Brock Lands

Restoration Plan

Toronto and Region Conservation

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Brock Lands Restoration Plan

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TORONTO AND REGION Conservation

for The Living City

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EXECUTIVE SUMMARY

In early 2011, Toronto and Region Conservation (TRCA) acquired the former Brock North and South Landfill sites from the City of Toronto after the lands were declared surplus in 2008. The Brock Lands are adjacent to two major natural corridors that offer critical wildlife habitat and connectivity to the Greenwood Conservation Area. Historic aggregate extraction, agricultural and landfill operations have left much of the property in an altered condition. The location, the overall size of the property and remaining intact habitats however present a great opportunity to transform the property into one of the most significant natural heritage parcels and recreational destinations in Durham Region.

Through a planning process involving TRCA and key staff representatives from the Town of Ajax and the City of Pickering, TRCA has prepared a Restoration Plan to achieve a self-sustaining natural system that contributes to the overall health of the Duffins Creek watershed. The goal of the Restoration Plan is to protect and restore ecological function and resilience to both aquatic and terrestrial systems. To achieve this goal the Restoration Plan focuses on the following objectives:

- Restore and enhance altered hydrology and sensitive groundwater zones;
- Enhance landform and soil conditions to promote self-sustaining natural communities;
- Restore natural cover and provide connectivity at both the local and regional scale; and
- Create and enhance optimal fish and wildlife habitat.

The Restoration Plan includes a summary of the overall planning context, which considers the existing and planned conditions of the site and surrounding area, as well as both the regional and local targets as outlined in the Terrestrial Natural Heritage System Strategy (TRCA, 2007), the Duffins Creek and Carruthers Creek Watershed Management Plan (TRCA, 2003), and the Fisheries Management Creek for Duffins Creek and Duffins Management Plan (TRCA, 2004). The Restoration Plan provides a framework to protect and restore the natural ecosystems by ensuring the health and diversity of native species, habitats, landscapes and ecological processes. Recommendations for the Brock Lands focus on four broad restoration strategies, including: protection, enhancement, rehabilitation and creation. All four strategies work towards promoting ecosystem health and restoring natural function to the landscape and hydrology (drainage).

Restoration opportunities fall into three broad categories: terrestrial, drainage and aquatic. These restoration opportunities address the need for improving natural cover such as forest habitats, recreating natural surface flows and infiltration over the landscape to support wetland and stream function and protect groundwater, and improving instream habitat. During the planning process, terrestrial and drainage opportunities were classified by the appropriate restoration strategy that will be applied (e.g. protection, enhancement, rehabilitation or creation). Aquatic restoration areas were first subdivided into stream reaches and then classified by the appropriate restoration strategy.

Implementation of the Restoration Plan is expected to achieve the following deliverables:

- 139 ha of improved terrestrial habitat;
- 26 ha of created or enhanced wetland habitat;
- 14 sub-catchments restored to capture flow of water generated by 1,035 ha of land;

- 142 ha of improved stream edge habitat;
- 14.7 km of improved headwater streams that support coldwater fisheries;
- 143 ha of improved landform and soil conditions that protect groundwater, support natural site drainage and promote self-sustaining natural cover; and
- Installation of essential structures such as nest boxes and log tangles to promote creation of wildlife habitat.

The Restoration Plan will help guide the preparation of a master plan to ensure that integration of planned recreational facilities and public use areas are in harmony with the ecosystems of the property. The master plan will explore the potential of this property to provide numerous recreational opportunities, trail connections and interpretation of natural and cultural heritage features. During the Master Plan process, TRCA will work with the City of Pickering, Town of Ajax, Durham Region, stakeholder groups and the public to identify and evaluate a range of public amenities that support municipal recreational and cultural objectives. City of Toronto representatives will also be consulted to ensure that any financial implications tied to the purchase agreements are defined and understood by TRCA and its partners.

Since March 2011, staff has been meeting with City of Pickering, Town of Ajax, community advisory committees and other interested stakeholder groups in an effort to seek feedback on TRCA's Restoration Plan. On May 25 and 26, TRCA held public information meetings to inform those interested in the future of this property and to seek representatives to participate in a public advisory committee. Those providing verbal and written comments during these meetings indicated overwhelming support for TRCA's overall vision for the property and the recommendations of the Restoration Plan.

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1.0 INTRODUCTION

On January 18, 2011, Toronto and Region Conservation (TRCA) acquired the former Brock North and South Landfill sites from the City of Toronto. This property is located north and south of Concession Road Five, east of Brock Road as shown in Figure 1. The property referred to as Brock North is located north of Concession Road Five in the City of Pickering, while the property known as Brock South is on the south side in the Town of Ajax.

These lands were originally secured by the former Municipality of Metropolitan Toronto in 1969 as part of a landfill site selection process. In order to purchase land for use as a landfill in another jurisdiction, the former Municipality of Metropolitan Toronto was required to enter into an agreement with the Township of Pickering. The required agreement, among other matters, provided that "on completion of the refuse disposal sites, the land would be turned over to the Metropolitan Toronto and Region Conservation Authority, for recreation purposes." The southwest portion of the Brock North site was used for landfilling in the late 1970's; however, the waste was removed from the site in 1997. The lands were subsequently declared surplus by the City of Toronto in 2008.

The Brock North and South property, hereinafter referred to as the Brock Lands, includes 392 hectares (969 acres) adjacent to two major natural corridors that offer critical wildlife habitat and connectivity to the Duffins Creek watershed. From a regional hydrogeological perspective, these properties play a unique role as both recharge and discharge areas of regional groundwater. Together with TRCA's adjoining 297 hectares (735 acres) at Greenwood Conservation Area, this land acquisition has created a greenspace measuring 689 hectares (1,704 acres).

Historic aggregate extraction, agricultural, and landfill operations have left much of the property in an altered condition. The location, the overall size of the property and remaining intact habitats however present a great opportunity to transform the property into the most significant natural heritage parcels and recreational destinations in Durham Region. Through a planning process involving TRCA and key staff representatives from the Town of Ajax, and the City of Pickering, TRCA has prepared a Restoration Plan to achieve a self-sustaining natural system that contributes to the overall health of the Duffins Creek watershed. The Restoration Plan will also help guide the preparation of a Master Plan, which will explore the potential of this property to provide numerous recreational opportunities, trail connections and interpretation of natural and cultural heritage features.

During the Master Plan process, TRCA will work with the City of Pickering, the Town of Ajax, Durham Region, stakeholder groups and the public to identify and evaluate a range of public amenities that support municipal recreational and cultural objectives. This planning process will ensure that integration of planned recreational facilities and public use areas are in harmony with the ecosystems of the property. This process will also result in the preparation of a strategy for ongoing management and operation of the property.

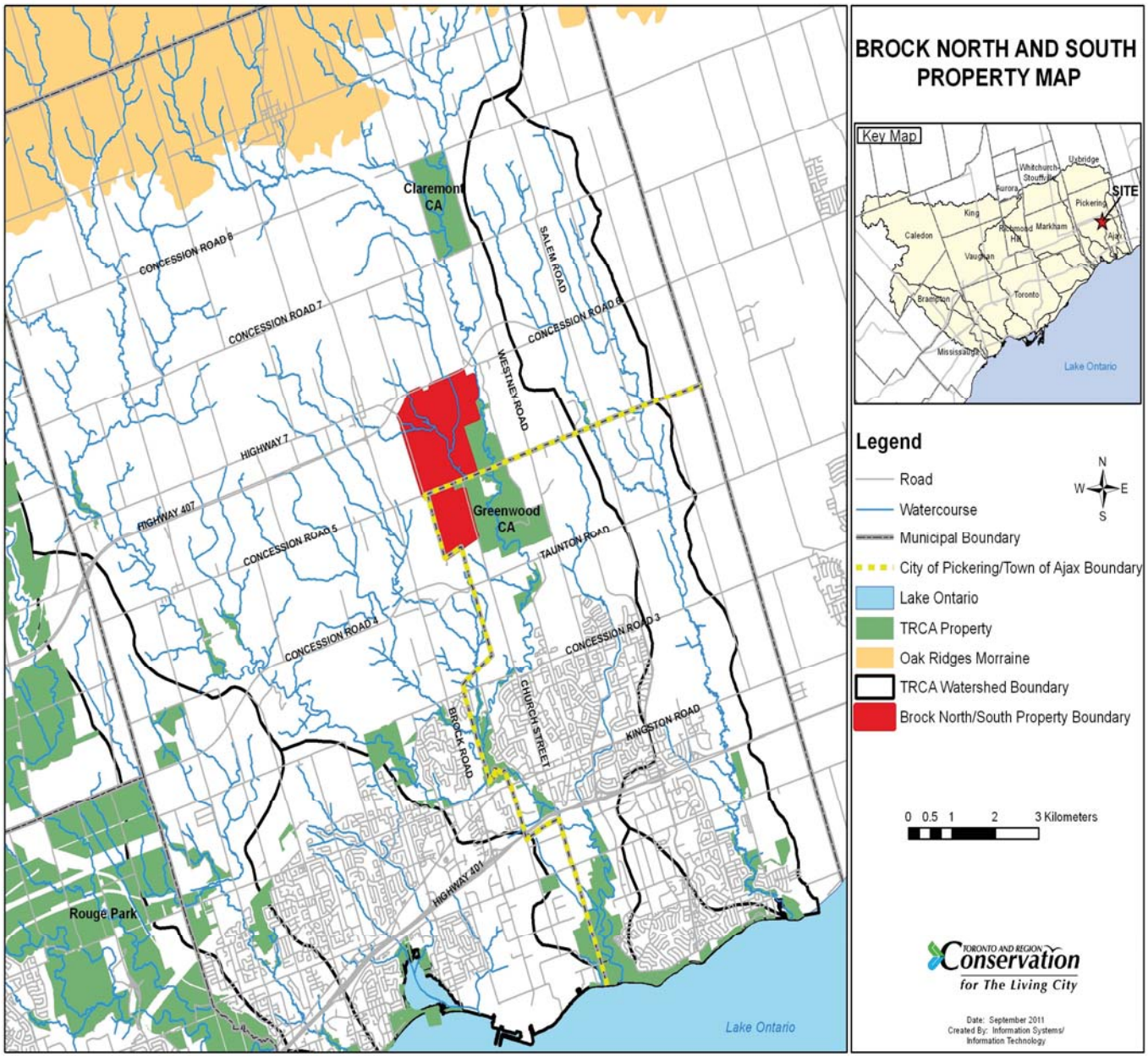

Figure 1. Location of the Brock Lands

1.1 Vision

The Brock Lands will be restored to support functioning, diverse and self-sustaining communities of native plants, fish and wildlife. Through careful planning, ongoing monitoring, and site management, these lands will become a public destination, offering a variety of recreational and cultural experiences that are appropriately integrated on the landscape to ensure natural and human heritage resources are protected. These lands will also facilitate important regional trail linkages and provide connectivity to the planned Seaton Natural Heritage System, west of the property and the Greenwood Conservation Area to the east, resulting in 3,313 ha (8,187acres) of connected natural greenspace.

1.2 Goals and Objectives

TRCA has developed a comprehensive list of goals and objectives to achieve the vision for the Brock Lands and help guide the planning process.

Natural Heritage Goal:
Protect and restore the natural ecosystems by ensuring the health and diversity of native species, habitats, landscapes and ecological processes.

Objectives:

- Improve the size and shape of habitats through restoration and protection.
- Maximize linkages and connectivity of the natural heritage features to one another within the site and to adjacent areas (e.g. planned Seaton Natural Heritage System and Greenwood Conservation Area).
- Build on the corridor function of the creeks and riparian zones.
- Enhance the health of Duffins Creek watershed by restoring and protecting the cold water features of its tributaries.
- Restore altered site hydrology and sensitive groundwater zones impacted by historic aggregate removal, agricultural use, and landfill operations.
- Enhance landform and soil conditions to promote self-sustaining natural communities.
- Manage for biological diversity and control invasive species.

Public Use & Recreation Goal:
Create a public destination that offers a variety of recreational and cultural experiences.

Objectives:

- Provide opportunities for appropriate, accessible nature-based recreation activities, which are consistent with all other objectives and complement Greenwood Conservation Area.
- Plan and manage appropriate outdoor recreation facilities in a manner that protects ecological health while providing social benefits.
- Integrate recreational activities that meet municipal partners' needs and contribute to health and well being of the existing and emerging communities.
- Construct and maintain trails that are linked to communities, Rouge Park, and inter-regional trails e.g. Oak Ridges Moraine Trail, Waterfront Trail and Trans Canada Trail.

Cultural Heritage Goal:
Protect and conserve the cultural heritage features for their inherent value and depiction of the long-term human use and occupancy of the area.

Objectives:

- Identify and promote the area's heritage features, including former Brougham Post Office.
- Identify and protect known and potential archaeological sites.
- Interpret the early history of the property and First Nations.
- Explore potential partnership with the Pickering Museum.

1.3 Planning Process

The preparation of the Restoration Plan has been undertaken by TRCA in consultation with the City of Pickering, and the Town of Ajax. The Restoration Plan was prepared to ensure that the lands contribute to TRCA's vision for Duffins Creek with functioning wetlands, diverse and self-sustaining communities of native plants, fish and wildlife. The Brock property has been assessed by TRCA to identify opportunities to restore the hydrological function, unique landforms, and terrestrial and aquatic habitats. TRCA has determined that in order to restore a functional physiographic landform that supports natural watershed drainage, importing of fill material and re-contouring of the landscape will be of significant importance. These restoration efforts will promote re-establishment of historic and/or site appropriate vegetation communities, create connections between existing habitats patches, and allow overall vegetation cover to be restored through planting efforts.

As the landowner, TRCA will lead the future implementation of the Restoration Plan. Once restored these lands have the potential to provide numerous recreational opportunities including hiking, cross country skiing, angling and nature viewing experiences. This tract of land will also facilitate important regional trail linkages to the Trans Canada Trail, Seaton Trail, Oak Ridges Moraine Trail and Rouge Park Trail systems, as well as connections to the planned communities of Seaton, Duffins Heights and Northern Ajax. These and other recreational uses will be considered during a future Master Plan process.

With the growing demand for recreation in Durham Region, TRCA and our partners will work together to achieve a sustainable balance between meeting these demands and preserving the natural heritage function of our conservation lands. Initial discussions regarding the future use of the lands have identified that City of Pickering is interested in utilizing two parcels of land measuring approximately 69 hectares (170 acres) for the future expansion of the Pickering Museum and a district park facility. Through consultation with staff from the Town of Ajax, TRCA has confirmed support for expediting TRCA's restoration plan and including the Brock South property into the existing 10 year management agreement for the Greenwood Conservation Area.

As per the conditions of the acquisition agreement, the City of Toronto has indicated their preference that the lands be used to support future open space and park purposes, including paths, trails and other passive recreational uses. The City of Toronto has specifically identified that ancillary uses such as an expansion of the Pickering Museum or district park facilities greater than 20.23 hectares (50 acres) which make provision for stadiums, places of assembly and active recreational and cultural uses will require that compensation will be payable and will be the fair market value of the interest granted.

A Master Plan will be prepared to determine future public use and ultimately guide the management and protection of the significant ecological features and functions of the property. The Restoration Plan will form the foundation of the Master Plan. As restoration opportunities are implemented management zones will need to be reassessed, taking into consideration the rate of succession of each restored system. For example, an area undergoing meadow restoration will progress to a natural state quicker than an area of reforestation.

TRCA will work with the City of Pickering, the Town of Ajax and Durham Region to ensure that integration of planned recreational facilities and public use areas are in harmony with the ecosystems of the property. Through the Master Planning process, TRCA will work with our

partners and consult with the community to introduce public use, provide interpretation of natural and cultural heritage features, and prepare necessary management and operation agreements. City of Toronto representatives will also be consulted to ensure that any conditions tied to the purchase agreements are defined and understood by TRCA and its partners.

The Master Plan process will be undertaken in four phases. Phase One will include initiation of the Public Advisory Committee described in Section1.4, and the completion of a Background Report that explores opportunities and challenges presented by the site, and local and regional recreational trends and demands. Phase Two will include the completion of a Site Protection and Securement Plan and the development of property management zones and recommendations. In Phase Three Public Use, Recreation Plan and Trail Plans will be completed and during the final phase of work a final report will be prepared which will include all final plans and recommendations, as well as implementation strategies, schedules and preliminary costs. A breakdown of the main tasks to be completed as part of the Master Plan and target for completion is outlined in Table 1.

Table 1. Master Plan phases and tasks

Phase One	**Tasks**
May 2011 – October 2011	• Host Public Information Meeting
	• Establish Public Advisory Committee
	• Determine draft management zones
	• Develop draft management recommendations
	• Complete Background Report
	• Host Advisory Committee Meeting to review Background
Phase Two	**Tasks**
November 2011 – January 2012	• Host Public Information Meeting
	• Complete Site Protection and Securement Plan
	• Develop recreation and public use concepts
	• Develop an overall draft trail plan for the property
	• Host Advisory Committee Meeting to review plans
Phase Three	**Tasks**
February 2012 – March 2012	• Finalize Public Use, Recreation and Trail Plans
	• Host Advisory Committee Meeting to review plans
	• Host Public Meeting to present final plan
Phase Four	**Tasks**
April 2012 – May 2012	• Develop implementation plan with schedules and costs

1.4 Consultation and Communication Strategy

The Consultation and Communication Strategy guiding all planning related to the Brock Lands recognizes TRCA's need for accountability to the public, stakeholders, and regulatory agencies. This Strategy will provide an inclusive and coordinated approach to any planning decisions that will affect the future of the property. In addition to individual meetings with regulatory agencies and stakeholder groups, TRCA will employ three separate consultation mechanisms to achieve this fundamental requirement of the project during the planning stage. These include a Technical Steering Committee, Public Advisory Committee (PAC), and Public Information Meetings. Following the planning stage, TRCA will form a Stewardship Committee to provide an opportunity for public feedback related to the ongoing management of the lands.

Regulatory agencies such as the Department of Fisheries and Oceans, Transport Canada, Ministry of the Environment, Ontario Ministry of Natural Resources, Ministry of Transportation, and others will be requested to meet with TRCA on an as needed basis to review and discuss the specific issues related to the future of the property to ensure that the interests of these agencies are met. TRCA staff will also meet with various citizen advisory committees to seek feedback and provide information on the planning and management of the property. Some of the committees TRCA expects to engage during this process include the Town of Ajax's Active Transportation and Trails Advisory Committee, Recreation and Culture Advisory Committee, Environmental Advisory Committee, as well as the Durham Trails Coordinating Committee, and Durham Environmental Advisory Committee.

Since March 2011, TRCA staff has been meeting with City of Pickering, Town of Ajax, community advisory committees and other interested stakeholder groups in an effort to seek feedback on the future of the Brock Lands. TRCA staff have also had discussions with Ministry of Transportation, Fisheries and Oceans Canada and Ministry of Natural Resources to identify both terrestrial and aquatic habitat restoration works and monitoring on the Brock property that can be achieved as part of the implementation of feasible mitigation measures and overall benefit for Species at Risk to eliminate, reduce and/or manage the adverse environmental effects of the 407 East expansion project.

1.4.1 Technical Steering Committee

A Technical Steering Committee comprised of key municipal and TRCA staff will provide overall project direction and input. The main functions that this committee is expected to perform include:

- Provision of technical expertise and advice to TRCA throughout the development of the Restoration Plan, and Master Plan;
- Insurance that appropriate staff and members at their respective municipalities, agencies or organizations are adequately informed throughout the process;
- Provision of comment, advice and input to suggestions brought to the advisory committee;
- Assistance with the identification of current issues affecting the property and suggestions as to appropriate ways of resolving them;
- Assistance with implementation of plans; and
- Assistance with public consultation and dissemination of information on the project, where appropriate.

1.4.2 Public Advisory Committee

To facilitate ongoing stakeholder involvement at the planning level of the project a Public Advisory Committee (PAC) made up of stakeholder representatives will be formed. The PAC will allow TRCA to maintain communication with community residents, local groups, associations, citizen advisory committees and organizations that share an interest in property. To ensure that the PAC is representative of the community and the future user groups, TRCA, Town of Ajax, City of Pickering, and Durham Region staff will work together to identify all stakeholder groups that will be invited to provide a representative to participate as a member of the PAC. Prior to the initiation of the Public Advisory Committee, TRCA will also attend various citizen advisory committees as recommended by municipal staff and host public information meetings in Ajax and Pickering to request public participation in the PAC. In addition to representatives from active stakeholder groups, TRCA will seek applications for six members at large to represent Ajax and Pickering on the PAC (three from each municipality).

The PAC will inform the planning decisions related to the future of this property. It is anticipated that the PAC will meet approximately five times during the planning process. The two key functions of the PAC will be to identify items of public concern related to the future use and management of the property and to offer potential advice or solutions to resolve any issues that may arise. To ensure that the PAC operates in this capacity, TRCA will develop a Terms of Reference, which will clearly articulate the purpose of the project, roles and responsibilities, and expectations of its members.

1.4.3 Public Information Meetings

A minimum of three Public Information Meetings are proposed to allow for public comment on the future of the Brock Lands. These public meetings will provide opportunities for the community to be made aware of current property planning, share local information about the property and surrounding areas, and provide TRCA with feedback and suggestions.

At the first Public Information Meetings held on May 25 and 26, 2011 TRCA presented information on the history of the property, existing conditions and planned restoration strategy. TRCA also discussed the Master Plan process and sought public feedback which will assist TRCA in identifying issues of specific interest to the public that will warrant future discussion and follow-up throughout the planning and implementation of the project. Those providing verbal and written comments during these meetings indicated overwhelming support for TRCA's overall vision for the property and the recommendations of the Restoration Plan.

The second public meeting will be held to report back on the outcome of the Restoration Plan and to initiate the Master Plan process. During this meeting the public will be able to help shape the vision for the Master Plan and assist TRCA in identifying the range of recreational and cultural experiences that should be considered during the planning of the property.

The final public meeting is expected to provide the public with an opportunity to provide comment on the draft Master Plan. Staff will also provide updates on the ongoing restoration of the property at this meeting and discuss the planned next steps in terms of implementing the Master Plan.

1.4.4 Communication Plan

TRCA will ensure that project information is clearly articulated, current, and widely accessible to the public. As such, TRCA will coordinate the preparation of a press releases, news advertisements and newsletters to communicate information about the project to correspond with each phase of the planning process. The planned Public Information Meetings will be advertised via local media outlets such as the Ajax/Pickering News Advertiser.

