • Sites with documented traditional use by species are most significant. • Species of particular interest to the planning authority (e.g., the CAC may recommend certain species such as indicator species) may be considered significant • Sites providing the best examples of habitat that will ensure the longterm • sustainability of the species are significant.
Seeps and Springs Rationale; Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams. Although these features are likely within the NHN, a feature-based water balance approach may be required to maintain these functions.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system. Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species	Field Studies confirm: • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat	• Sites with several seeps/springs (e.g., >5) are most significant. • Most significant seeps/springs are present even during very dry summers. • Most significant sites support diversity of native vegetation. • Sites supporting rare or uncommon species (e.g., plants, salamanders), or species that are unique to the area (e.g., Wild Turkey) are more significant than those that support only common species. • Seeps/springs located on south-facing slopes are probably more significant than seeps with other aspects because of their winter value to some wildlife species. • Seeps/springs in forest stands and/or headwater areas are generally more significant than those found in other areas. • Seeps/spring found in relatively undisturbed areas are generally more significant than those found in areas disturbed by human activities (e.g., off-road vehicle travel).