The newsletter will introduce the project to the public and provide updates and information on next steps. The newsletter will also be used as a mechanism to advertise upcoming venues for public participation. The newsletter will be distributed to the public by TRCA through e-mail contact lists, and direct mailings. Newsletters and other key project information will be made available to the public on TRCA website. The City of Pickering and the Town of Ajax will also be requested to provide links to TRCA's website.

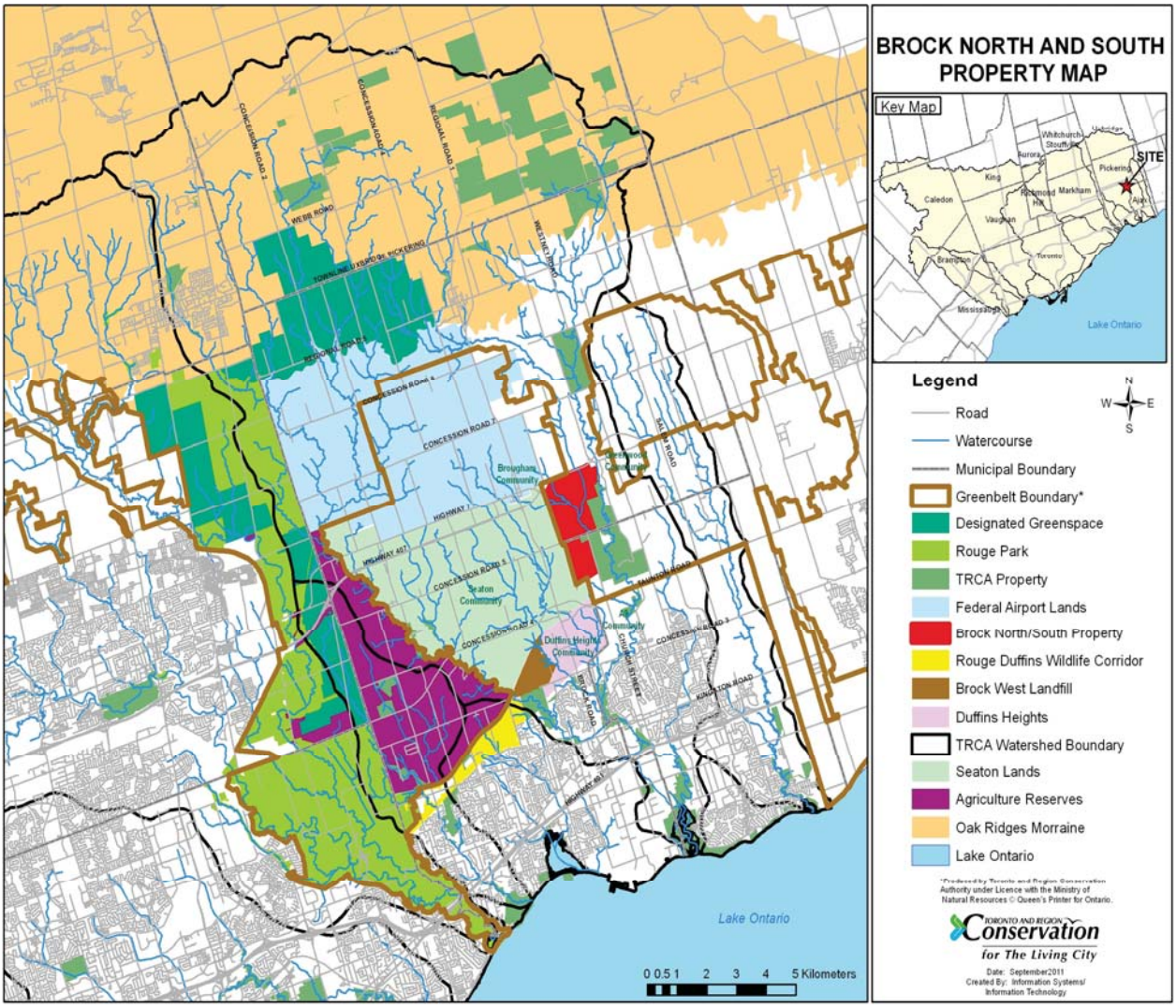

Figure 2. Regional planning context

1.5 Planning Context

The Brock property is surrounded by many existing and planned residential communities and protected natural features as illustrated in Figure 2**.** TRCA planning efforts consider federal, provincial, and municipal regulations. The following section explores these existing plans, regulations and guidelines as detailed by all levels of government.

1.5.1 Toronto and Region Conservation

At Authority Meeting #4/09, held on May 22, 2009 TRCA staff was directed to request that the City of Toronto convey the Brock North and South Landfill sites to TRCA for a nominal cost of $2. Furthermore, TRCA staff was directed to work with the City of Pickering and the Town of Ajax staff to develop a naturalization and management plan for the property. On January 28, 2011 during Authority Meeting #1/11, TRCA staff reported that the City of Toronto had conveyed the land to TRCA for a nominal sum of $2 and that staff have initiated planning discussions with City of Pickering and Town of Ajax staff related to the restoration and recreation potential of the property.

1.5.1.1 Towards a Living City Region

Toronto and Region Conservation is committed to community partnerships with all sectors of society, to encourage environmental stewardship and build on innovative thinking about environmental health, social responsibility, and sustainable economies (TRCA, 2003). TRCA's vision of a Living City Region has four objectives:

- Healthy Rivers and Shorelines - To restore the integrity and health of the region's rivers and waters from the headwaters in the Oak Ridges Moraine, throughout each of the nine watersheds in TRCA's jurisdiction, to the Toronto waterfront on Lake Ontario;
- Regional Biodiversity - To protect and restore a regional system of natural areas that provide habitat for plant and animal species, improve air quality and provide opportunities for the enjoyment of nature;
- Sustainable Communities - To facilitate broad community understanding, dialogue and action toward integrated approaches to sustainable living and city building that improve the quality of life for residents, businesses and nature; and
- Business Excellence - To produce continuous improvement in the development and delivery of all programs through creative partnerships, diverse funding sources, and careful auditing of outcomes and effectiveness.

1.5.1.2 Terrestrial Natural Heritage System Strategy

Toronto and Region Conservation's Terrestrial Natural Heritage System Strategy (TNHS, 2007) was designed to enhance biodiversity and the quality of life for residents by seeking to increase the amount of forest and wetland habitats. It is grounded on the ecosystem based approach, which uses a number of ecological and planning criteria to identify an expanded and targeted land base for inclusion in a terrestrial natural heritage system. The Strategy was designed for the entire TRCA jurisdiction as terrestrial systems and their interactions span watershed boundaries. The target system relates to the terrestrial component of the natural heritage system. Although increases in natural cover benefits many other system components, such as promoting natural water budget, the target terrestrial natural heritage system was designed using mainly the terrestrial ecological criteria. The Strategy contains a number of strategic directions including proposed land use planning policies, land management, stewardship and education opportunities, and long-term monitoring. The implementation of the Strategy is further being informed by, among others, another piece of strategic program, Ecosystem

Recovery Planning Program (ERPP), currently being designed by the TRCA. The ERPP has developed a series of ecological tools that allows for meaningful prioritization of habitat restoration and securement, provide regional direction on restoration objectives including targets for species and vegetation communities, and to assess the long term ecological benefits of habitat restoration.

The Brock Lands are identified as part of the Targeted Terrestrial Natural Heritage System. The Strategy offers specific recommendations for public lands that are identified as part of the target system. The recommendations for public land management, pertinent to this site include:

- Complete management plans for all TRCA owned lands within the target system;
- Develop natural heritage restoration plans for all lands that are potential natural cover;
- Where municipalities manage TRCA owned lands, TRCA will work with them to ensure the management agreement is in accordance with the Strategy; and
- Provide opportunities for appropriate passive recreation within the target system.

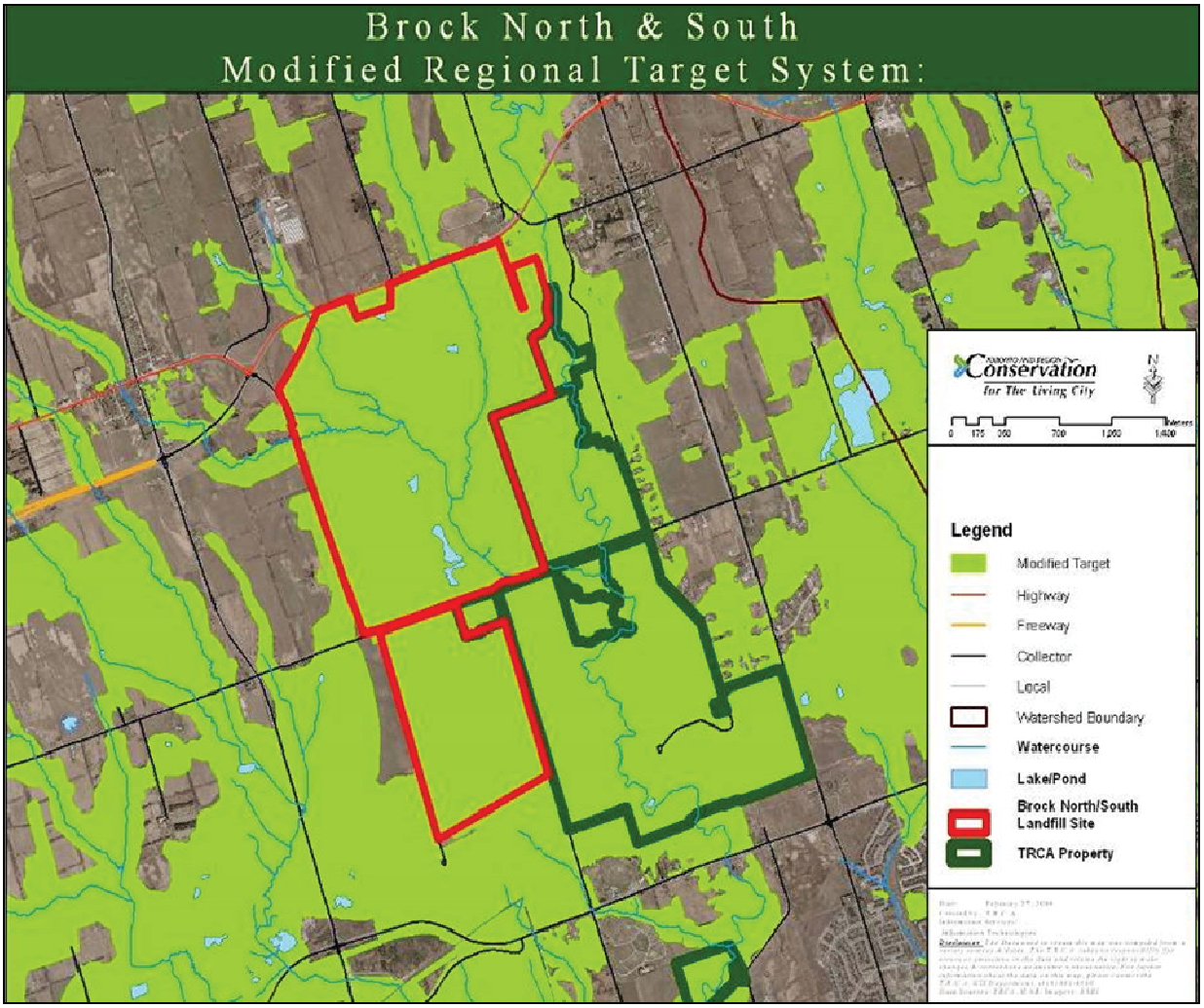

Figure 3. Target Natural Heritage System for the Duffins Creek Watershed

1.5.1.3 Duffins Creek and Carruthers Creek Watershed Management Plan

The Management Plan, published in 2003, was designed to evaluate the potential effects of current and future watershed activities and identifies management actions needed for watershed protection and enhancement. The vision of the Plan is that both watersheds become healthy, dynamic, and sustainable watersheds that continue to have clean, safe water (TRCA, 2003a). These watersheds will have functioning wetlands and be diverse with self-sustaining communities of native plants, fish and wildlife, where natural and human heritage features are protected and valued. Many of the key management strategies to address the Plans goals involve active or passive revegetation strategies. The Plan aims to achieve the following goals:

1. Maintain the existing hydrological function of the watershed;
2. Protect and improve surface water quality;
3. Protect aquatic habitat and species;
4. Protect and enhance terrestrial habitat and species;
5. Provide sustainable public use which promotes environmental awareness and enhancement;
6. Preserve and interpret our evolving human heritage resources; and
7. Achieve a behavioural shift in lifestyle and resource use in keeping with the environmental objectives for the watershed.

1.5.1.4 Duffins and Carruthers Fisheries Management Plan

The Duffins and Carruthers Fisheries Management Plan was published in June 2002 in partnership with the Department of Fisheries and Oceans (DFO) and Ontario Ministry of Natural Resources (OMNR) and TRCA. The goal of the Plan is to:

- Present current and historical fisheries information;
- Identify critical issues;
- Outline management objectives; and
- Recommend rehabilitation activities.

Currently, the Plan is being implemented throughout the Duffins watershed. Opportunities to rehabilitate aquatic habitat are being assessed by TRCA staff in the East Duffins watershed, Brougham Creek, Spring Creek, and the Main East Duffins. Key recommendations from the Plan focused on the removal of in-stream barriers and the implementation of the TRCA's Terrestrial Natural Heritage System (TRCA, draft 2002). Various in-stream barriers were identified for removal in Brougham Creek and East Duffins Creek. Aquatic restoration efforts will focus on the enhancement for target species as identified by the fish management plan such as Atlantic salmon (*Salmo salar*), brook trout (*Salvelinus fontinalis*), darter species, rainbow trout (*Oncorhynchus mykiss*) and redside dace (*Clinostomus elongatus*).

1.5.1.5 Duffins Creek Watershed Wetland and Riparian Opportunities Plan

The Duffins Creek Watershed Wetland and Riparian Opportunities Plan (2008) is an evolution of the Habitat Implementation Planning (HIP) process which was initiated in 2003 by TRCA as a means to strategically identify and implement restoration opportunities on an eco-hydrologic system basis. This Plan identified wetland and riparian restoration opportunities for the entire Duffins Creek watershed, with the exception of the federally owned Pickering Lands.

The initial planning process resulted in a targeted site-level implementation strategy, based on watershed objectives, generated from desktop and field assessments. The Wetland and Riparian Opportunities Plan was refined by utilizing additional GIS desktop assessment

techniques to determine landscape characteristics based on topography and drainage. Through the use of GIS, drainage lines and catchment boundaries were derived to determine the intermittent and permanent flow of water, as well as depressions on the landscape for riparian or wetland restoration projects for the Duffins Creek watershed. Through road side investigations, these features were then field verified. The potential restoration opportunities were photographed, documented, catalogued, and digitized. In total, 30 ha catchments were delineated within the study area, which were overlaid onto additional GIS information layers (wetland, forest, riparian cover, etc.). Summary statistics on percent natural cover within these 30 ha catchments were calculated and compared to prioritized areas for restoration and protection. The Duffins Creek Wetland and Riparian Opportunities Plan is a mechanism by which the concepts in the Terrestrial Natural Heritage Program (2004), Duffins Creek and Carruthers Creek Fisheries Management Plan (2003), A Watershed Plan for Duffins and Carruthers Creek (2003) can be implemented as they pertain to wetland and riparian improvements. In addition, this work compliments other initiatives such as source water protection, species recovery planning, Atlantic salmon restoration/reintroduction and restoration at the Brock Road North and South properties.

1.5.1.6 Pickering Lands Site Restoration Opportunities Plan

Building on previous works completed by TRCA, in 2010 the Pickering Lands Site Restoration Opportunities Plan (ROP) was developed for the Pickering Lands. The method followed was the same as set out in the Duffins Creek Watershed Wetland and Riparian Opportunities Plan (2008), building upon field verification and prioritization approach. Field reconnaissance work again provided a mechanism for ground truthing, while the modeled drainage provided further principal data pertaining to the restoration opportunity sites, which was performed in the field. The prioritization of opportunities was rooted in the establishment of Priority Areas based on catchment summary statistics and the refined TNHSS, value surface layer. The multi criteria value surface layer refined the TNHSS model from a jurisdictional to local scale to create a locally refined natural heritage boundary. Additionally within each Priority Area, each individual restoration opportunity was given a priority rank based on data collected in the field.

The Pickering Lands Site Restoration Opportunities Plan process has become the focal point for current and future restoration work within the Pickering Lands, and has completed the process of strategically identifying the restoration opportunities present within the Duffins Creek Watershed.

1.5.2 City of Pickering

1.5.2.1 Pickering Official Plan

The City of Pickering published the 6th Version of the City of Pickering Official Plan in February of 2010. The purpose of the Pickering Official Plan is "*To promote a complete community by sustaining healthy urban, rural and ecological systems and facilitating beneficial and supportive interactions amongst these systems*" (City of Pickering, 2010). The City has committed to adopt the following goals in support of its ecological system:

- To conserve natural resources, especially non-renewable resources;
- To respect ecological carrying capacity, and sustain renewable resources;
- To protect the health and integrity of Pickering's ecological processes, functions, cycles and systems;
- To promote ecosystem diversity, stability, equilibrium and exchanges; and

- To involve residents, business-people, landowners, relevant public agencies, and other interested groups and individuals in making decisions concerning the ecological system.

"*The open space system is Pickering's "greenspace", important not only for its role in maintaining ecological health, but also in promoting physical, spiritual and mental health for the City's residents" (*City of Pickering, 2010). Brock North is classified as a Natural Area and part of the City's Open Space System, which includes the City's "*valley and stream corridors; shorelines; environmentally significant areas; areas of natural and scientific interest; wetlands; significant forested areas; major parks, recreational, and conservation areas; major open space linkages and other major blocks of land comprising natural core areas and corridors*" (City of Pickering, 2010). The uses permitted on lands that are designated in the Official Plan as Open Space System – Natural Areas include '*not only conservation, environmental protection, restoration, education, passive recreation and similar uses, but also agricultural uses outside valley and stream corridors, wetlands, environmentally significant areas, and areas of natural and scientific interest and existing lawful residential dwelling and a new residential dwelling on a vacant lot'* (City of Pickering, 2010).

The Official Plan defines core areas as relatively large tracts of land having important biological, physiographic or hydrologic attributes and which make a substantial contribution to the health of the ecological system. Brock North is designated as a core area as the property is identified as containing mature and early successional forest communities, as well as known groundwater recharge and discharge areas. The Official Plan states that "*City Council recognizes the important role core areas, corridors and linkages play in defining Pickering's natural landscape, and in sustaining a healthy ecological system; accordingly, Council shall endeavour to protect, conserve and enhance its core areas, corridors and linkages*" (City of Pickering, 2010).

Among the objectives outlined in the Official Plan, the City recognizes the importance of habitat connection across the region and the need to restore and rehabilitate degraded and damaged ecosystems. The Plan resolves, '*to improve or restore the open space linkages between Natural Core Areas and along river valleys and stream corridors*' (City of Pickering, 2010). As such, the Official Plan states Councils commitment to encourage public and private practices that protect important natural features and landscapes in their natural state including, '*assisting in the rehabilitation and restoration of degraded landscapes and encouraging naturalized vegetated buffers adjacent to significant natural features, including watercourses, valley edges, wetlands, and woodlots*' (City of Pickering, 2010). The Official Plan also promotes the '*naturalization of valleylands and stream corridors; enhancing groundwater recharge and discharge; and protecting, restoring and where possible creating large contiguous natural areas in order to provide more and better aquatic and terrestrial habitat'* (City of Pickering, 2010).

1.5.2.2 Trails and Bikeway Master Plan

In 1996, the City of Pickering published the Trails and Bikeway Master Plan to identify opportunities and public support to develop trails and pathways within the existing framework of parks and open spaces. It also sought to identify a significant opportunity to establish a city-wide pathway system and to upgrade the existing Seaton Hiking Trail to improve the quality of the trail and associated infrastructure and to heighten its identity and profile in the community (Totten, Sims, Hubicki & Associates, 2002.)

The Plan identifies a number of opportunities to link the municipal trail network to the planned community of Seaton and the Brock Lands. A north-south trail connection is proposed will along Duffins Creek, which would provide a linkage between the Brock Lands and Greenwood Conservation Area to the Waterfront Trail and the Oak Ridges Moraine Trail.

Figure 4. City of Pickering Trail and Bikeway Master Plan - Northern Pickering.

Source: Totten, Sims, Hubicki & Associates, 1995

1.5.2.3 Seaton Master Environmental Servicing Plan

In May of 2006 the Central Pickering Development Plan (CPDP) was approved by the Province of Ontario under the Ontario Planning and Development Act. Seaton is the urban community identified in the CPDP. The policies within the CPDP establish the need for the preparation of a Master Environmental Servicing Plan (MESP) prior to development occurring within the Seaton community. North Pickering Community Management Inc. is conducting the Seaton MESP. A Terms of Reference for the MESP has been completed and a draft MESP has been prepared for review by regulatory agencies.

The draft Seaton MESP addresses the following components needed for development to occur, as identified in the CPDP:

- Identify requirements for water source protection;
- Conduct a water balance on a subwatershed basis;
- Conduct an erosion sensitivity analysis for receiving watercourses;
- Promote maintenance and enhancement of the fisheries;
- Prepare a storm water management master plan;
- Confirm municipal service requirements;
- Confirm the major transportation system requirements;
- Identify the number and general location of major community facilities;
- Provide preliminary servicing cost estimates for infrastructure;
- Identify an interconnected network of pedestrian, bicycle and multi-use trails; and
- Identify existing and proposed major utility requirements.

The Region of Durham is undertaking a Class Environmental Assessment for the provision of Regional services, including water, wastewater, transportation, transit and service facility infrastructure necessary for the development of the Seaton community.

1.5.2.4 Seaton Natural Heritage System Management Plan & Master Trail Plan

The Seaton Natural Heritage System Management Plan and Master Trail Plan was developed as mandated by the Central Pickering Development Plan, which provides the framework within which the Seaton lands will be developed and managed (Schollen & Company Inc, 2008). The goals of these Plans are to:

- Protect, maintain and enhance natural features, functions and systems intended to sustain a viable and permanent natural eco-system;
- Functionally integrate the Natural Heritage System into the new Seaton community providing opportunities for recreational and educational activities, spiritual regeneration, interaction and movement; and
- Enable the integration of cultural heritage into the new community fabric by drawing on the legacies of Aboriginal and European occupations.

The Seaton Natural Heritage System Management Plan and Master Trail Plan defines the natural heritage and trail system that will link neighbourhoods and provide regional trail and open space connections as illustrated in Figure 5. The corridor of habitat provided by the south-west tributary of Broughham Creek will provide connection to the Brock Lands and the 1,520 ha identified natural heritage system identified for Seaton. A dedicated bike route proposed along Concession Road Five (Whitevale Road) and a planned secondary neighbourhood trail connections adjacent to Brock North will provide the opportunity for connections between the Seaton community and the Brock Lands.

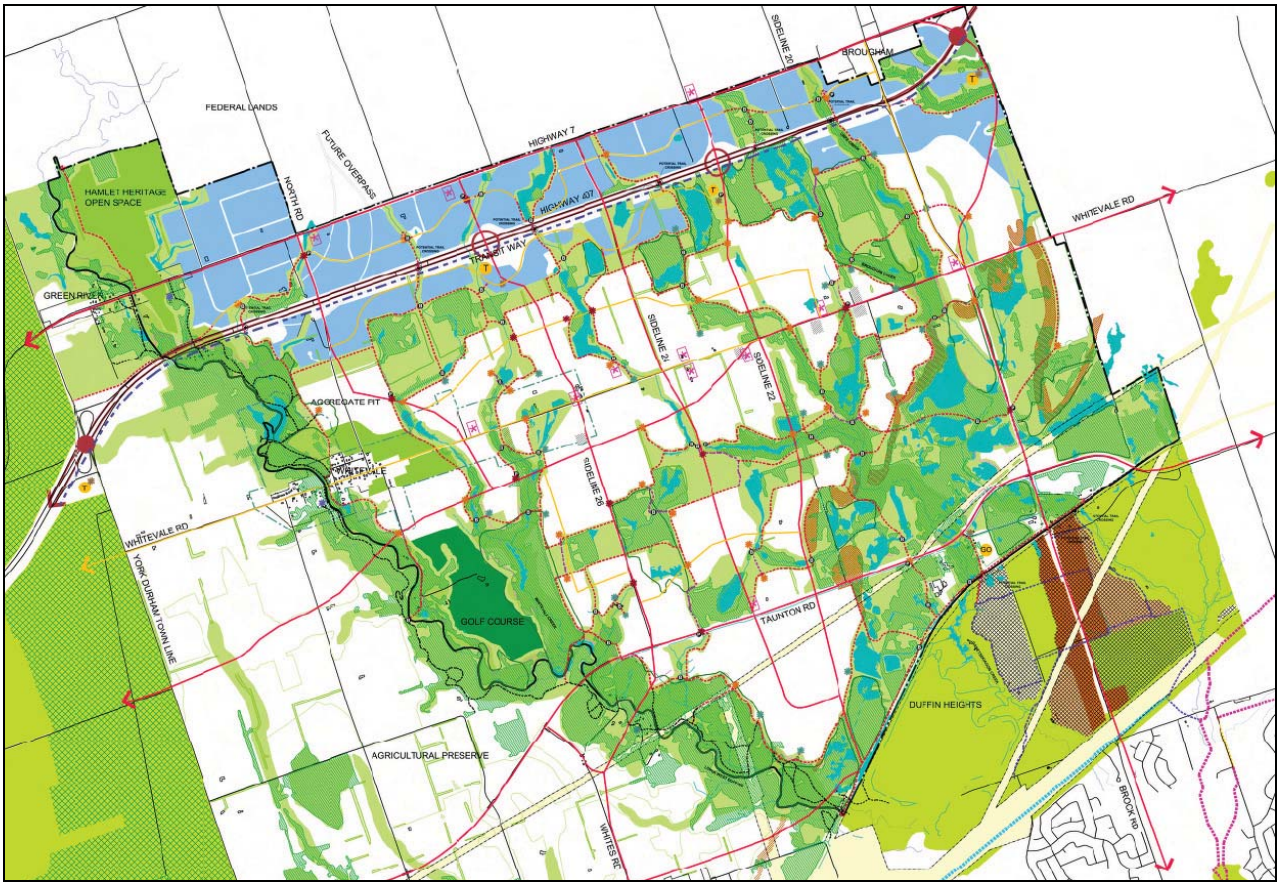

Figure 5. Seaton Natural Heritage System Management Plan and Master Trail Plan
Source: Schollen & Company INC, 2008

1.5.2.5 Duffin Heights

The Duffin Heights community is located south of the Brock Lands bounded by West Duffins Creek, the CP rail line, the Ajax-Pickering boundary, and Ontario Hydro transmission corridor. The neighbourhood population is projected to be 9,400 by 2016. The neighbourhood plan includes significant open space lands associated with the various tributaries of the East Duffins Creek; and includes the Grand Valley Park, and the southerly limit of the Seaton Hiking Trail. The neighbourhood also has environmentally sensitive areas associated with the West Duffins Creek, Ganatsekiagon Creek, and Urfe Creek. The neighbourhood Environmental Service Plan was endorsed by City Council on October 20, 2008. As a result, The Pickering Official Plan was amended to increase the amount, and revise the configuration of the "Open Space System - Natural Areas" designation. City Council will address the protection of the natural heritage features and functions from the impacts of any new development through mechanisms such as buffers, tree management, tree preservation, invasive species management, environmental construction management, and stormwater management.

1.5.2.6 Greenwood and Area

The Greenwood and area neighbourhood is adjacent to the Brock Lands and Greenwood Conservation Area, along Concession Road Six, approximately between the East Duffins Creek and Westney Road. The neighbourhood population is projected to be 690 by 2016. The establishment of uses and activities in Greenwood which complement the recreational, cultural

and educational opportunities offered by the Pickering Museum Village are encouraged by the City of Pickering within this community.

1.5.2.7 Brougham

Brougham is a Hamlet located northwest of the Brock Lands at the intersection of Brock Road and Highway 7. The majority of the lands located within and north of Brougham are part of the Federally-owned lands acquired in the 1970s as a site for a possible future airport. The population if Brougham is projected to be 315 by 2016. There are several watercourses that traverse Brougham which include Urfe Creek, Brougham Creek and Spring Creek.

1.5.3 Town of Ajax

1.5.3.1 Ajax Official Plan

The Town of Ajax published the Town of Ajax Official Plan in December 2009. '*The Official Plan is one of a series of policies, guidelines and regulations that direct the actions of the Town and shapes growth and development. The Official Plan establishes the context for the future urban structure of the Town and, as such, will serve as the basis for managing change'* (Town of Ajax, 2009). The Plan recognizes that '*citizens of the Town of Ajax benefit from the proper management of the environment, which is based on sound community principles and appropriate, responsible development policies*' and furthermore that the '*community believes that managed, sustainable growth is necessary to ensure the preservation of natural heritage features, create residential and employment opportunities, provide quality services and infrastructure, and maintain fiscal responsibility*' (Town of Ajax, 2009).

The Official Plan is based on principles of protecting and enhancing the natural heritage system, of which the Lake Ontario Waterfront and river corridors are particularly unique and valued features. As such the Plan identifies that Ajax will promote:

- The protection and enhancement of significant natural heritage features and their functions, and significant environmental resources;
- The protection of natural heritage linkages of the features within areas of the Town and to natural areas outside the Town; and
- The consideration of environmental impacts during the review of development applications.

"*It is a goal of the Official Plan to establish an ecosystem-based approach to planning and development, with the achievement of sustainable development and linked greenspace as primary long-term objectives. The Official Plan provides a two-level framework for protecting, restoring and linking the natural features and their functions in the Town to achieve a healthy natural environment and ecological diversity*" (Town of Ajax, 2009). A two-level framework which includes an Environmental Protection designation and the Environmental Resources Overlay with corresponding policies are designed to address cumulative impacts by promoting comprehensive planning for natural areas and watersheds. The majority of Brock South is identified an Environmental Resource Area.

The Official Plan also includes a Greenlands Framework which is '*based on the belief that the quality of life in Ajax will be enhanced by the establishment and maintenance of a network that links environmental resources and recreational areas both within and beyond the boundaries of the Town'* (Town of Ajax, 2009). Among the objectives outlined in this framework are the following that are relevant to the planning of the Brock Lands:

- Work in partnership with other agencies and landowners to establish a comprehensive and unified approach to the securement, implementation, maintenance and enhancement of the Greenlands Framework;
- Incorporate the concept of sustainability into all facets of municipal infrastructure development and land use planning decisions;
- Establish, over time, an interpretive trail system comprising linked and interconnected environmental and recreational features;
- Provide accessible and visible public parks that have a clear functional relationship to the residents they are intended to serve;
- Secure, over time, lands included in the Greenlands Framework, whenever feasible and appropriate; and
- Protect existing significant natural heritage systems and their functions and identify and implement appropriate management and stewardship techniques and enhance and expand the natural heritage system to achieve a net environmental gain.

Brock South is identified in the Official Plan as having several features that are worthy of environmental protection which includes a segment classified as a valley and stream corridor and section of the Lake Iroquois Shoreline. The network of identified stream and valley corridors and other significant habitat areas found at Greenwood Conservation Area to the east of Brock South have been given the Environmental Protection designation in the Plan. The Official Plan recognizes that these features are worthy of preservation and are sensitive to some forms of development for biological and ecological reasons. The remaining sections of the Greenwood Conservation Area are categorized under the Open Space land use designation. According to the Plan, these areas shall, '*contain continuous walkways for pedestrians and a system of multi-purpose trails, provided the ecological integrity of the area is maintained*' (Town of Ajax, 2009).

1.5.3.2 Recreation, Parks and Culture Master Plan

In 2008, the Town of Ajax published the Recreation, Parks and Culture Master Plan to assist decision-makers, stakeholders and the general public in determining needs and priorities related to services and facilities encompassing the recreation, parks and cultural demands of Ajax. The goal of the Master Plan is to provide an action plan that leads the development of future municipal facilities and services in a fiscally responsible manner. The Master Plan outlines the Town's role in providing services and facilities pertaining to recreation, parks, arts, culture and heritage through to the year 2021 (Town of Ajax, 2008*)*.

A recommendation of the report was the creation of parkland to service outdoor leisure pursuits for residents. It identified the importance of active parkland for sports and recreational needs but also passive parkland for conservation and public enjoyment of open spaces. Specifically, the report recommended that in order to meet the long-term demand for passive parkland and nature trails, the Town of Ajax should focus its efforts on the procurement of environmentally significant spaces, especially as it relates to trail connectivity. The report also identified a need for additional off leash dog parks, particularly when a willing community organization is able to contribute sufficiently to its operation through a cost sharing arrangement with the municipality.

1.5.3.3 Ajax A9 Neighbourhood

The planned Ajax A9 neighbourhood is bounded by Taunton Road to the north, Duffins Creek and the hydro corridor to the east, Rossland Road to the south, and the Ajax-Pickering municipal boundary to the west. The development area is approximately 332 hectares and is

anticipated to serve primarily residential use by accommodating a future urban population. The current land use is primarily agriculture. Within this future neighbourhood is an Environmentally Sensitive Area located in a major municipal park known as Paulynn Park (18.13 hectares). Other natural systems found in this planned community include habitat corridors associated with Duffins Creek, Urfe Creek and its tributary, which transverse the site in a north-south direction.

1.5.3.4 Greenwood Conservation Area Management Plan

The Greenwood Conservation Area Management Plan (2004) arose as part of a management agreement and partnership between TRCA and the Town of Ajax, which actively manages this conservation property within its municipal boundary. The goal of the plan is to protect, conserve and regenerate the ecological integrity of the area and guide current and potential future public uses of the area. The Plan describes and evaluates the property based on relevant plans and policies, existing environmental conditions and site limitations and opportunities. Specific management zones are identified in the Plan, which guide the appropriate location and types of activities for the site. Finally, the Plan makes recommendations for future initiatives, including the protection of natural features and habitat regeneration based on an ecosystem approach to planning and management.

1.5.3.5 Ajax Pedestrian and Bicycle Master Plan

In 2010, the Town of Ajax published the Ajax Pedestrian and Bicycle Master Plan to achieve a balanced transportation network that is vital to the economic prosperity of the growing Town of Ajax and to the overall quality of life of its residents (IBI Group, 2010). Currently, the Town of Ajax is planning for an expanded network of trails, sidewalks, and bikeways, along with supportive policies and programs so that walking and cycling are viable ways of getting around town.

The Plan includes 62 km of new sidewalks; 63 km of new trails; 13 km of pedestrian priority corridors; 47 new bike lanes and 13 km of new bike priority streets and marked shared lanes. As shown in Figures 5 and 6, the Plan identifies both pedestrian and cycling routes that connect the Greenwood Conservation Area and surrounding areas to the planned active transportation routes.

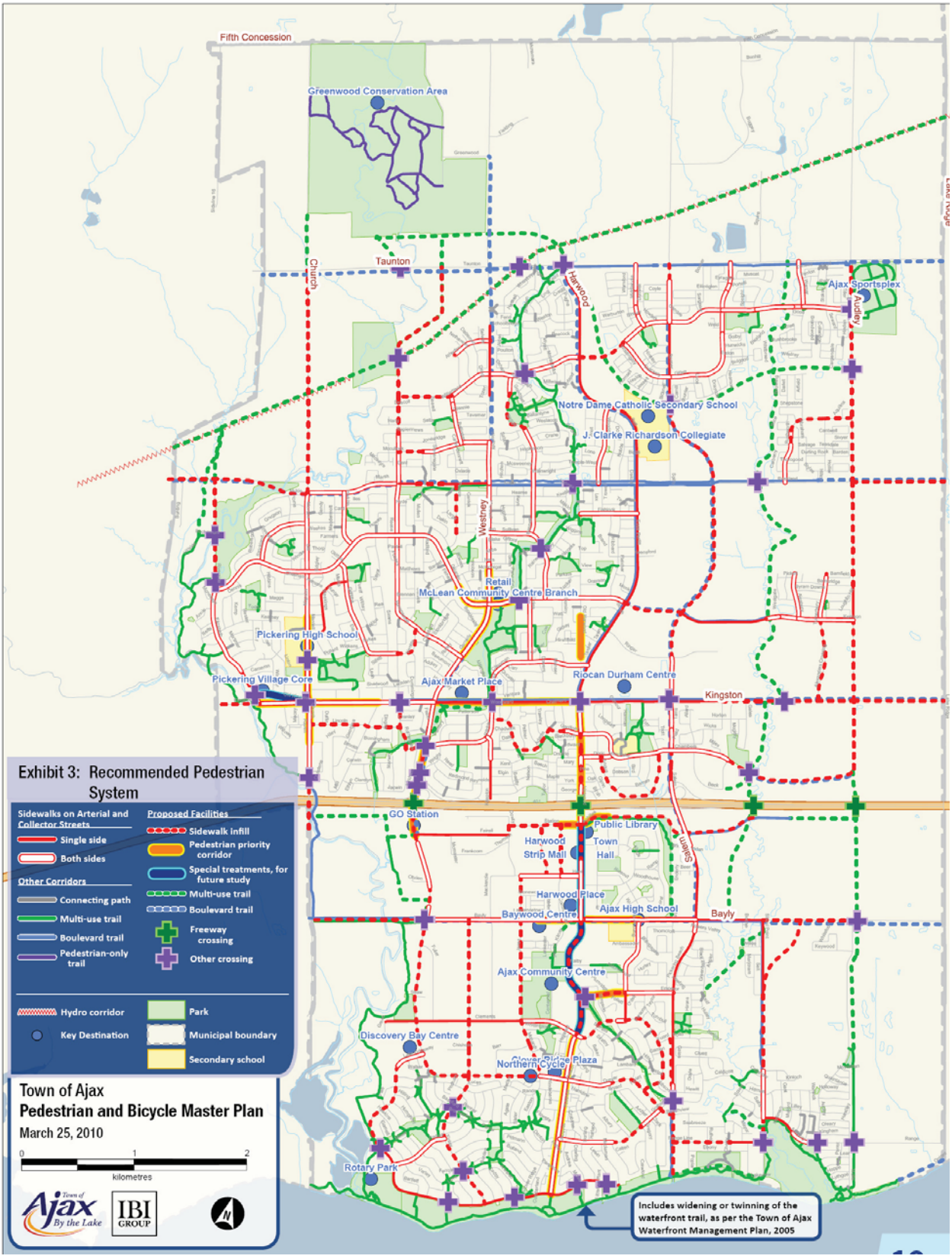

Figure 6. Recommended pedestrian network - Pedestrian and Bicycle Master Plan

Source: IBI Group 2010

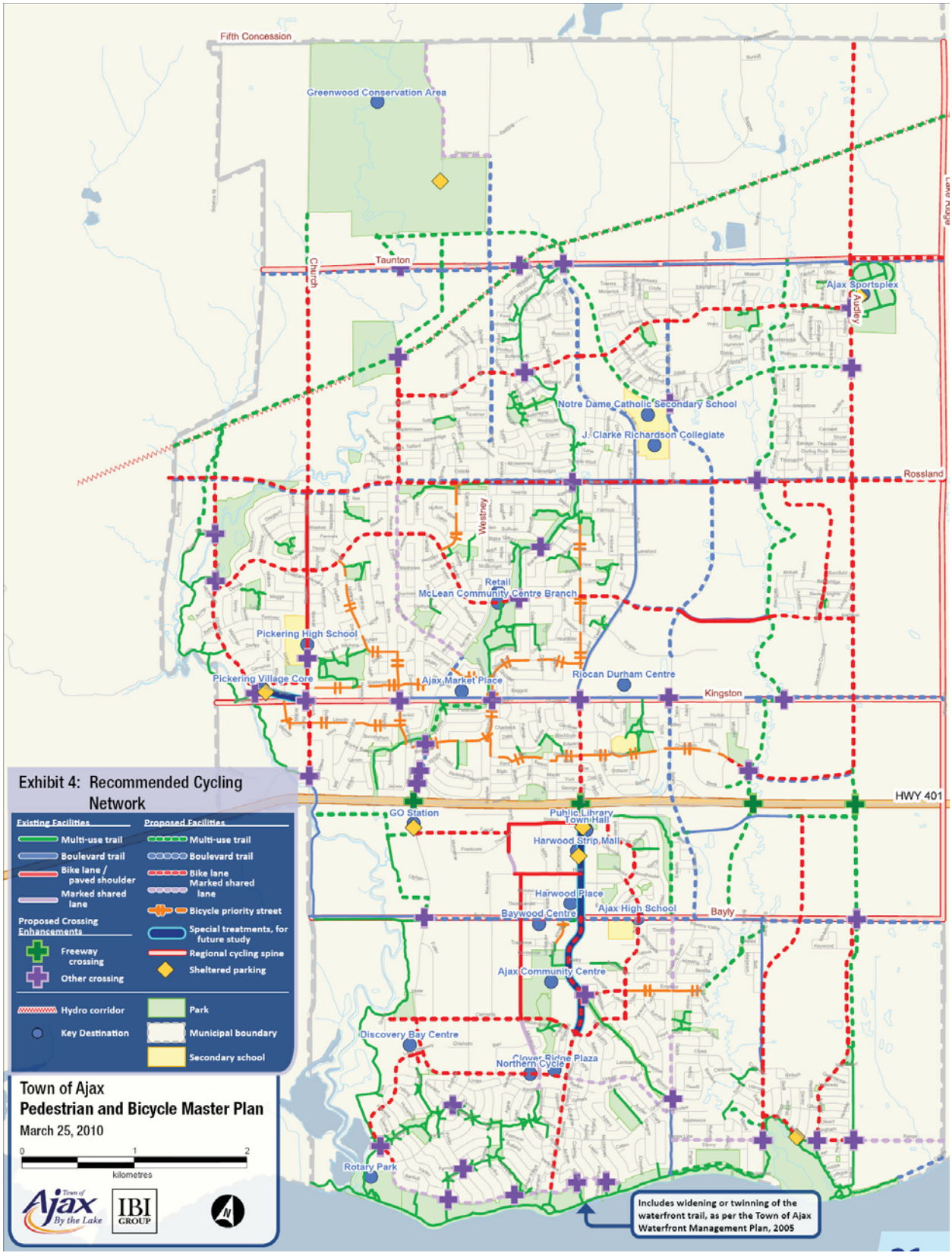

Figure 7. Recommended bicycle network - Pedestrian and Bicycle Master Plan

Source: IBI Group 2010

1.5.4 Region of Durham

1.5.4.1 Region of Durham Official Plan

The Durham Region Official Plan was published in June 2008. The Plan was created to ensure the preservation, conservation and enhancement of the Region's natural environment for its valuable ecological functions and for the enjoyment of the Region's residents. The purpose of the Plan is to provide policies and guidelines to ensure the quality of life and well-being of present and future residents of the Region. The Plan establishes goals to manage growth, create liveable urban environments and to ensure that residents live in harmony with the natural environment and heritage of the Region. The need for protecting significant features and functions of the natural environment and encouraging stewardship of the land are among the directives of the Plan to achieve these goals.

The Brock Lands are designated by Durham Region as part of the Greenbelt Natural Heritage System which 'includes areas of the Greenbelt Protected Countryside with the highest concentration of the most sensitive and/or significant natural features and functions' (Region of Durham, 2008). As per the Official Plan, the Greenbelt Natural Heritage System '*is to be managed as a connected and integrated natural heritage system*' (Region of Durham, 2008). Stream corridors and associated forest cover within the property are identified as key natural heritage and hydrologic system features. The Official Plan prohibits development and site alteration in these areas with the exception of works related to forest, fish and wildlife management, conservation and flood or erosion control projects, and minor recreational uses (i.e. trails, footbridges). Furthermore, the Region's Official Plan encourages:

- Expanding woodlands and linkages to achieve a minimum forest cover target of 30%;
- Rehabilitating drainage systems and streams and adjoining lands to a natural state; and
- Providing opportunities for a variety of compatible recreational activities.

A Major Open Space Area Official Plan designation is identified for the property based on the presence of natural heritage and hydrologic features found at the Brock Lands. As per the Region's policy the predominant use of the lands with this designation shall be conservation. Site alteration must demonstrate that there will be no negative effects on the key natural heritage and hydrologic features or their functions, that connectivity is maintained, that less than 25% of the area be disturbed, and impervious surfaces do not exceed 10% (except for major recreational uses).

The majority of the Brock Lands are also within the Region of Durham's identified High Aquifer Vulnerability Areas. The Region suggests protection of these areas when considering new development or site alteration.

1.5.5 Province of Ontario

1.5.5.1 Provincial Policy Statement

The new Provincial Policy Statement came into effect on March 1, 2005, coinciding with Section 2 of Strong Communities, which requires that planning decisions on applications be consistent with new policies. The Provincial Policy Statement is issued under the authority of Section 3 of the Planning Act. It provides direction on matters of provincial interest related to land use planning and development, and promotes the provincial "policy-led" planning system.

The Provincial Policy Statement recognizes the complex inter-relationships among economic, environmental, and social factors in planning and embodies good planning principles. It includes enhanced policies on key issues that affect communities, including efficient use and management of land, and protection of the environment. Several policies are relevant to the planning of the Brock Lands.

Policy 1.5.1 suggests that healthy, active communities should be promoted by: providing for a full range of equitable distribution of publicly-accessible built and natural setting for recreation, including facilities, parklands, open space areas, trails, and where practical water-based resources; and providing opportunities for public access to shorelines.

Policy 2.1.2 suggests that the diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surfaces water features and ground water features. In addition, Policy 2.1.3.a suggests that development and site alteration shall not be permitted in significant habitat of endangered species and threatened species.

Policy 3.1.1.a suggests that development shall generally be directed to areas outside of hazardous lands adjacent to shorelines of the Great Lakes-St. Lawrence River Systems due to flooding and erosion hazards and/or dynamic beach hazards.

1.5.5.2 Greenbelt Plan Implementation

The Greenbelt Plan Act was established in 2005 by the Ministry of Municipal Affairs and Housing to offer permanent protection to the natural heritage and water resource systems that sustain ecological and human health and that form the environmental framework around which major urbanization in south-central Ontario will be organized. The Brock Lands are designated Protected Countryside under the Act. Protected Countryside contains a natural system that provides a continuous and permanent land base necessary to support human and ecological health in the greenbelt and beyond. The natural system policies protect areas of natural heritage, hydrologic and/or landform features, which are often functionally inter-related and which collectively support biodiversity and overall ecological integrity.

1.5.5.3 Places to Grow

The 'Places to Grow' Growth Plan for the Greater Golden Horseshoe Area was created in 2006 to provide a framework for implementing the Government of Ontario's vision for building stronger, prosperous communities by better managing growth in this region by 2031. The 'Places to Grow Act' (2005) provides the legislative framework for the Plan. The Plan is intended to work in conjunction with other provincial legislation, policies, plans and regulations. The Brock Lands are located in the provincial Greenbelt Area. As such, the Plan details that '*for lands within the Greenbelt Area, all policies regarding natural systems set out in the provincial plans, applicable to lands within the Greenbelt Area, continue to apply*' (Province of Ontario, 2005).

1.5.5.4 Central Pickering Development Plan

The Central Pickering Development is located west of the Brock Lands bounded by the CPR Belleville Line to the south, Sideline 16/Pickering-Ajax border to the east, Highway 7 to the north and the York-Durham Town Line to the west. The proposed plan covers 4,860 hectares (12,009 acres) of land, composed of fifteen compact neighbourhoods that offer a range of

residential, mixed-use and employment uses for eventual residents and that open on to forests, fields and streams (City of Pickering, 2006). The Central Pickering Development Plan aims to incorporate urban elements into a natural settling. The residential development will accommodate 77,000 people and the employment lands will provide approximately 33,000 jobs. A central component of this Plan is a commitment to permanently protecting prime agricultural land and promoting agricultural land-uses and viable settlement communities in the Duffins Rouge Agricultural Preserve. In addition, this system of protected areas includes significant natural features, such as wetlands, woodlands, and the Iroquois Shoreline, and conserves local wildlife habitat. The proposed preservation of the heavily forested West Duffins Creek valley will retain an important linkage between the Oak Ridges Moraine and Lake Ontario. Conservation of an extensive natural heritage system is identified as the foundation for building a sustainable community in Central Pickering.

1.5.5.5 Clean Water Act

The Ontario Clean Water Act was enacted in 2006 to protect existing and future sources of drinking water. A key recommendation from this Act was to create a multi-barrier approach to source water protection. This required a characterization of the distribution of all vulnerable aquifers. The Brock Lands are classified as 'vulnerable' under the Act as these lands include a significant groundwater recharge area and a highly vulnerable aquifer.

1.5.5.6 Species at Risk Act

The Species at Risk Act was enacted in 2007 to protect species that are at risk and their habitats, and to promote the recovery of species that are at risk. To support the recovery of individual species at risk, a recovery strategy will outline recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the areas that should be considered in the development of habitat regulations.

1.5.5.6.1 Ontario Recovery Strategy Series – Redside Dace in Ontario

The Redside Dace Recovery Strategy was created February 18, 2010 under the Ontario Endangered Species Act. The long-term goal of the recovery plan is to restore viable populations of redside dace in a significant portion of their historic range in Ontario by:

1. Protecting existing healthy, self-sustaining populations and their habitats;
2. Restoring degraded populations and habitats; and
3. Re-establishing redside dace to sites of former distribution where feasible.

Within nine months after a recovery strategy is prepared, the Endangered Species Act requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy.

1.5.5.7 Ministry of Transportation

In June 2010, the Ontario Minister of the Environment, with the approval of Cabinet made a decision to allow the 407 East Environmental Assessment (EA) to proceed, subject to conditions. The approval was for a 70 km transportation corridor, including a highway, dedicated transitway and support facilities, located in Durham Region. This transportation corridor extends 50 km eastward from the existing 407 Express Toll Route (407 ETR) terminus at Brock Road in Pickering to Highway 35/115 in Clarington. There are also two 10 km north-south links connecting to Highway 401 to the 407 East Extension; one in Whitby (West Durham Link) and one in Clarington (East Durham Link).

Impacts on all factor specific areas were undertaken to determine the most desirable location for the transportation corridor. Environmental investigations were conducted on natural features (terrestrial and aquatic), social-economic factors (noise, air quality, land use, agriculture and contaminated soils) and cultural factors (archaeology, built heritage and cultural landscapes).

As part of the implementation of the 407 East EA, feasible mitigation measures and overall benefit for Species at Risk have been developed to eliminate, reduce, and/or manage the project's adverse environmental effects. TRCA, in collaboration with the Ministry of Transportation, Department of Fisheries and Oceans, and Ministry of Natural Resources, are working together to identify both terrestrial and aquatic habitat opportunities that will be undertaken, including restoration works and monitoring on the Brock Lands.

1.5.6 Transport Canada

1.5.6.1 Pickering Lands

The Pickering Lands refers to the 7,530 hectares (18,600 acres) of land in Pickering, Markham and Uxbridge that has been owned by the Government of Canada since 1972. Properties on these lands have been leased by the Government of Canada to residential, farm and commercial tenants since 1975. Site management policy for these lands is established by Transport Canada and administered on a day-to-day basis by Public Works and Government Services Canada.

The Bird Use, Bird Hazard Risk Assessment, and Design of Appropriate Bird Hazard Zoning Criteria for Lands Surrounding the Pickering Airport Site (Pickering Lands) was written by LGL Limited, Environmental Research Associates in May of 2002, as a result of the Pickering Lands being officially declared an “airport site” on August 1, 2001. Produced for Public Works and Government Services Canada and Transport Canada, Ontario Region the report categorizes relationships between landuse and bird species to predict the degree of risk to aircraft during different phases of flight. The document outlines their findings including; elements of risks, hazardous bird species, landuse by hazardous species, and hazardous landuses. Recommendations are also made concerning bird hazard provision, airport zoning, and landuse within the bird hazard zone. These recommendations and potential impacts on the restoration of the Brock Lands must be considered due to the location of the property in relation to the planned airport site.

All proposed restoration will be in accordance with the criteria set out in the report, Bird Use, Bird Hazard Risk Assessment, and Design of Appropriate Bird Hazard Zoning Criteria for Lands Surrounding the Pickering Airport Site (LGL Ltd. Environmental Research Associates, 2002). Restoration works on the Brock Lands will not elevate the site’s current land use risk levels as set out by LGL. Hazardous land use rankings include: high, moderate, low, potential, and no risk. None of the proposed restoration works will create “high risk” land use areas that regularly attract large numbers of hazardous bird species for airports. The site’s past land-use as a landfill would be considered a “high risk”, while natural habitats are considered “no risk”. In some instances, restoration works may lower the level to a no risk through the restoration of natural habitats including; forests, woodlots and riparian habitats.

1.5.7 Rouge Park

1.5.7.1 Rouge Park Trails Master Plan

The Rouge Park is currently undertaking a Trail Master Plan process that will offer a range of experiences and recreational opportunities to assist in meeting the needs of users of all ages and physical ability. The Rouge Park trail system will serve as a means to understand and appreciate the unique natural and cultural attributes of the park through heightened visitor experiences and immersion in the landscape. The trail system will support the protection of the outstanding natural features, agricultural landscapes, and diverse cultural heritage of the park by managing appropriate public access and patterns of use while providing a rewarding experience of nature. The goals for the trail system include:

1. Protect important natural heritage features
   - Protect natural heritage features and functions
   - Enhance habitat connectivity, diversity and function where possible avoid fragmentation
   - Generally avoid steep slopes and areas prone to flooding

2. Provide a continuous north-south and east-west linkage
   - Provide for a multi-use trail connection from the waterfront to the Oak Ridges Moraine
   - Provide key linkages to connect neighbourhoods adjacent to Rouge Park
   - Provide a multi-modal trail network that maximizes accessibility and is integrated with public transportation

3. Protect, respect and celebrate cultural heritage resources
   - Capitalize on interpretive opportunities
   - Avoid sensitive cultural heritage features and landscapes

A major principle of the trail alignment will be connectivity. The planning of the Rouge Park trails will address links with existing and planned trail systems, both local and regional beyond the park limit. As such, the Rouge Trail will connect with the existing Seaton trail network along a series of trail connections on the Markham-Pickering Town Line located at the park's eastern limit.

1.5.8 City of Toronto

The City of Toronto has placed several conditions on the acquisition agreement that indicate preference that the Brock Lands be used to support future open space and park purposes, including paths, trails and other passive recreational uses. Assuming the lands are used for these purposes the City of Toronto has stipulated that no compensation payable to City of Toronto is required. The City of Toronto has specifically identified that ancillary uses by Pickering, Ajax or Ontario such as an expansion of the Pickering Museum, a district park of 20.23+ hectares (50+ acres) serving Pickering with stadiums, places of assembly and active recreational and cultural uses, would require that compensation be payable and will be the fair market value (FMV) of the interest granted. Other conditions of sale identify that if the property or some portion is to be sold in the next 50 years or is used for purposes other than those included in the agreement then either the City may require the property to be reconveyed to it

at the original purchase price of $2.00 or the City will be entitled to the profit so that in the case of leasing, licensing or permitting someone to use some or all of the property, the profit would be considered to be the FMV of the payments to be made under the right, license, lease or use given regardless of the amounts that are actually paid to TRCA. TRCA would however be entitled to deduct from the profit its costs of capital improvements, environmental clean up and costs of acquiring, operating and maintaining the property.

2.0 EXISTING CONDITIONS

2.1 Site History

The Brock Lands have undergone a number of land use changes since the beginning of the 20th century. Earliest land use documented in historic air photos indicates that site was primarily used for agricultural purposes. However, by the mid-century aggregate extraction had begun. In 1954, aggregate extraction activities were focused at the northern extent of Brock South as shown in Figure 8. These activities expanded into Brock North in the 1960's and appear to be at the height in 1967, until the land was sold to the Municipality of the Metropolitan of Toronto in 1969 for consideration as a landfill site.

In May 1972, preceding an Environmental Hearing Board sitting, the Ontario Ministry of Environment approved the Municipality of the Metropolitan of Toronto to begin a landfilling operation at the Brock North site (Johnson, Sustronk, Weinstein & Associates, 1975). A Provisional Certificate of Approval was issued under the Environmental Protection Act on May 18, 1977. In October 1978, the Brock North Landfill (a natural attenuation landfill) began to accept refuse. In all, an estimated 142,000 tonnes of refuse was placed over 4.9 ha at the southwest corner of Brock North. By this time, the entire Brock South property with the exception of the southwest quadrant had been operated as a sand and gravel pit and *Consolidated Sand and Gravel Limited* still utilized a portion of land in the northwest section of the property as a sedimentation lagoon and water storage pond for their washing operation (Golder and Associates, 1987).

By April 1979, the landfilling operations at Brock North had ceased. In 1981, a leachate collection system was created on the east and south sides of the fill area due to periodic egress of the leachate from the lagoon (located 250 m east of the filled areas) into Brougham Creek (Dixon, 2004). Between December 1996 and March 1997, approximately 120,000 tonnes of waste was removed followed by site regrading, topsoil placement and seeding. The leachate collection system was disconnected in the fall of 1997. The City of Toronto had been required to keep annual hydrogeological reports on file for the Brock North landfill site. Post closure water monitoring began in 2003 and continued to 2006 (Golder and Associates, 2008). In the *Brock North Landfill Water Quality Monitoring Report* published in 2006, Golder and Associates staff recommended that groundwater quality and level monitoring be discontinued and an assessment of surface water flows from the former landfill area be undertaken to determine further monitoring requirements.

TRCA is currently investigating a number of requirements to close the Provisional Certificate of Approval (C of A) No. A390405 issued under the Environmental Protection Act on May 18, 1977. These may include but are not limited to:

1. Assessment of residual site impacts, consistent with Ontario Regulations 153/04 and the applicable site conditions standards as set out in the Soil and Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act.

2. Decommissioning of the holding tanks on the groundwater perimeter sub-drain.

3. A water and sediment quality monitoring program in areas down gradient of the former landfill area.

Figure 8. Brock Lands in 1954

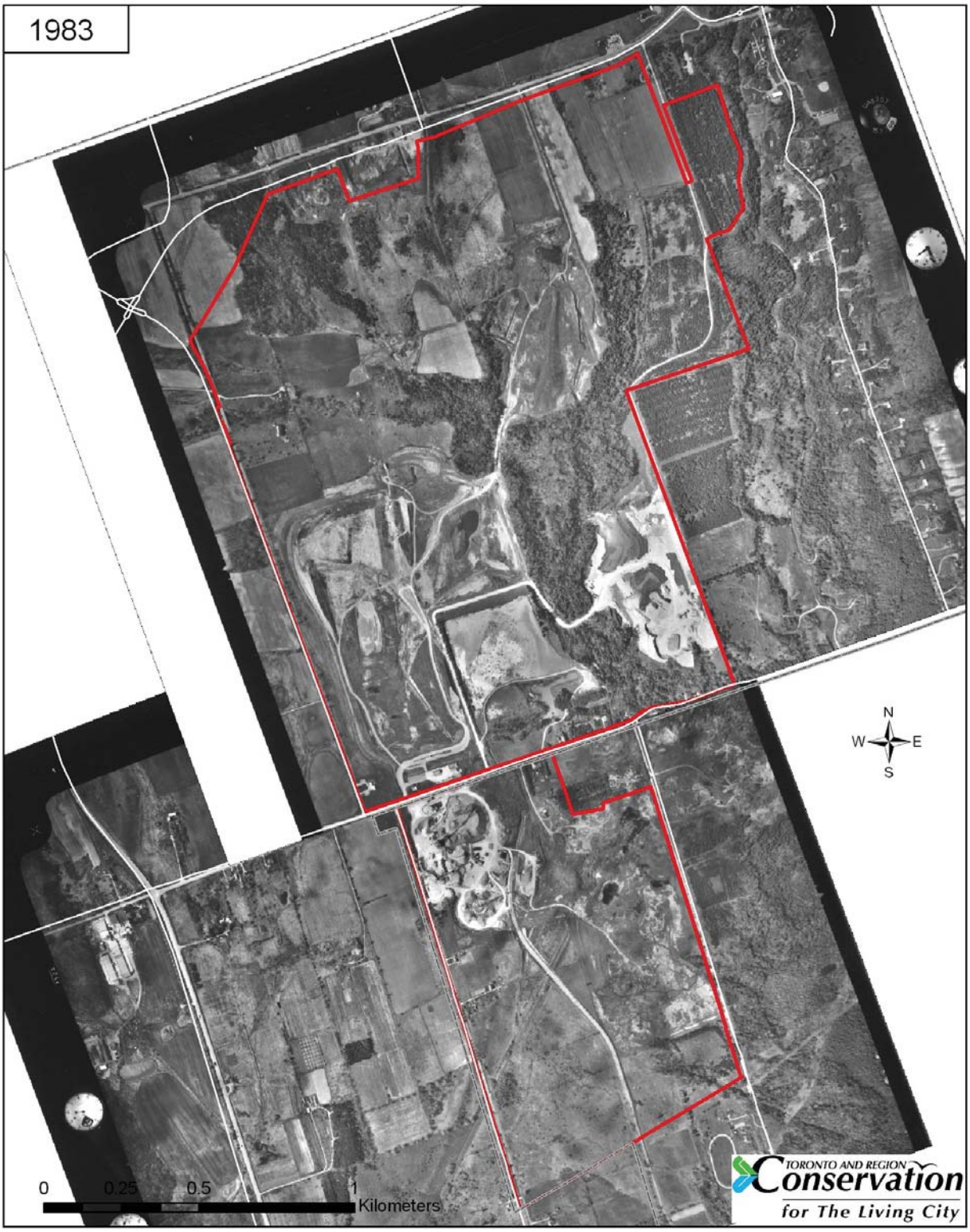

Figure 9. Historical aerial photography from 1983 depicts site prior to removal of landfill materials

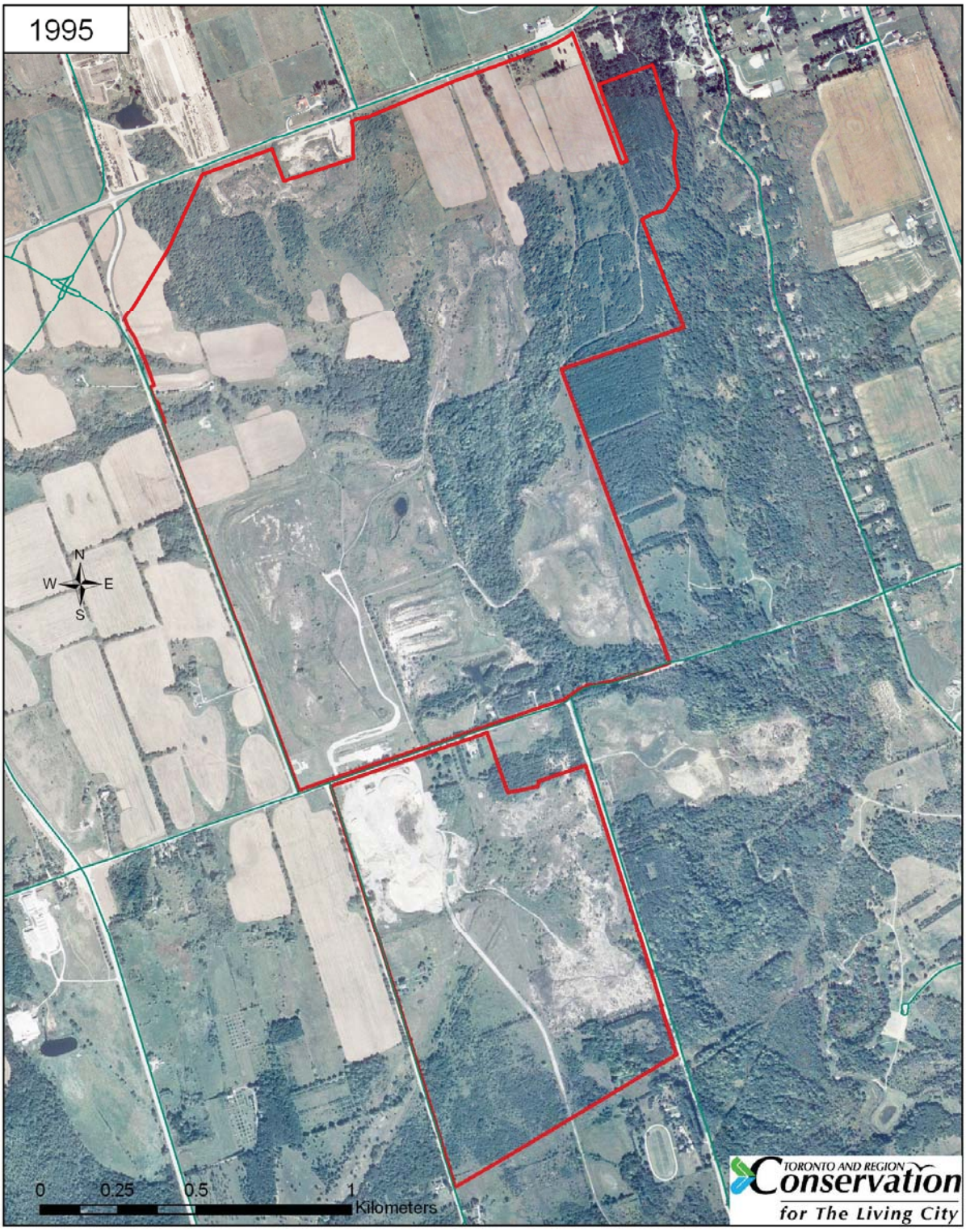

Figure 10. 1995 aerial photo depicts site prior to removal of landfill materials

2.1.1 Physical Characteristics

The Duffins Creek watershed is divided into three major physiographic regions, each with a distinct topography and geologic setting. The Oak Ridges Moraine is situated in the northern portion of the watershed and forms the headwaters of Duffins Creek. The South Slope begins on the southern edge of the Oak Ridges Moraine and slopes gently toward Lake Ontario to an elevation of about 135 m above sea level (at approximately Highway 7). The Lake Iroquois Plain extends from the southern boundary of the South Slope to Lake Ontario. All of these physiographic regions are shown on Figure 11. The majority of the Brock property lies within the Lake Iroquois Plain, with a small portion of the northwest corner lying within the South Slope.

The Lake Iroquois Plain was created approximately 12,500 years ago along the shores of glacial Lake Iroquois. The shoreline of this lake forms the southern boundary of the South Slope and comprises a low ridge of sand and gravel. The top of this ridge has relatively high recharge, while groundwater discharges from the base of the slope, particularly adjacent to river valleys.

The Lake Iroquois Plain consists primarily of permeable, sandy soils, particularly at the northern edge near the former beach. These rich aggregate deposits attracted aggregate companies to the Brock Lands. The resulting extraction of these materials has resulted in significant alterations to the original physical conditions of the property. These changes include the creation of large holes or depressions in the landscape, redirection of surface flows, and exposure of groundwater and low permeability soils derived from the Halton and Newmarket Tills.

The use of Brock North as a landfill has also impacted the physical characteristics of the property. These impacts include creation of berms, ditches and sump ponds, alterations to watercourses, and infilling with soils and fill materials with low permeability.

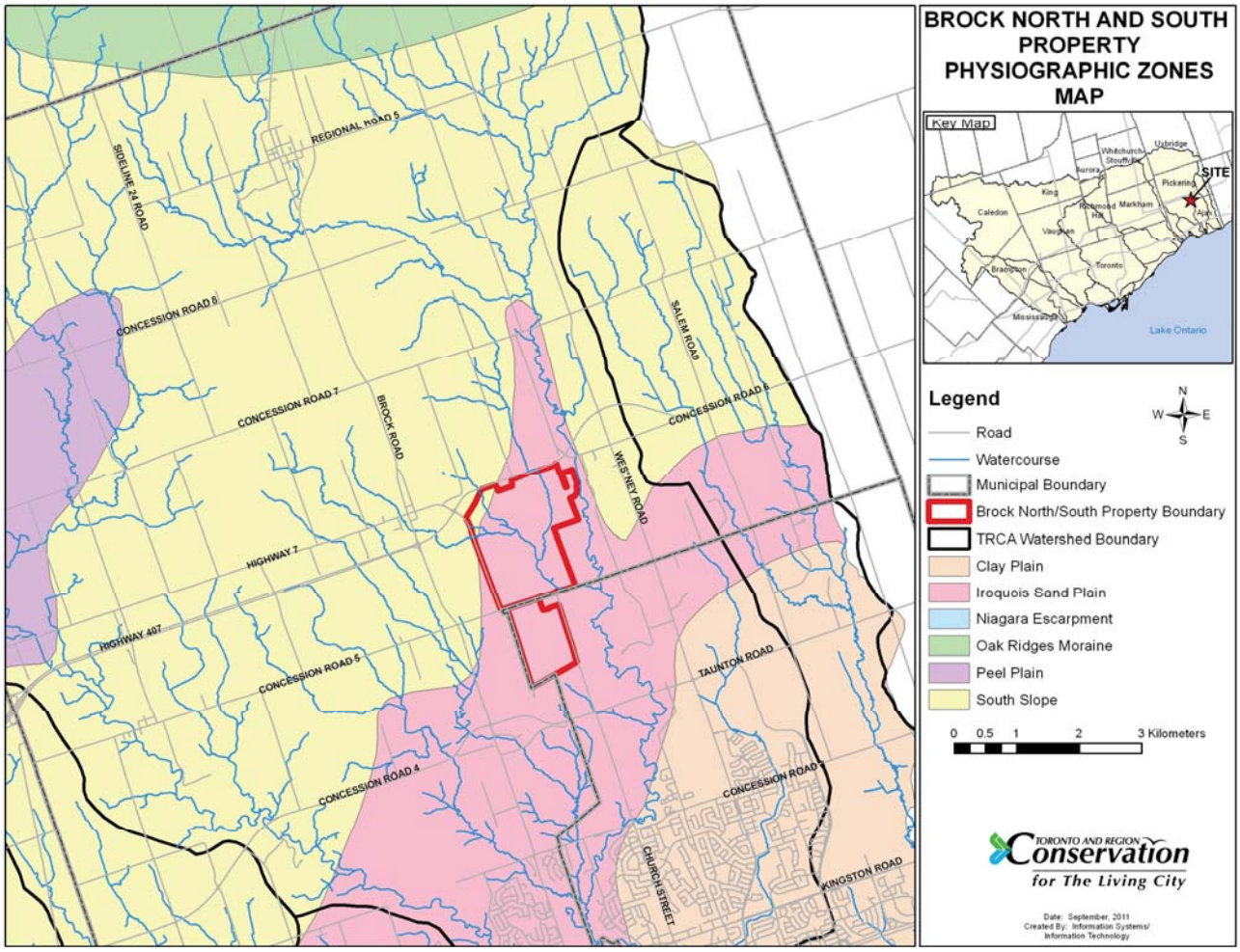

Figure 11. Physiographic regions

2.1.2 Hydrogeology

Current geologic and numeric models, as well as the established vegetation communities show the areas within and adjacent to the Brock Lands as a complex network of recharge and discharge areas. The quantity and rate of groundwater flow is largely dependent on the nature of the geologic material through which it flows. A series of aquifers, or water bearing zones, and aquitards, which restrict the flow of groundwater from one aquifer to another are found underlying the Brock Lands. These are as follows in order, from bedrock to surface: the Scarborough Aquifer; Sunnybrook Aquitard; Thorncliffe Aquifer; Newmarket Aquitard; Oak Ridges Moraine Aquifer; and Halton Aquitard (Gerber, 2003).

The dominant surficial geology of the site is glacial till. Figure 12 is a cross-section directed east and west through the Brock Lands showing the distribution of the hydrostratigraphic units. The surface geology of the site has been altered as a result of the past gravel extraction practices. Modeling suggests that some areas of the property have been excavated to the point of exposing the Oak Ridges Aquifer and possibly the Newmarket Aquitard. This represents a significant alteration of the local hydrogeology from its pre-disturbance condition resulting in impacts to both the quantity and quality of discharge and recharge within the Brock Lands, and to Duffins Creek. The remnant manipulated topography including the creation of

sumps, ditches and pits have created wetlands, conveyance channels, seeps and discharge points which further impacts groundwater movement and mixing with surface runoff. This results in an altered interstitial relationship between ground and surface water, which can have significant impacts to local and downstream terrestrial and aquatic resources.

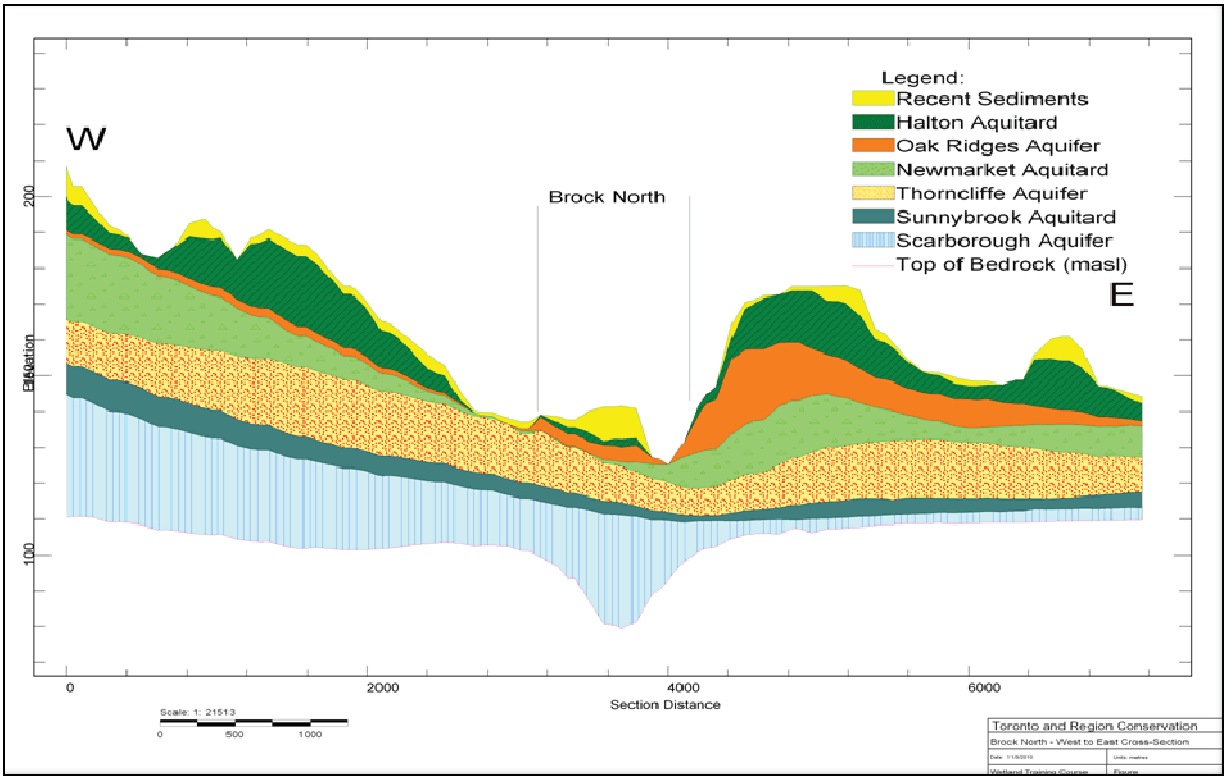

Figure 12. East-West cross section through Brock Lands showing hydrostatigraphic units

2.1.3 Soils

As noted, the majority of the Brock Lands lies within the Lake Iroquois Plain, with a small portion of the northwest corner lying within the South Slope, as shown in Figure 11. The west ridge of Brock North is a part of the South Slope region with surficial deposits consisting mainly of till, a mixture of materials ranging in size from clay particles to boulders, often covered by a thin layer of sand, silt and clay. Lake Iroquois resulted in large sand and gravel deposits throughout the Brock Lands. Those easily accessible deposits were removed by aggregate companies between the early 1950's and into the 1980's. It is estimated that over 100 ha of the 392 ha property was affected by aggregate extraction. These activities for the most part were focused at Brock South and on the west side of Brock North and were abandoned once the deposits were depleted or up until a point that groundwater began to interfere with the operation. In areas where the sand and gravel deposits were substantially removed, the lower strata clay, clay loam, and loam were exposed. Site operations during occupancy of the property by City of Toronto also resulted in low permeability non-native soils and fill material being imported to the site.

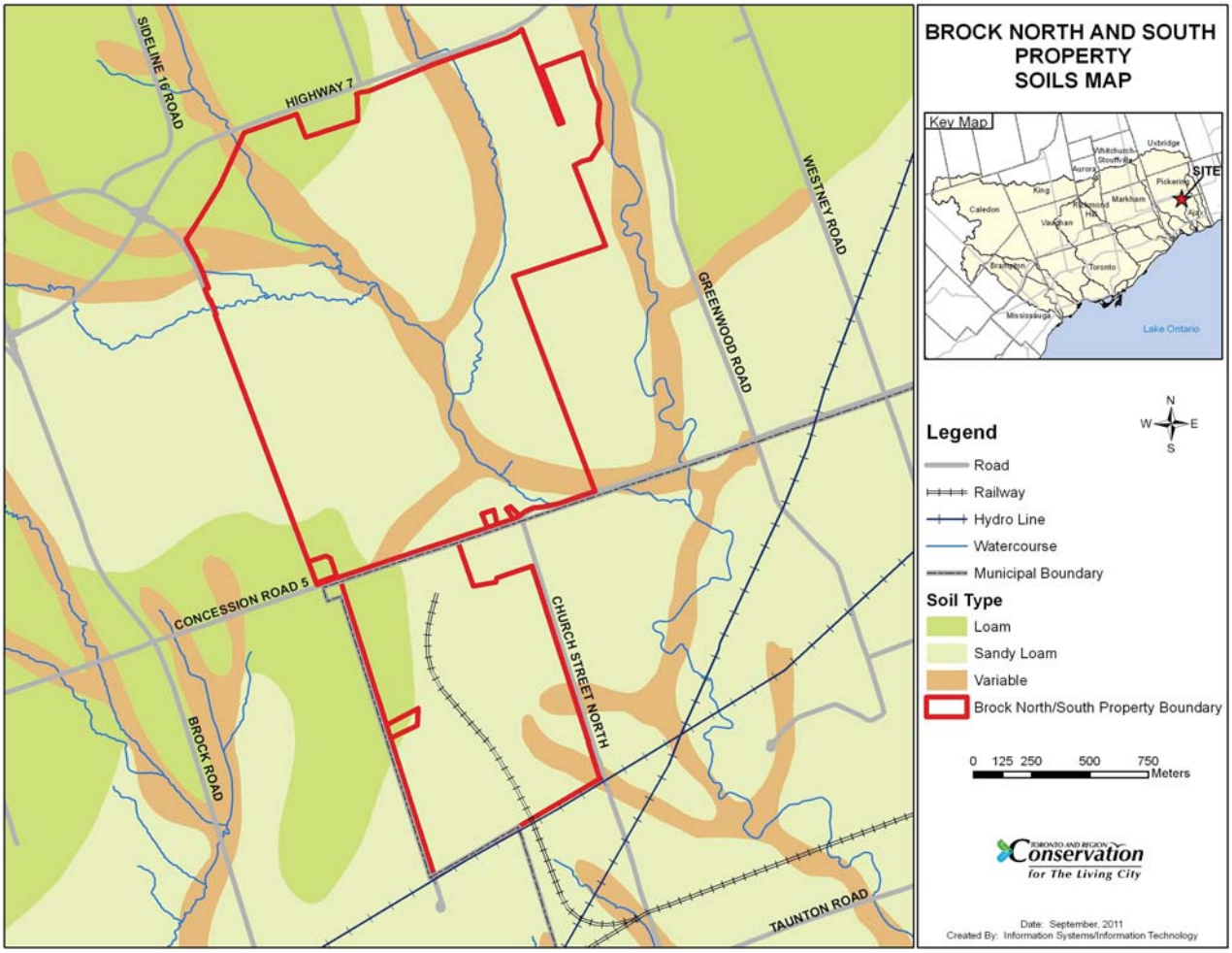

Figure 13. Soil classifications

2.1.4 Water Quality and Quantity

The Duffins Creek watershed is one of the last watersheds within TRCA's jurisdiction that exhibits the characteristics of a typical rural watershed, due to the small amount of urbanization, large amount of natural features, predominance of sandy soils and the large amount of forest cover. It drains an area of 283 km^2, and has an approximate stream density of 1,156 m per km^2 (TRCA, 2003b). The outflow is located at Duffins Marsh flowing into Lake Ontario, with a total annual discharge rate of approximately 80 million m^3 per year and a mean annual flow of 2.6 m^3 per second (TRCA, 2003b).

Monitoring of both stream level (or flow) and precipitation is achieved through TRCA's network of stream and precipitation gauges. TRCA also operates a jurisdictional baseflow monitoring program, which provides spot flow measurements during baseflow conditions. Added to the TRCA precipitation network are the federal climate stations, owned and operated by Environment Canada. These stations have significant historic records, dating as far back as the early 1900's. A watershed can be broken into two general categories: groundwater based, and run-off based. Using a Baseflow Index (total annual baseflow / total annual flow) as an indicator Duffins Creek can be classified as a groundwater dependant watershed.

The water quality conditions of the watershed are good overall, and among the highest quality of watercourses within TRCA's jursidiction. While the natural features of the entire Duffins watershed are a contributing factor to good water quality, the predominance of sandy soils and extensive forest cover and wetlands in the upper branches of Duffins Creek promote infiltration and reduce stormwater runoff. Additionally, groundwater discharge makes up a significant portion of stream flow and therefore helps maintain cool temperatures and good water quality throughout much of the creek (TRCA, 2003b).

The Brock property is located within the East Duffins subwatershed, and comprises approximately 32% of this subwatershed. Past gravel extractions have directly altered drainage lines and tributaries located on the property, which in turn has had site specific consequences on the water quality and quantity of these tributaries. A few factors that may be influencing the local water quality on the property include: eroded stream banks, a deficiency of natural vegetation, proximity to roads, channelization, old infrastructure and the overall altered drainage. Alterations to the landscape due to the former gravel extractions have caused changes to the volumes and pathways of local surface water that have altered the size and shape of watercourses and drainage lines, the stability of stream banks, and fish and wildlife habitat. Additionally, in some areas on the property, extractions have reached below the water table, exposing areas of groundwater seepage.

The Brock North property was used as a landfill site by the City of Toronto between October 1978 and April 1979. Monitoring studies conducted by Golder Associates Ltd. from 2003 to 2006 investigated the effects of the landfill site on groundwater and surface water quality and quantity (Golder Associates, 2008). Golder concluded that the water quality of Brougham Creek did not appear to be significantly influenced by the landfill derived contamination. As noted in Section 2.1, the Ministry of Environment is considering revoking the Certificate of Approval for the decommissioned landfill area.

Restoration work will help improve water quality and quantity at a site specific level, as well as downstream of the property. Further monitoring is required to help determine present water quality and quantity conditions. The best available science will be used to inform the restoration planning process.

2.2 Natural Heritage

The Terrestrial Natural Heritage System Strategy (TRCA, 2007) was designed to enhance biodiversity and the quality of life for residents and uses two natural indicators: the quality distribution and quantity of natural cover in the analyses. Habitat patch mapping was excerpted from the regional 2007/2008 mapping of broadly-defined patch categories (forest, wetland, meadow and coastal) and digitized using ArcView GIS software. A key component of the field data collection is the scoring and ranking of vegetation communities and flora and fauna species to generate local "L" ranks (L1 to L5). Vegetation community scores and ranks are based on two criteria: local occurrence and the number of geophysical requirements or factors on which they depend. Flora species are scored using four criteria: local occurrence, population trend, habitat dependence, and sensitivity to impacts associated with development. Fauna species are scored based on seven criteria: local occurrence, local population trend, continent-wide population trend, habitat dependence, sensitivity to development, area-sensitivity, and patch isolation sensitivity. With the use of this ranking system, communities or species of regional concern, ranked L1 to L3, now replace the idea of rare communities or species. Rarity (local occurrence) is still considered but is now one of many criteria that make

up the L-ranks, making it possible to recognize communities or species of regional concern before they have become rare.

In 2010, TRCA conducted an inventory of flora and fauna of the Brock Lands with efforts concentrated in Brock North. The purpose of this inventory was to characterize the terrestrial natural heritage features of the lands to provide the terrestrial natural heritage information required to make management decisions during the restoration planning process. In addition to taking inventory of species present on the site, TRCA staff sought to determine how this site relates to the regional natural heritage system. Surveys were conducted to the patch size level (landscape analysis), vegetation community, and species (flora and fauna) according to TRCA methodologies for landscape evaluation.

2.2.1 Brock North Natural Cover

The Brock North study area consists of a complex mosaic of cedar-dominated forest habitat and open meadow habitat interspersed with fen-like wetlands and ponds – an extensively modified landscape resulting from a recent history of changing land-uses and significant disturbance. A total of 87 Ecological Land Classification (ELC) vegetation community types were described for the site as depicted in Figure 14. Communities range in age and origin from native mature forests, down to sand barrens and fen-like wetlands resulting from aggregate extraction, and newly formed meadows on recent fill materials. In between these extremes are mid-aged post-agricultural communities such as conifer plantations and semi-grown over successional habitat types.

The largest forest patch is 107 hectares, but a large portion of this patch extends into and includes the neighbouring Greenwood Conservation Area. The forested portion of the Brock Lands accounts for approximately 24% of the property. Of the 76.7 hectares of forest within the study area, 40.7 hectares can be characterized as mixed and coniferous; 27 hectares as white spruce (*Picea glauca*) or blended conifer plantation with small areas of black locust (*Robinia pseudoacacia*) plantation; and 8.9 hectares as deciduous forest.

Sixteen types of successional semi-woody habitat cover 32 hectares, representing 10% of the study area's natural cover. This habitat is scattered across the site, occupying formerly agricultural lands and areas disturbed by aggregate extraction.

Meadow communities account for 114 hectares or 35% of the total natural cover. These are located on recently abandoned agricultural fields and disturbed areas related to the landfill. The majority of these communities are native, with smaller areas dominated by exotic species.

Wetland communities comprise approximately 89 hectares or 27% of the site's total natural cover. Swamp habitats dominate the wetland types, totaling 53 ha with coniferous, mixed, deciduous/shrub thicket communities. Marsh habitats total 14.9 ha with forb mineral meadow marsh and hybrid cattail (*Typha* x *glauca*) mineral shallow marsh being the most abundant. Other types include horsetail mineral meadow marsh and invasive dominated wetlands such as common reed (*Phragmites australis*) mineral meadow/shallow marsh and purple loosestrife (*Lythrum salicaria*) mineral meadow marsh. There are more than 20 ha of fen-like communities that have developed because of aggregate extraction activities exposing groundwater. A number of flora species of conservation concern have been observed in these habitats.

Approximately 8.6 hectares or 4% of sand barren area, including a portion with clay soils, are the remnant features of aggregate extraction. These open communities have harsh dry conditions and support several flora species of conservation concern.

Eighteen vegetation types at Brock North are ranked L1 to L3 (13 wetland types, 4 sand barren types and 1 successional woodland type) are of conservation concern representing 14% of the total natural cover. All of the forest communities are of conservation concern because of their extent, mature age and intact native-dominated ground layer. A total of 539 flora species were documented at Brock North, including 94 L1 to L3 plants, 14 of which are regionally rare.

2.2.2 Invasive Species

With a few exceptions, invasive species have not taken over large areas of Brock North. The greatest threat to upland habitats is dog-strangling vine (Cynanchum rossicum). This plant has been observed in successional areas in the northwest and central parts of Brock North and in patches in the plantations on the east side. This plant is a formidable threat to natural systems and without intervention will likely become the dominant ground layer species in most upland habitats, except for mature forests. Biological control is the best long-term hope for managing it. Asiatic bittersweet (Celastrus orbiculatus), another strangling type of vine is also present at Brock North. There is a large colony of this woody vine, originally planted and currently localized, at the Pickering Museum. It can genetically swamp the native American bittersweet (Celastrus scandens), which is also present at Brock North.

Fortunately, garlic mustard (*Alliaria petiolata*) is vastly localized at Brock North, being restricted to a disturbed area of swamp in the northwest where the water table has been lowered. It is however, likely to spread along trails.

Scots pine (*Pinus sylvestris*) is vigorously regenerating in the better-drained fen and adjacent aggregate pit habitats. The main threat that this tree poses is that it could shade out sun-loving fen specialists. Common reed (*Phragmities australis*) is also a significant threat to the fen and marsh habitats. A number of areas are dominated by monotypic stands of common reed, especially along the watercourse and ponds in the south-central part of Brock North, and in a few openings along Brougham Creek. Hybrid cattail is even more dominant along the disturbed watercourse in the south-centre part of Brock North.

2.2.3 Brock South Natural Cover

Vegetation community mapping dates from 2002 and covers less than half of the Brock South site. A brief site visit was undertaken in November 2010. Detailed inventories are currently planned or underway.

Most of the site is represented by successional vegetation communities, including areas that have been disturbed since 2002, as shown in Figure 14. The northwestern portion of the site was not included in the 2002 mapping exercise. This area has been largely covered by fill since 2002 and young meadow vegetation covers this area. Sand barrens communities are concentrated in the northeastern and central parts of Brock South, including along an abandoned railway spur. While these areas are of high conservation concern, they are the result of aggregate extraction activities. The southeast portion of the site includes small areas of mature coniferous and mixed forest. Black locust plantation, including areas with coniferous

plantation, are located in the northeastern section of the property and have a heavy component of invasive exotic species.

Overall, the range of habitats and species is similar to Brock North. The partial survey of Brock South revealed 111 vascular plants and 29 L1 to L3 species of regional concern.

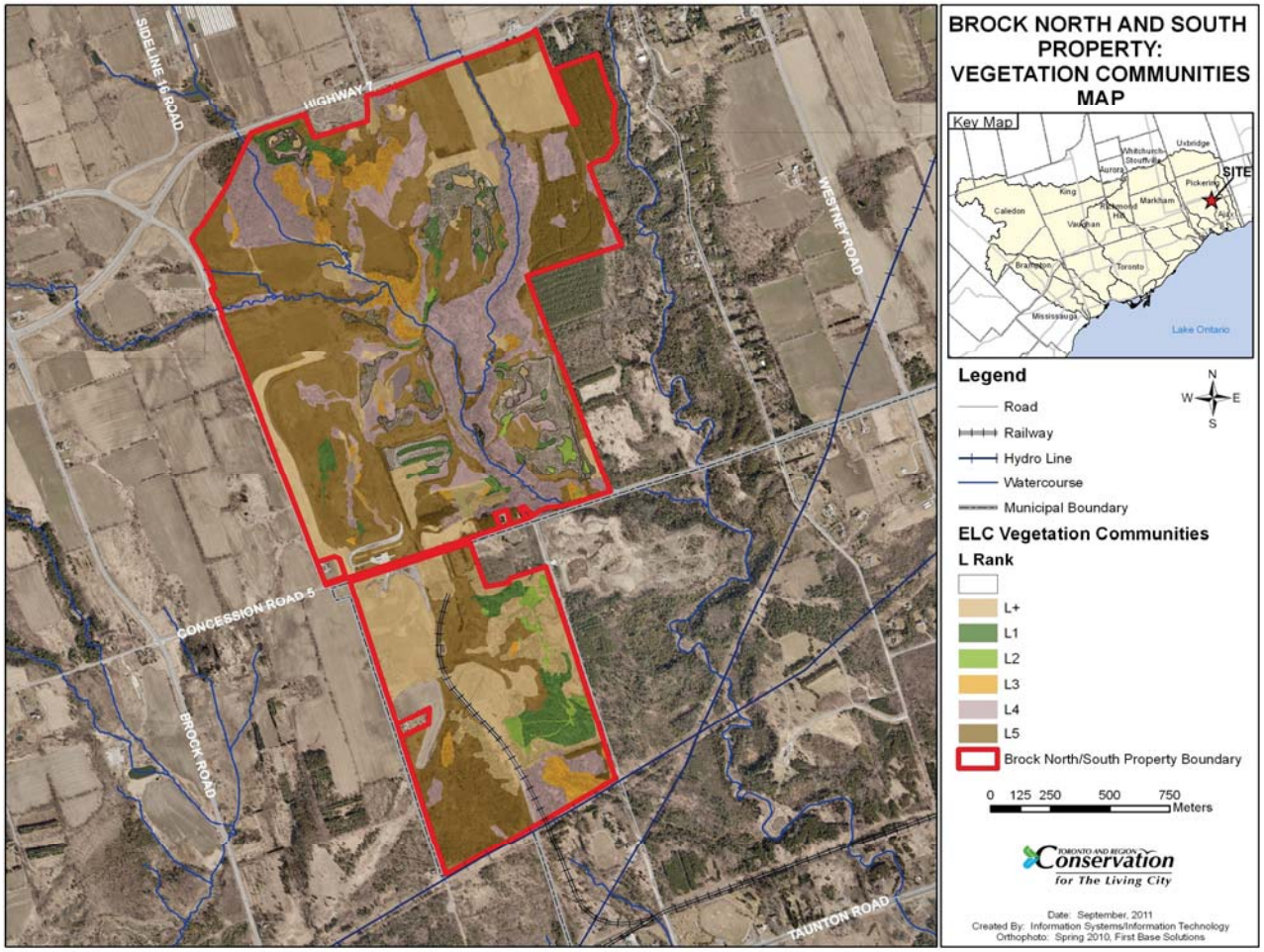

Figure 14. Vegetation communities

2.2.4 Brock Fauna

Fauna surveys were undertaken through field surveys and remote camera images. Surveys were undertaken during the appropriate times of year to capture breeding status of birds and amphibians. Cameras were deployed in suitable habitats where wildlife trails and signs of use had been previously noted.

A total of 103 vertebrate fauna species were recorded for the Brock Lands. Fauna surveys at Brock North reported 33 species of regional concern including 25 bird species; one mammal species; and seven herpetofauna species. Two species of concern documented at Brock North are listed on the provincial Species at Risk list. Common snapping turtle (*Chelydra serpentina*) is listed as special concern by the province, while Bobolink (*Dolichonyx oryzivorus*)

is listed as threatened at both the provincial and federal levels, and is therefore afforded protection under Ontario's Endangered Species Act (2007).

Brock South contains many of the habitat features that have been identified within the Brock North study area and as such presents many similar breeding opportunities for fauna species which have been found to the north of Concession Road Five. Much of the more open area has not yet been formally surveyed, however, the more closed, forested and shrubby habitat in the south portion of the site was surveyed extensively in 2002 as part of the TRCA's A9/A10 inventory. The 2002 survey identified a very similar avifauna to that listed for Brock North in 2010, with good numbers of sensitive species such as Eastern Towhee (*Piplio erythrophthalmus*), Blue-winged Warbler (*Vermivora pinus*) and Nashville Warbler (*Vermivora ruficapilla*), together with sightings of three broods of Ruffed Grouse (*Bonasa umbellus*) – a species that was not reported for Brock North during the breeding seasons in either 2008 or 2010.

2.2.5 Natural Heritage Recommendations

As noted in the Terrestrial Natural Heritage System Strategy (TRCA, 2007), natural heritage recommendations support regional targets within TRCA's jurisdiction. The overall site recommendation is to protect and maximize the contribution of the Brock Lands to the wider natural system. Specifically, work on the site should optimize patch size and shape; minimize negative matrix influence; improve connectivity to nearby habitat; and improve habitat quality.

The larger the habitat block, the more resilient the associated flora and fauna communities are to developments within the landscape and to increased user pressure. Increasing natural cover through strategic plantings and restoration will improve patch size and shape, and facilitate the reduction of negative matrix influences. Future trail planning should consider locations of sensitive communities and direct pressure away from these areas. Habitat connectivity in the area is generally very good; however roads bordering the site represent barriers to mammal and herpetofauna movement. Efforts should also be made to retain and improve the high quality of existing habitat and to ensure that restoration work addresses the site conditions. Exotic invasive species management is recommended, as well as best management practices to reduce the spread of exotic invasives.

2.3 Duffins Creek/Aquatic Habitat

2.3.1 Brock North

From an aquatic perspective, the Brock North site is ideally situated to protect and enhance the aquatic integrity of sensitive habitats within the Duffins Creek watershed. These lands contain the confluence of two sensitive watercourses, Brougham Creek, a true coldwater stream, and Spring Creek, a coolwater stream. Brougham Creek (including lower, mid, southwest and northwest tributaries) contains sensitive salmonid species such as brook trout that require cold, clean water and often spawns directly over locations of groundwater discharge or upwellings. Brougham Creek has historically supported redside dace a nationally and provincially endangered fish species (COSEWIC, 2007; ESA, 2007; OMNR, 2011). Presence of this species at this location has not been confirmed in recent years due to the lack of fisheries surveys; however the habitat potential for this species in this system is likely high. The Fisheries Management Plan for Duffins and Carruthers Creek (FMP) identifies high discharge rates within Brougham Creek through the subject lands at 3 – 5 l/s/km, an important ecological function for

both redside dace and brook trout habitat (TRCA, 2004). Spring Creek has been identified to support a population of redside dace (OMNR, 2008). This species is likely benefiting from the cool water habitat in the watercourse and high water clarity, which enables the species to capture insect prey above the water column.

The presence of regionally rare slimy sculpin (*Cottus cognatus*) has also been noted on the property (OMNR, 2005). This species requires very cold, clean water, therefore may prove to be a critical indicator of climate change, and site specific impacts on the aquatic system, due to their reliance on cold water habitat, as well as their high site fidelity. Brock North has potential to become one of the only sites in the TRCA's jurisdiction where a climate change study on the aquatic ecosystem using slimy sculpin as a sentinel species could be carried out.

The FMP identifies both the sections of Brougham and Spring Creek through Brock North as redside dace habitat. The sands and gravels of the Lake Iroquois Plain are a recharge/discharge zone, and provide groundwater discharge in support of aquatic species such as brook trout and redside dace.

Since 2006, Atlantic salmon stocking has occurred at the adjacent Greenwood Conservation Area. The Lake Ontario Atlantic Salmon Restoration Program is a multi-year program led by Ontario Federation of Anglers and Hunters (OFAH) and the Ontario Ministry of Natural Resources to restore wild populations of Atlantic salmon to Lake Ontario and the surrounding watersheds. The program involves multiple partners and funding contributors, including TRCA (OFAH and OMNR, 2011). It is expected that if the project is successful, once adults return to spawn (starting as early as fall 2011) they will utilize Brougham and Spring Creek.

Restoration of the Brock Lands will mean improved habitat for these at risk species. Further, these lands may be critical to the survival of redside dace within Duffins Creek given the planned future development within the watershed. Redside dace are known to occur on the Brock North lands, along most of the Spring Creek subwatershed and along parts of the Brougham Creek subwatershed, which are within the Greenbelt planning area (OMNR, 2008). The fate of redside dace in Ganatsekiagon Creek is uncertain because of potential impacts associated with the development of the Seaton Lands. The Brock North property may become one of only a handful of TRCA properties where the long-term survival of the species can be ensured.

For aquatic habitat management purposes the various portions of Brougham Creek have been divided into sections as outlined in Figure 15. More detailed information on these stream sections, as well as Spring Creek, is provided below.

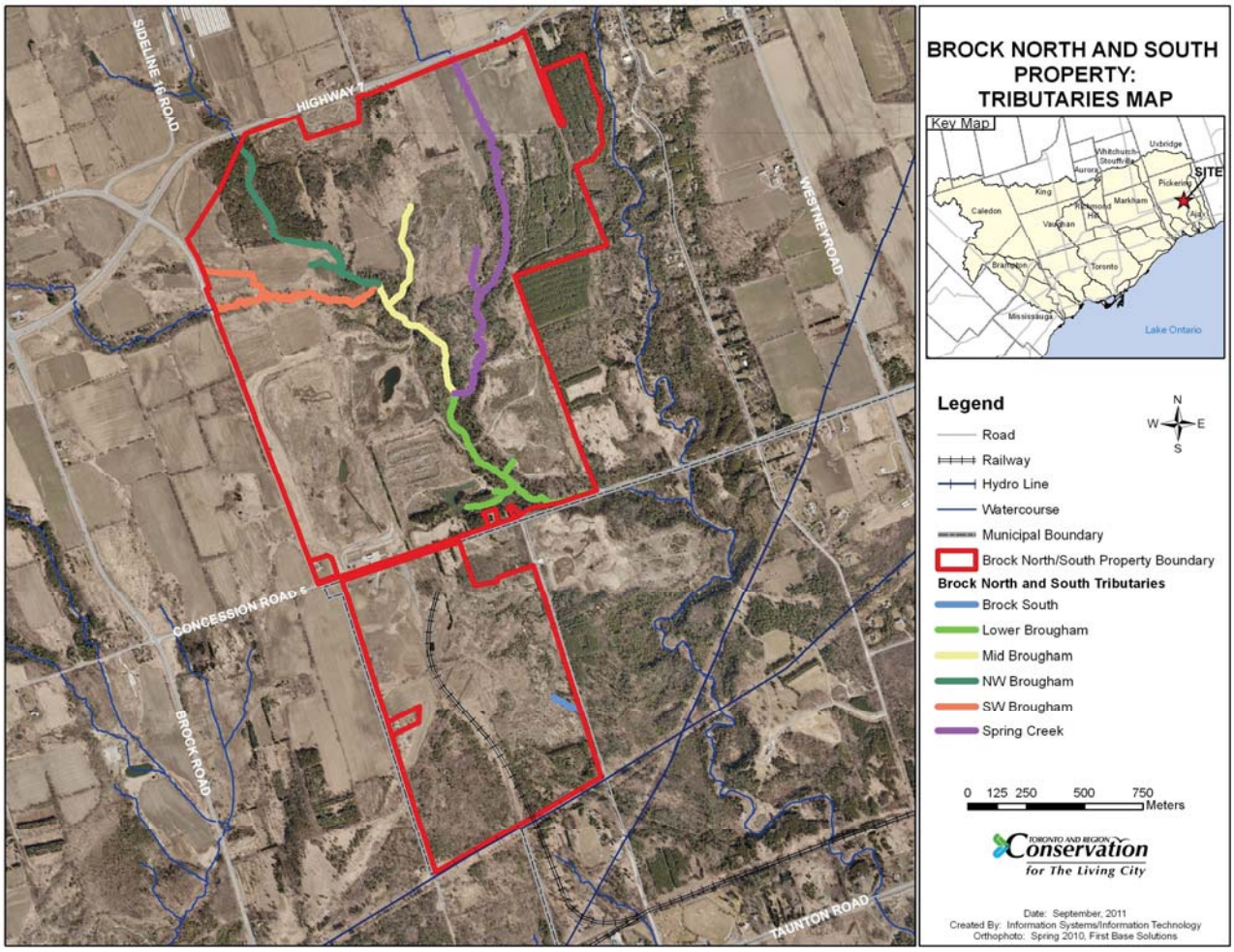

Figure 15. Duffins Creek tributaries located within the Brock Lands

2.3.1.1 Lower Brougham Creek

This section of stream receives the combined flow from the various tributaries including Spring Creek, Mid Brougham and several smaller unmapped tributaries. It provides a corridor from East Duffins Creek upstream to the smaller tributaries and also provides spawning and nursery habitat for migratory salmonids including rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), Chinook salmon (*Oncorhynchus kisutch*), and Coho salmon (*Oncorhynchus tshawytscha).* There are numerous beaver dams on this section of stream, most of which are no longer active. Some of these old dams may be a barrier to fish movement and will be assessed to determine if mitigation is required to facilitate fish passage. An undersized, perched culvert at the access road crossing is a fish barrier that will be mitigated. A portion of Lower Brougham Creek runs parallel to, and then under Concession Road Five, receiving road runoff and impacting water quality. Efforts should be made in future to mitigate these impacts.

2.3.1.2 Spring Creek

This tributary does not receive the same quantity of groundwater input as the tributaries further to the west and represents coolwater habitat. Habitat associated with the northern portion of the stream has been impacted by channelization and past agricultural practices. The lower portion has a natural channel and flows through a conifer stand that provides shading. There are also several old beaver dams on this tributary that should be assessed to determine if

mitigation is required to facilitate fish passage. Redside dace have been captured in several pools of Spring Creek in the vicinity of Highway 7 (OMNR, 2008) and it is likely that they also inhabit pools further downstream.

2.3.1.3 Mid Brougham Creek

This section of stream flows through a mature forest and provides spawning and nursery habitat for migratory salmonids and a corridor to upstream habitats. There are several old beaver dams, as well as some active beaver dams, that should be assessed to determine if mitigation is required to facilitate fish passage. The partially blocked road culvert under the access road is impeding fish passage upstream to the Northwest Brougham and Southwest Brougham tributaries and should be mitigated.

2.3.1.4 Northwest Brougham Creek

This tributary receives an abundant supply of groundwater and contains the best quality coldwater habitat on the property, as observed by TRCA staff during site visits in 2010. Brook trout inhabit this section, as well as brown and rainbow trout. The northern portion of this tributary flows through a mature cedar forest that helps maintain the coldwater habitat. The southern portion of this tributary flows through open meadow habitat and the channel is very sinuous with numerous eroding stream banks. This tributary is impacted by upstream land use practices north of Highway 7. The stream is receiving a heavy sediment load and the channel is unstable due to significant fluctuations in flow causing water levels to change more rapidly than they would under a more natural flow regime.

2.3.1.5 Southwest Brougham Tributary

This tributary enters the west side of the property through a perched culvert that conveys flow under the 16th Sideline. The culvert has been identified as a barrier to fish passage. There are several springs and seepage areas that contribute groundwater to the stream. The channel flows through open meadow habitat and there are numerous eroding banks. An access road has a level crossing with the stream and has caused the channel to braid.

2.3.2 Brock South

Much of the Brock South site has been impacted by previous aggregate extraction operations. The west portion of this property has surface drainage features that are normally dry. The mid and east portions have numerous wet areas where the groundwater table is at or near the surface. The many seepage areas eventually join to form a permanently flowing stream channel near the east boundary of the property as illustrated in Figure 15. The Brock South tributary crosses under Church Street and flows east to join East Duffins Creek in Greenwood Conservation Area. Erosion rills are present along the banks, which is a potential source of sedimentation downstream. Further downstream, prior to the channel joining the main Duffins Creek in Greenwood Conservation Area, a large wetland and berm are present. Fisheries data is lacking for this tributary, therefore it is unknown if the wetland and berm are preventing fish passage. Fisheries surveys should be conducted to determine fish barriers and to assess the fish community.

2.3.3 Duffins and Carruthers Creeks Fisheries Management Plan Targets

The recommendations set forth in the FMP will be considered while planning and implementing the aquatic restoration recommendations for the Brock Lands. Specific aquatic management

components from the FMP that relate to the restoration planning of the property include: water quality and quantity, instream barriers, riparian vegetation, altered watercourses, wetlands, target species and species at risk.

The Brock Lands contain significant areas of both high recharge and discharge, with past extraction operations having exposed groundwater discharge areas. Following recommendations set out by the FMP, these areas need to be protected to maintain and/or enhance baseflows and ensure the provision of ecological functions.

Overall, the FMP recommends strategic instream barrier mitigation, noting that it is critical to rehabilitating stream functions and biological communities (TRCA, 2004). Removing barriers entirely is the preferred method to mitigating the impacts. While the FMP only identifies two potential barriers on the perimeter of the property, further field studies have identified numerous additional barriers that require removal or mitigation. Restoration efforts should focus on removal of those barriers that most impact fish migration, especially those limiting brook trout, Atlantic salmon and redside dace movement.

A high priority recommendation of the FMP is the planting of riparian vegetation. Management targets for riparian vegetation suggest 100% stream length should be naturally vegetated, 75% of which should be with woody vegetation (TRCA, 2004). Both the headwaters of Spring and Brougham Creek have been identified in the FMP as requiring woody riparian vegetation enhancements.

Numerous watercourses within the Brock Lands have been altered and require habitat rehabilitation. The FMP suggests the use of techniques that mimic natural process, such as implementing natural channel design instead of 'hard' techniques that inhibit natural processes, such as concrete channels (TRCA, 2004). As recommended by the FMP, restoration of altered segments of watercourses should be site specific and employ natural channel design principles, bioengineering, instream habitat improvements, and riparian plantings (TRCA, 2004).

Aquatic restoration that takes place on the property must also ensure the protection and restoration of habitat for target species including brook trout, Atlantic salmon and redside dace. The FMP provides a framework for fisheries management and promotes the rehabilitation of degraded fish communities and fish habitat, for self-sustaining native stocks. It can be used through the planning and implementation of restoration works to ensure the protection and enhancement of the biological integrity of the aquatic ecosystem at the Brock Lands.

2.4 Cultural Heritage and Archaeological Resources

The Duffins Creek Watershed has been inhabited by people since the glaciers retreated 10,000 to 12,000 years ago. The watershed's natural resources such as ponds and stream corridors supported abundant flora and fauna, which in turn attracted early nomadic Aboriginal groups, followed by year-round agricultural villages. In the area surrounding the Brock Lands, European settlers established communities for agricultural purposes, and to utilize the extensive forests for lumber resources in the late 18th century. Archaeological sites and cultural heritage features within and surrounding the Brock Lands provide a record of past land uses and ownership. Among these known heritage sites is the former location of the Brougham Post Office, established circa 1836. To ensure that cultural and archaeological resources are protected at the Brock Lands TRCA will ensure the following:

- Staff will conduct an archaeological assessment and notify appropriate agencies prior to all land use modifications;
- Compliance with TRCA practice to avoid and protect archaeological sites on TRCA property whenever possible (Alteration of development plans to avoid identified archaeological sites will be encouraged.); and
- Where avoidance is not possible, mitigation may be carried out by TRCA archaeology staff.

Further cultural heritage information for the Brock Lands and surrounding area may be found in Duffins Creek State of the Watershed Report (TRCA, 2002a), and A Watershed Plan for Duffins Creek and Carruthers Creek (TRCA, 2003b).

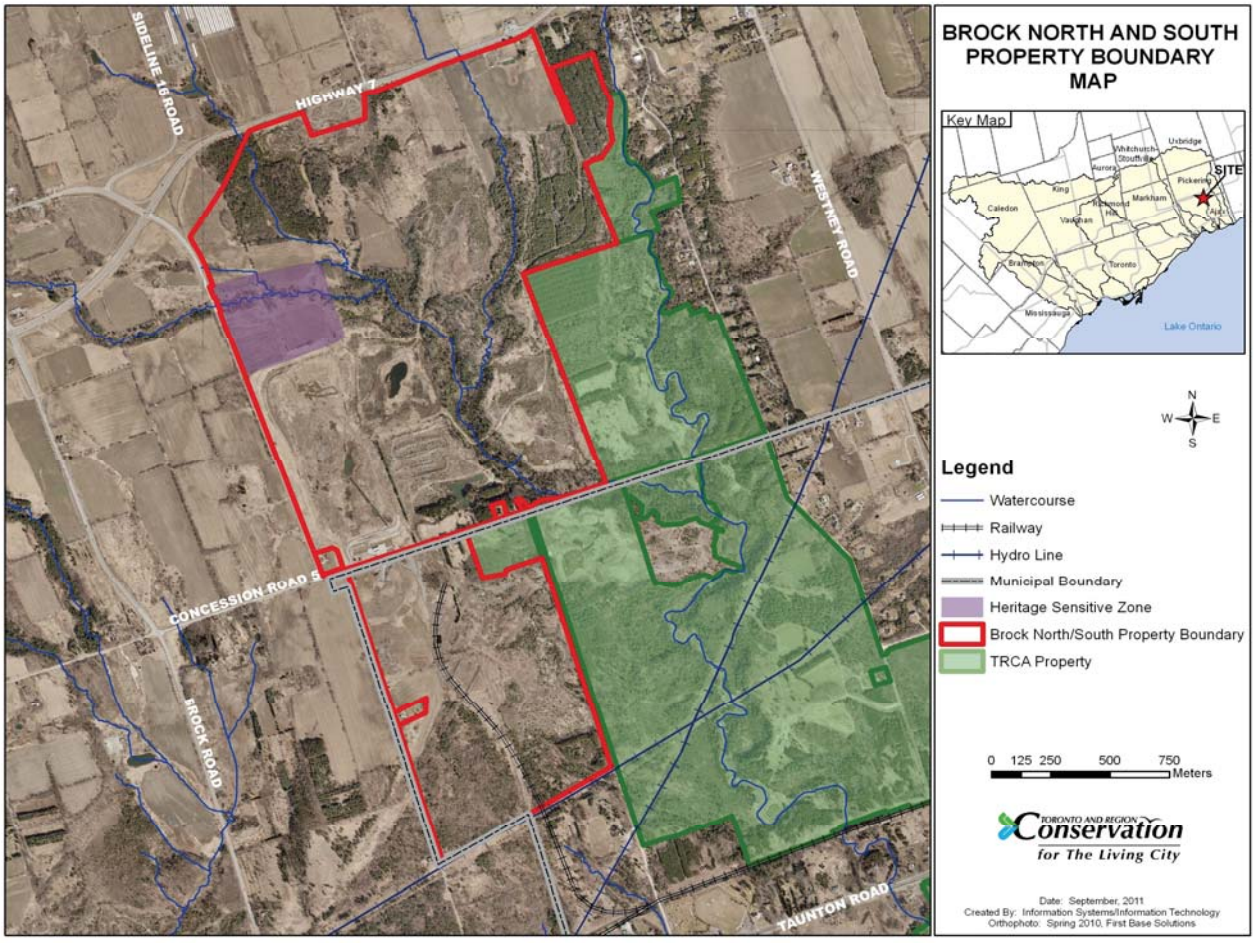

Figure 16. Heritage resources and sensitive zones

2.4.1 Trails

With connections to the Greenwood Conservation Area and the planned natural system of the Seaton lands, the Brock property has a huge potential to make a significant contribution to the natural heritage and biodiversity of Duffins watershed. As a result, all public use must be carefully planned, developed, and monitored to ensure the long-term sustainability of the property.

Informal trail systems place additional pressures on the natural features and functions of the site. Current use of the property has been documented by TRCA staff, including off-leash dog walking, trail hiking, all-terrain vehicle (ATV) use, snowmobiling, and mountain biking. ATV tracks have been observed in the southeast corner of Brock North, while snowmobile tracks were observed within Brock South. Mountain biking trails, ramps, and bridges have been found within the northeast corner of Brock North, with a few unauthorized bridges constructed to cross portions of Spring Creek. These bridges should be removed as they currently pose a safety risk to users, while other informal trails and recreational uses should be assessed to determine if they will become part of the future formal trail system of the Brock Lands. Undesired trails should be decommissioned and the areas restored.

TRCA will work with the Town of Ajax, City of Pickering and the Trans Canada Trail Committee and other stakeholder groups to develop a formal trail plan for the property during the Master Plan process. The trail system should promote passive nature based recreation that will have minimal impacts on the sensitive natural features and functions of the site. When designing the trail system it will be important to take into account the sensitivity of the site's current natural system, as well as the planned restoration work. Consideration of all potential natural heritage impacts should include: ensuring that trails avoid areas where communities of concern and/or sensitive species have been identified, and where possible avoid transecting interior forest and stream channels. Trail planning and development should also adhere to the guidelines set forth in TRCA's Trail Planning Guidelines (MTRCA, 1992), and the polices of the Valley and Stream Corridor Management Program (MTRCA, 1994).

Several established trail systems are situated within the area surrounding the Brock Lands. Linkages to existing and planned regional and municipal trail systems should be considered to maximize public use and recreation opportunities. Possible trail linkages could be established with the Trans Canada Trail, Greenwood Conservation Area Trail, and the Rodar Property Trail. A connection to the Trans Canada Trail will provide access to the Oak Ridge's Trail to the north and the Waterfront Trail to the south. Potential for a trail linkage to the southwest of the Brock Lands through the planned Seaton community also exist.

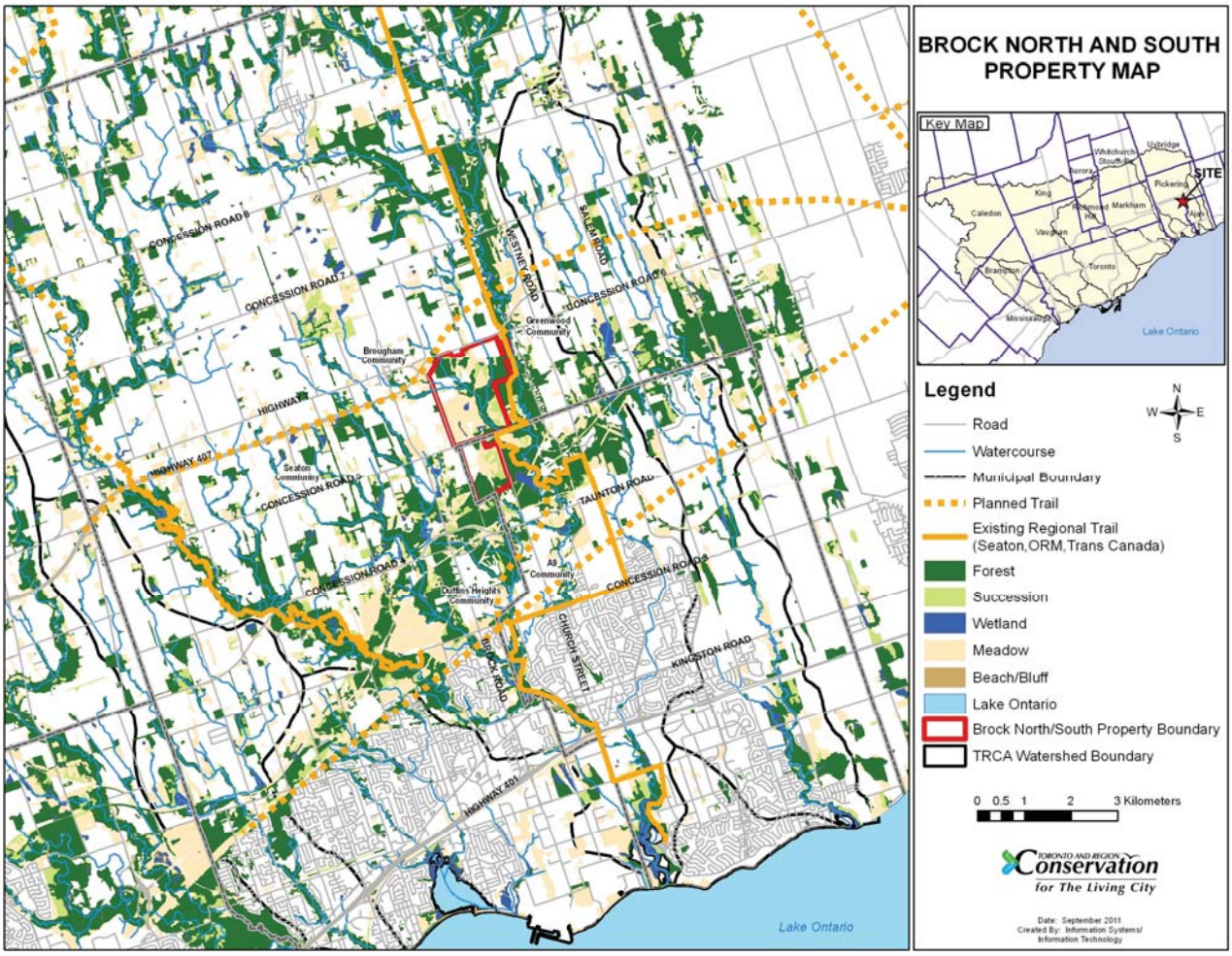

Figure 17. Existing and planned regional and local trail network

2.5 Adjacent Land Uses and Socio-Economic Conditions

Land uses immediately adjacent to and surrounding the Brock Lands will influence the ecological function of the natural heritage system of the area. As a general rule, adjoining natural cover is beneficial, while agricultural uses exert a moderately negative influence and urban uses, such as roads, housing developments and supporting infrastructure, exert a strongly negative influence.

The entire Brock property is situated in the Southern Ontario Greenbelt, and partially occupies two municipalities, the City of Pickering and the Town of Ajax. Immediately adjacent to the site are the Rodar Property and Greenwood Conservation Area to the east and agricultural and natural lands to the west and north. The outlying areas surrounding the Brock Lands will be urbanized in the coming years with future developments planned in both Ajax and Pickering; however, the immediate areas adjacent to the Brock property in both Ajax and Pickering depict lands remaining primarily rural (GCAMP et al, 2004). Both current and future land uses will have an influence on the ecological features and functions of the property. Programs like TRCA's Urban Forest Study for Pickering and Ajax can provide recommendations to minimize negative influences on the property's natural system.

The area immediately northwest of the Brock Lands is owned by Transport Canada and while currently dominated by agriculture or natural greenspace, they may become part of a proposed airport in the future (GCAMP et al, 2004). Although the proposed airport has not been confirmed, the restoration of the Brock Lands will help buffer the effects of future airport development.

The property's location in the southern portion of the Duffins Creek watershed, close to urban centres and new developments, makes it an important area for the provision of greenspace and natural ecosystem processes within the surrounding urbanizing environment. The existing natural greenspace corridors to Greenwood Conservation Area and Claremont Conservation Area create a network of connected natural areas necessary to sustain ecological function and facilitate wildlife movement. Connections between these natural areas should be protected and enhanced to help mitigate the effects of urbanization on species movement and habitat.

While consideration of the impacts of land use of the immediate surroundings is crucial, it will also be critical to consider the impact of the proposed large-scale developments. Although the proposed changes and developments to the landscape may seem far removed from the Brock Lands, their impacts will most definitely be felt over time. In the longer term, the overall increase in surrounding development, impervious surfaces, infrastructure, noise and light pollution, increased surface water runoff and human populations, among other impacts, will have a negative effect on the overall ecological conditions of the Brock Lands. It is important to ensure the continued protection, enhancement and restoration of the property so that it may contribute to the broader overall ecosystem of the municipalities of Ajax and Pickering, as well as Durham Region in general.

2.6 Road Networks

A number of roads surround the subject property, which will provide access during implementation of restoration works and influence consideration for future public use and access to the site during master planning. The property is bisected by Concession Road Five, which is also referred to as Whitevale Road. The road is located in both the Town of Ajax and the City of Pickering and is considered a two-way arterial road which is managed by Durham Region. It contains residential properties on both sides. The northern limit of the property is bounded by Highway 7. Highway 7 is a two lane rural arterial undivided Kings Highway, which is currently under construction to accommodate four lanes from Brock Road in Pickering to Baldwin Street in the Town of Whitby. Greenwood Road is the closest roadway to the east of Brock North, with residential properties along its east side. Greenwood Road is classified as a collector road. South of Concession Road Five, Church Street forms the eastern boundary of Brock South. It is considered a local street and forms the western border of Greenwood Conservation Area. Sideline 16 Road is located on the western boundary of the property and is considered a local street, with residential properties on both sides. Brock Road is located to the west of the Brock Lands and is an arterial road located in the Town of Ajax and City of Pickering. The City of Pickering has selected a preferred option to re-align the road around the Hamlet of Brougham as shown in Figure 18. Figure 18 also identifies the future expansion of 407 East to the north of the property.

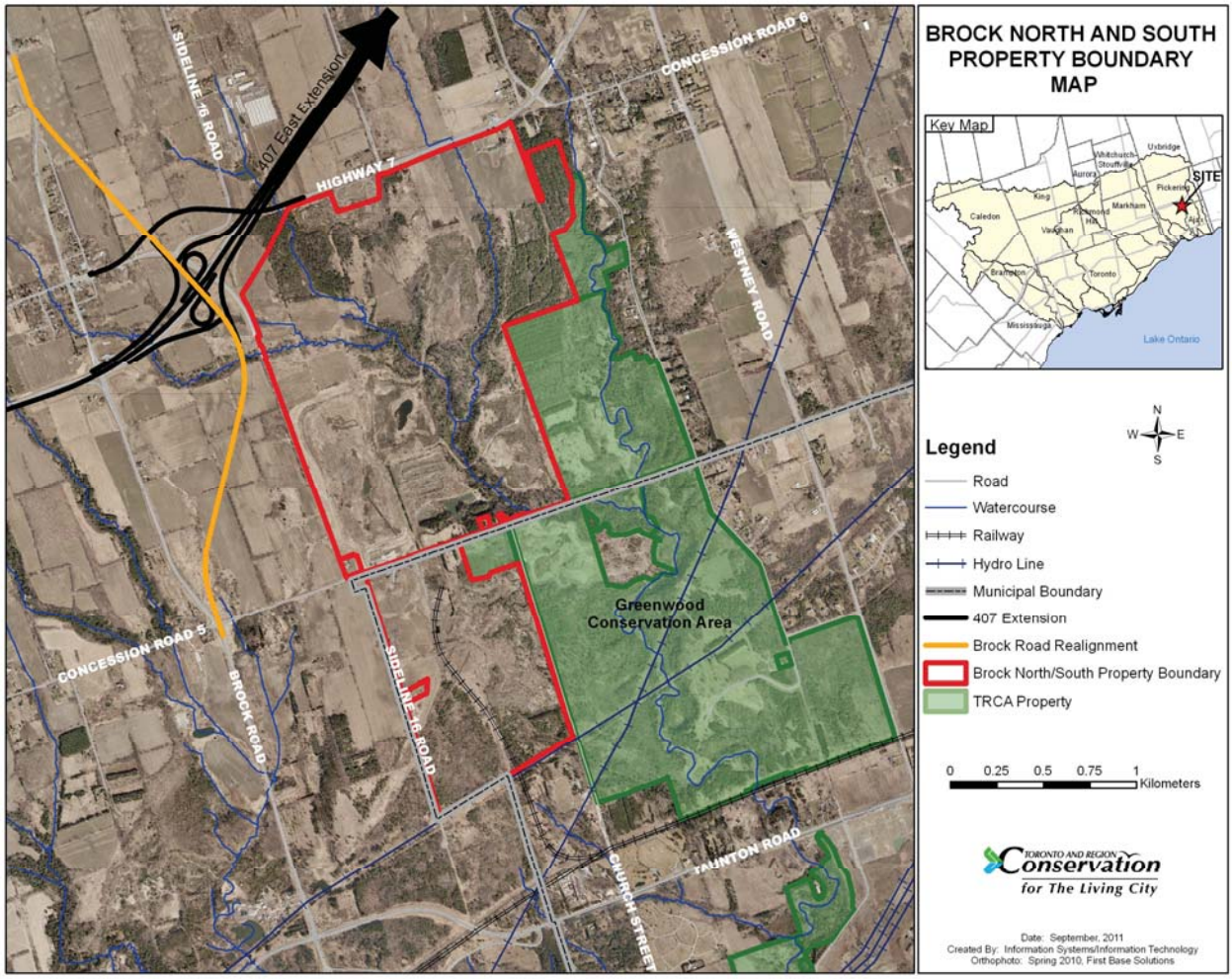

Figure 18. Transportation routes

2.7 Potential On-Site Land Uses

The City of Pickering has expressed an interest in obtaining a portion of Brock North for a proposed future expansion of the Pickering Museum, as well as a district park facility. The Town of Ajax supports passive recreational uses and trails for the Brock South site. TRCA will work closely with both municipalities to address the recreational needs of the community in a sustainable manner.

With this expressed interest in a variety of uses for the property, including outdoor recreation and ecological restoration, the provision of public uses on the property must consider the economic factors and the recreational needs of the growing community, as well as ensure the natural landscape is protected and sustainably managed. Planning, implementation and management that incorporates the needs of the existing communities, future population growth, the surrounding land use and the natural features and functions of the site will ensure the long-term sustainability and success of the property.

2.7.1 Tenanted Properties, Site Servicing and Infrastructure

Four tenanted properties were assumed by TRCA during the acquisition of the Brock Lands from the City of Toronto. Within Brock North, two residential lease areas are located on the north side of Concession Road Five and one residential lease area is located on Sideline 16. On the Brock South property, one residential lease area is located on Sideline 16. The location and boundary of the residential lease areas is shown in Figure 19. All properties are currently under lease agreement with TRCA.

Existing buildings and infrastructure associated with the former use of the property remain on site. Within Brock North these include, however are not limited to: sump ponds, culverts, stream crossings, a leachate collection system with holding tanks, an operations yard, fencing, gravel roads, berms, spoil piles, hydro line, and water quality test wells. On the Brock South site, known infrastructure and site servicing includes a sump pond, rail line, hydro line, gravel road, culverts, fencing and water quality test wells. TRCA will prepare a strategy that investigates removal or adaptation of the above structures that helps meet TRCA's restoration and future management objectives.

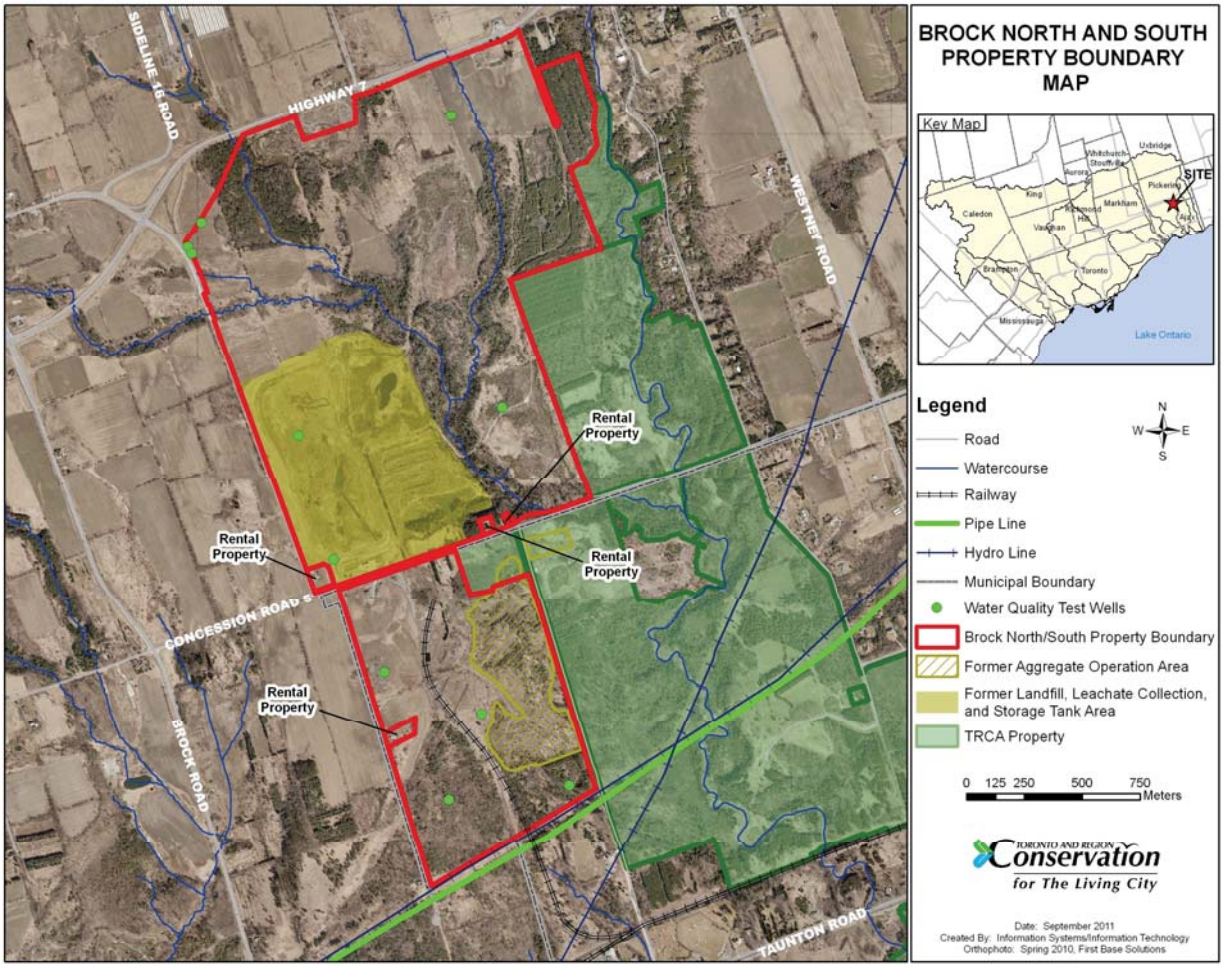

Figure 19. TRCA tenant properties on the Brock Lands and known infrastructure

3.0 RESTORATION PLAN

The terrestrial landscape and hydrologic function of the Brock Lands have been significantly altered through previous aggregate extraction and landfill operations. TRCA estimates that 143 hectares (353 acres) or 36% of the lands have been disturbed through previous land use activities which have altered the topography, drainage and ability to support historic vegetation as seen in Figure 20. Restoring these disturbed areas offers a unique opportunity to enhance habitat for a number of regionally sensitive species, including aquatic, avian and terrestrial species at risk. TRCA has prepared this Restoration Plan to achieve a self-sustaining natural system that contributes to the overall health of the Duffins Creek watershed.

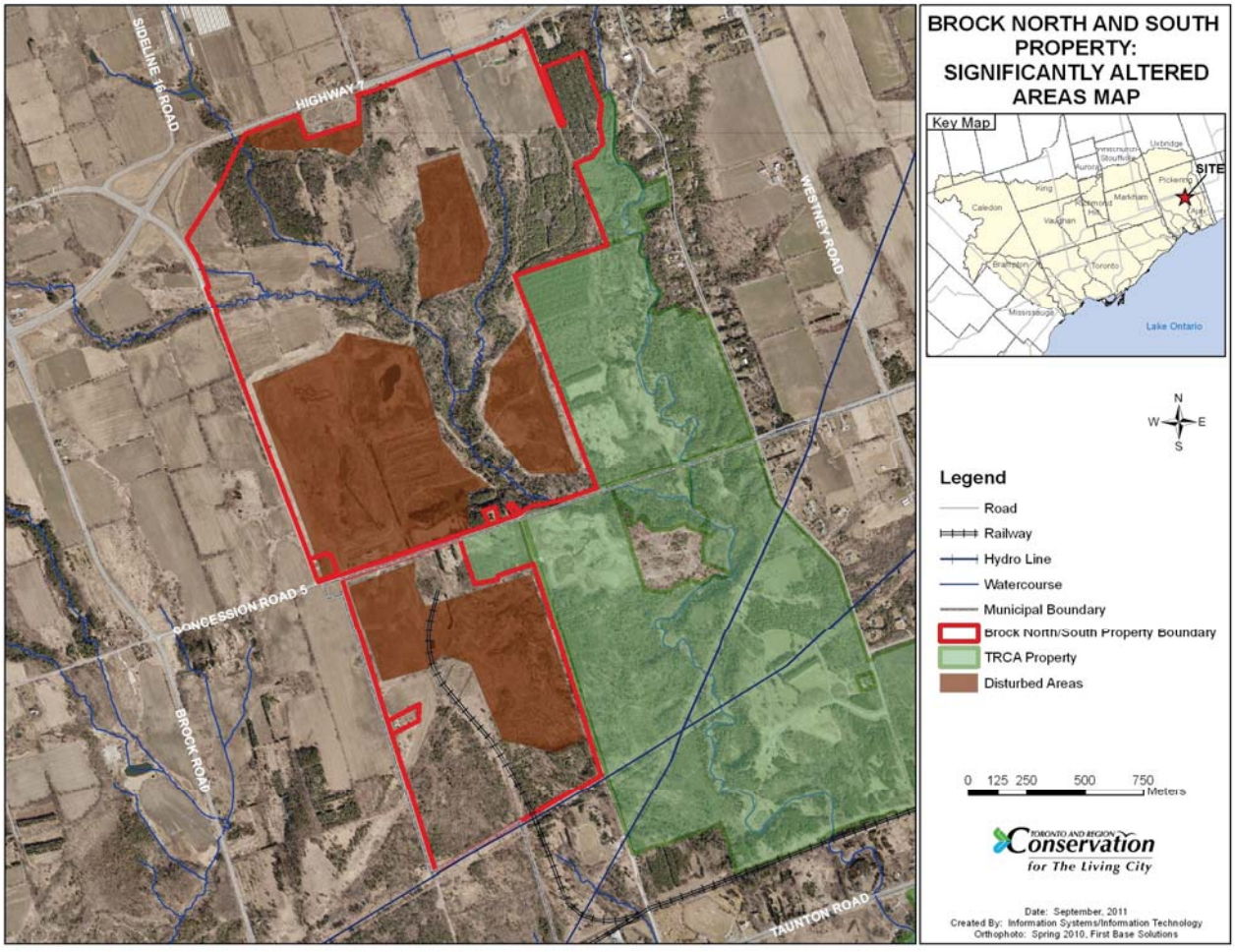

Figure 20. Areas of Brock Lands significantly altered by previous land uses

3.1 Goals and Guiding Principles

Previous landuses have severely altered the natural function of the Brock Lands. Modifications on the site have led to habitat loss, soil degradation, topography changes, and loss of native vegetation, increased erosion and sedimentation of watercourses, altered hydrology, and introduction of invasive species. Some of the undisturbed natural areas that remain on the property provide excellent quality habitat and corridor connections to adjacent natural systems.

The restoration planning process considers both the regional and local targets and consults existing documents including the Terrestrial Natural Heritage System Strategy (TRCA, 2007), the Duffins Creek and Carruthers Creek Watershed Management Plan (TRCA, 2003), and the Fisheries Management Plan for Duffins Creek (TRCA, 2004).

The Duffins Creek Watershed Wetland and Riparian Opportunities Plan (TRCA, 2008), the Pickering Lands Site Restoration Opportunities Plan (TRCA, 2010) and the Ecosystem Recovery Planning Program (TRCA, 2011) also provide insight into restoration opportunities and objectives.

The intent of the Restoration Plan is to set the framework to protect and restore the natural ecosystems function and resilience by ensuring the health and diversity of native species, habitats, landscapes and ecological processes. Top restoration priority has been given to highly altered and degraded sites, especially where multiple restoration opportunities converge. The site has the potential to become one of the most significant natural heritage parcels south of the Oak Ridges Moraine within the TRCA jurisdiction, as it is adjacent to the natural greenspace of the Seaton Natural Heritage System to the west and the Greenwood Conservation Area to the east. Restoration work on the Brock Lands will increase both ecological connectivity and critical mass habitat required to ensure biodiversity.

The Restoration Plan is centered on achieving the following objectives:

1. Improve the size and shape of habitats through restoration and protection.

2. Maximize linkages and connectivity of the natural heritage features to one another within the site and to adjacent areas (e.g. planned Seaton Natural Heritage System and Greenwood Conservation Area).

3. Build on the corridor function of the creeks and riparian zones.

4. Enhance the health of Duffins Creek watershed by restoring and protecting the cold water features of its tributaries.

5. Restore altered site hydrology and sensitive groundwater zones impacted by historic aggregate removal, agricultural use, and landfill operations.

6. Enhance landform and soil conditions to promote self-sustaining natural communities.

7. Manage for biological diversity and control invasive species.

3.2 Methodology

Restoration opportunities for successional management, terrestrial and wetland sites have been strategically catalogued and prioritized through TRCA's Restoration Opportunities Planning protocol (TRCA, 2008). The process identified, prioritized, and delineated restoration opportunities through a combination of Geographic Information Systems (GIS) analysis and onsite reconnaissance. The methodology used for identifying the restoration opportunities is represented in Figure 21. The process involved collecting and analyzing information derived from orthophotography, GIS data layers including ArcHydro modeling and a digital elevation model (DEM). Based on this data, potential restoration opportunities in the field were mapped

for further investigation. Field investigations provided a mechanism for ground-truthing modeled drainage, as well as identifying additional restoration opportunities not represented by the model. All potential restoration opportunities were then catalogued, photographed and documented. Finally, these opportunities were digitized.

Aquatic opportunities were identified through field based assessments. Field assessments consisted of photographic records, detailed field notes, and a GIS reference position. Information collected was digitized into ArcView GIS to produce a comprehensive aquatic opportunities database. Through the mapping of these opportunities general restoration themes emerged for each watercourse reach, as well as site specific opportunities. Prioritization for implementation was guided by the objectives of the Fisheries Management Plan (TRCA, 2004), and by degree of degradation and alteration.

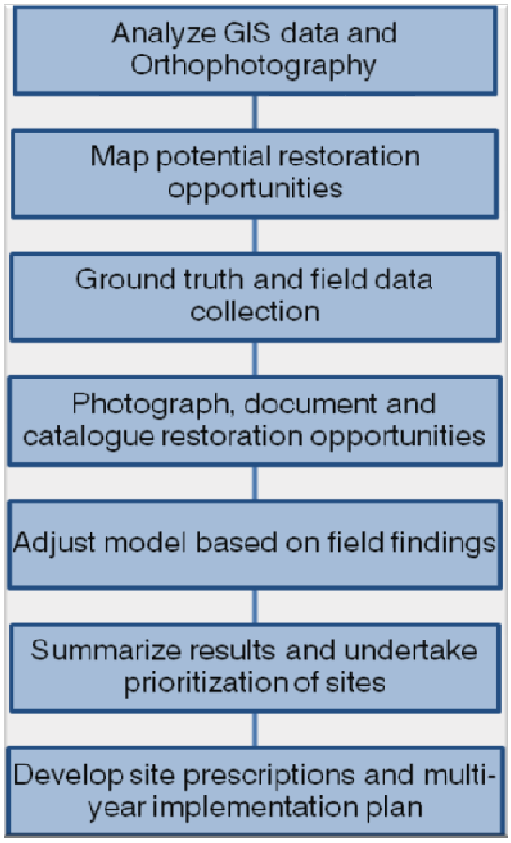

Figure 21. Methodology flow chart used for identifying restoration opportunities

3.3 Site Selection and Restoration Zones

Recommendations for the Brock Lands focus on four broad restoration strategies, including: protection, enhancement, rehabilitation, and creation. All four strategies work towards promoting ecosystem health and restoring natural function to the landscape and hydrology.

Table 2. Restoration strategies and descriptions recommended for the Brock Lands

Strategy	Description
Protection	No restorative work required. Small scale habitat features will be installed as required. Generally, natural succession areas will be monitored regularly for invasive species and for overall health.
Enhancement	Passive restoration techniques will be applied. Generally these are areas where successional communities are being established but require additional support to promote ecosystem growth and health. Enhancements will work to increase diversity, density and connectivity, manage invasive species, and remove debris and barriers.
Rehabilitation	Active restoration techniques will be utilized. These areas are those that have undergone major alterations and require restoration to reinstate natural processes and ecosystem functions. Rehabilitation work could include land regrading, invasive species removal, infrastructure removal, installation of critical habitats and natural channel design.
Creation	Very active restoration techniques will be utilized. These areas include severely altered landforms, drainage and site hydrology, and limited natural cover. Infilling to modify slopes, drainage and alter soil conditions will be required to restore native vegetation, and terrestrial and aquatic ecosystem function.

3.3.1 Terrestrial Restoration Objectives

Potential sites were assessed by TRCA to identify priority terrestrial restoration opportunities within the Brock Lands. The property has many large areas with varying levels of disturbance and stages of succession. As a result, different techniques need to be applied to various areas within the property. Below is a breakdown of specific techniques that will be utilized in each of the terrestrial restoration zones.

3.3.1.1 Terrestrial Enhancement

There are many important existing terrestrial habitat communities that should be protected and expanded upon to increase patch size and improve corridor connectedness. There are also many areas where reforestation and tree and shrub plantings are appropriate. In order to mimic forest expansion and succession, tree and shrub planting composition should include pioneer species such as poplars and dogwoods. A combination of native coniferous, deciduous, and berry producing wildlife shrub nodes should be used to promote a diversity of wildlife habitats that provide food, shelter and nesting opportunities. Structural habitat features such as large woody debris, nesting structures and habitat piles should be introduced to these areas to help restore what would have been there prior to disturbance and to complement the existing and restored natural cover.

A number of unique habitat features have developed due to dramatic land alterations, including horsetail bog and meadow communities. Some of these areas should be protected to help increase habitat diversity, while some should be restored to similar historic conditions. Many areas would also benefit from soil amendments as much of the topsoil was removed during

past gravel extraction. Amended areas will be seeded to limit the colonization of non-native invasive species. Additionally, non-native invasive plants such as Scot's pine and common reed should be managed.

3.3.1.2 Terrestrial Rehabilitation

Although the Brock Lands support a number of important natural communities, much of the property is too disturbed to support natural habitat function and succession. Altered sites need to be regraded and amended to ensure appropriate topography, soils and drainage features are in place to support a natural system function. There are many sites where utilizing various reforestation techniques are appropriate. In order to mimic forest expansion and succession, tree and shrub composition should be represented by pioneer species such as poplars and dogwoods. A combination of native coniferous, deciduous and berry producing wildlife shrub nodes should be used to promote a diversity of wildlife habitats that provide food, shelter and nesting opportunities. Former agricultural fields should have drainage tiles removed and be planted with conifer seedlings using mechanical reforestation, with random hand planting of tree and shrub nodes. All newly disturbed areas (e.g. cultivated and regraded sites) will be seeded with a nurse crop to limit the inclusion of non-native invasive species. Structural habitat features such as large woody debris, and nesting structures should be added to these areas to complement the existing and restored natural cover. Additionally, non-native invasive plants will need to be managed.

3.3.1.3 Terrestrial Creation

The approach throughout the creation zones will utilize the most active restoration techniques such as major grade alterations and the placement of imported topsoil and clean fill. This work will not encroach on existing significant vegetation communities that are to be retained or important restoration areas that do not require major modifications. Furthermore, the work should be reflective of supporting the natural hydrologic and terrestrial system function.

In some cases, creation sites should result in the creation of hummocky topography to diversify natural vegetation communities by offering a variety of microclimates, sun exposures, and soil moisture conditions. Consideration will also be given to the creation of landforms that provide a physical buffer from adjacent incompatible land uses (roads, future residential and industrial developments). All disturbed areas will be cultivated and seeded to limit the inclusion of non-native invasive species. Structural habitat features such as large woody debris, nesting structures and habitat piles will also be utilized in these areas.

3.3.2 Drainage Restoration Objectives

Sites were assessed by TRCA to identify priority drainage restoration opportunities within the Brock Lands. Drainage areas were defined by the modeled 2.5 ha drainage line and ground truthed to confirm the location of important headwater areas, both ephemeral and permanent.

Many of the drainage features are greatly lacking in vegetative cover. Priority should be directed at planting appropriate areas to promote connections between existing forest patches and other habitat types, and to increase riparian cover along headwater drainage features and permanently flowing creeks.

Prior aggregate extraction has exposed a significant amount of groundwater to the current surface topography. Restoration should focus on increasing the interstitial zone between

surface and groundwater. More natural site topography should be created by reshaping the land to restore natural drainage and surface flows. Work should also focus on utilizing existing topographic features and restoring altered areas to promote wetland habitat. Specific techniques that will be utilized in each of the drainage restoration zones are outlined below.

3.3.2.1 Drainage Enhancement

There are many ephemeral drainage areas and riparian zones that need to be naturalized and revegetated. Tree and shrub composition should represent native pioneer species appropriate to wet features. There are a number of wetland features that are remnants of past land-uses that can be enhanced through subtle recontouring and planting to provide habitat, as well as water quality and quantity benefits to the natural system. The introduction of log tangles and nesting structures will help provide additional habitat.

3.3.2.2 Drainage Rehabilitation

A strong focus on restoring the hydrologic regime and natural watershed drainage of the site is required. Due to the high level of disturbance, some areas require an active restoration approach to ensure a successful natural drainage system function. Regrading to create appropriate topography, soil amendments, and the removal of old infrastructure (above and below ground) are needed to allow proper drainage of the land and to sustain wetland habitat.

In some cases drainage features run through fallow agricultural fields. Some of these fields are suspected to contain tile drains that should be removed to re-saturate soils and promote the establishment of wetlands. Many areas have also been ditched to drain the surrounding lands or have sump ponds, which were historically used to extract ground water in excavated areas to facilitate aggregate extraction. These old ditches and sump ponds should be decommissioned to promote natural drainage and water retention or the establishment of wetlands. Planting efforts within these newly restored areas and adjacent riparian zones will utilize native pioneer species which are suited to wet soils.

3.3.3 Aquatic Restoration Objectives

All watercourses found within the Brock Lands were assessed by TRCA to identify priority restoration opportunities. The assessed watercourses were generally in good condition; however, a variety of issues consistent within the overall site condition and some that were more specific to a given reach were also documented. More common aquatic concerns are centred on fish access, channel braiding, erosion and sedimentation. The target for the aquatic system is to maintain good quality, continuous habitat that is consistent with a natural coldwater system. In relation to fish management, target species include redside dace, rainbow trout and Atlantic salmon. Table 3 provides a breakdown of specific techniques that should be utilized in each of the stream reaches.

Aquatic restoration strategies have been divided into two general categories based on the level of required intervention. Work within enhancement areas will utilize more passive techniques to support and promote succession, while rehabilitation areas will utilize more active techniques to deal with major alterations and restore natural system function.

Table 3. Brock Lands aquatic restoration strategies

Lower Brougham	***Enhancement*** Remove barriers to fish passage, including natural debris, beaver dams and remaining infrastructure. Degree of removal should be based on fish management objectives. Utilize bioengineering techniques and riparian plantings to minimize erosion and prevent siltation. Address unauthorized recreational uses such as mountain biking and ATV trails that are negatively impacting the natural stream processes. Techniques include removal of structures (ramps and informal stream crossings), restricting ATV access and designing a site appropriate recreational trail system. ***Rehabilitation*** Beyond typical enhancement work, there are two major crossings affecting Lower Brougham Creek. It is recommended that both crossings be removed and be replaced with an open channel (and a span bridge if needed). The crossings vary in size and degree of work, but both are important to achieve stream restoration. The work will involve utilizing heavy machinery to remove the crossing and restoration of the creek channel utilizing natural channel design principles.
Online Pond	***Enhancement*** The outlet to the online pond is plugged with vegetation and sediment causing elevated water levels and flooding of the littoral zone. The long-term restoration objective of the pond is to take it offline, however in the interim maintenance of the outlet is required to achieve proper flow dynamics. ***Rehabilitation*** The pond should ultimately be taken offline to mitigate downstream thermal impacts and restore historic tributary connections to Duffins Creek.
Middle Brougham	***Enhancement*** Remove barriers to fish passage, including natural debris and beaver dams. Degree of removal should be based on fish management objectives. Utilize bioengineering techniques and riparian plantings to minimize erosion and prevent siltation. Address unauthorized recreational uses such as mountain biking and ATV trails that are negatively impacting the natural stream processes. Techniques include removal of structures (ramps and informal stream crossings), restricting ATV access and designing a site appropriate recreational trail system.
Southwest Brougham	***Enhancement*** Remove barriers to fish passage, including natural debris and beaver dams. Degree of removal should be based on fish management objectives. Utilize bioengineering techniques and riparian plantings to minimize erosion and prevent siltation. ***Rehabilitation*** Beyond typical enhancement, priority should be given to old crossings that are not being used and are falling into disrepair. Work involves utilizing removing the crossing and reforming a natural creek channel.

Spring Creek	***Enhancement*** Address unauthorized recreational uses such as mountain biking and ATV trails that are negatively impacting the natural stream processes. Techniques include removal of structures (ramps and informal stream crossings), restricting ATV access and designing a site appropriate recreational trail system. ***Rehabilitation*** Beyond typical enhancement priority should be given to old crossings that are not being used and are falling into disrepair. Work involves utilizing heavy machinery to remove the crossing and reform a natural creek. A straightened channel exists through the agricultural fields in the northeast section of the property. Natural channel design techniques should be investigated.
Northwest Brougham	***Enhancement*** Remove barriers to fish passage, including natural debris and beaver dams. Degree of removal should be based on fish management objectives. Utilize bioengineering techniques and riparian plantings to minimize erosion and prevent siltation. ***Rehabilitation*** Beyond typical enhancement priority should be given to old crossing that are not being used and are falling into disrepair. Work could involve utilizing heavy machinery to remove the crossing and reform a new natural creek. Braided channels should be redefined to reestablish a creek targeted for redside dace. Sections of the tributary are heavily eroded with braided channels and tortured sinuosity. Natural channel design techniques should be used to create a single naturalized channel.
Brock South East Duffins Tributary	***Enhancement*** Utilize riparian plantings to minimize sedimentation and erosion. A lower priority culvert located under Church Road should be assessed for mitigation measures that would improve fish passage.

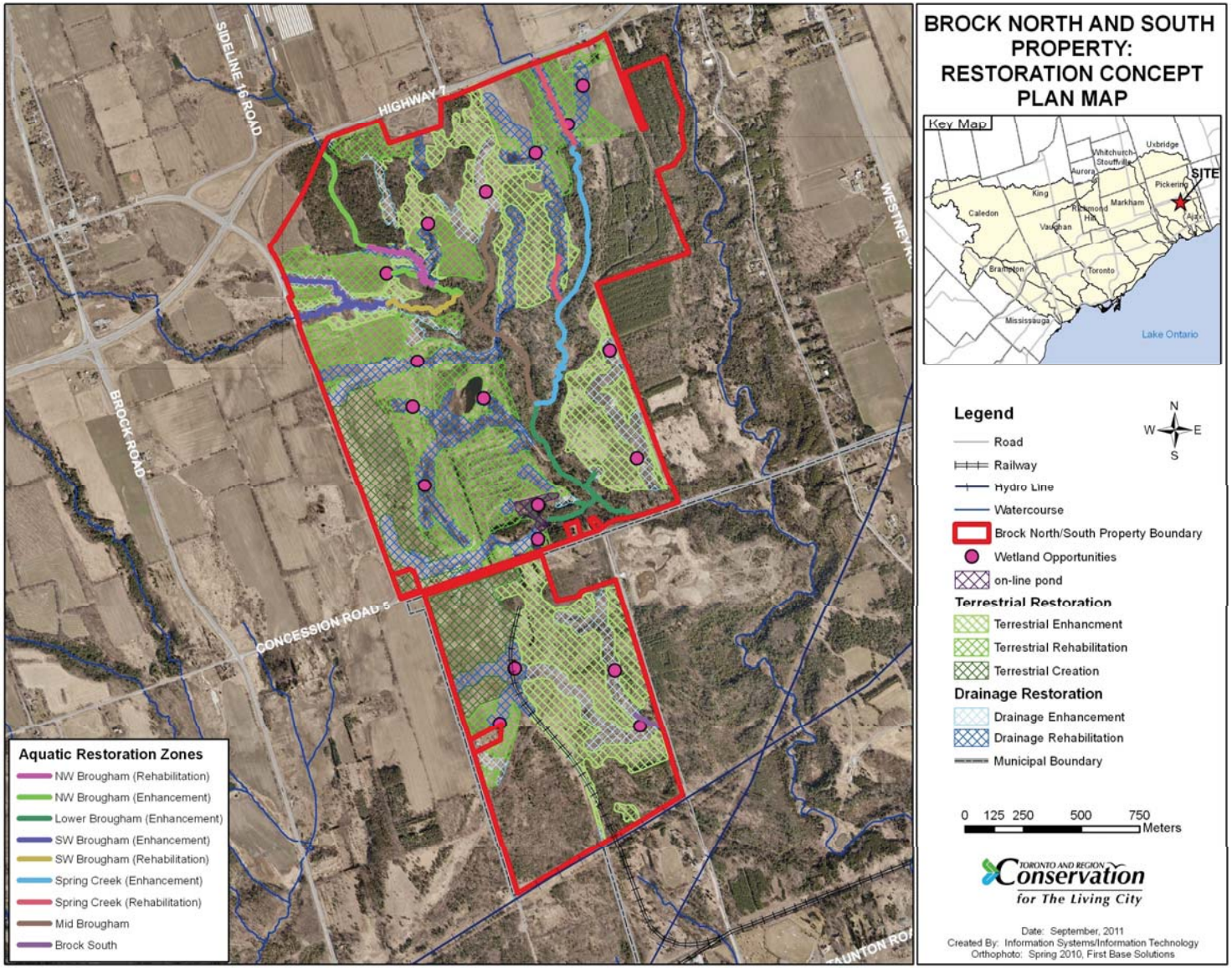

Figure 22. Restoration concept plan

4.0 IMPLEMENTATION PLAN

The Brock Lands represents a significant amount of restoration opportunity that can contribute to TRCA's natural heritage targets for aquatic, wetland and terrestrial systems. Important contributions could be made to increasing wetland, riparian and forest habitat through restoration measures. A system of headwater tributaries run through the site and improving them can have significant benefits to cold-water fisheries especially as it pertains to Atlantic salmon re-introduction. The site could also hold a wide variety of essential wildlife habitat structures which were removed as a result of past land-use practices. Past land-uses have resulted in a significant amount of hydrologic impairments. Restoring the site would improve surface drainage, groundwater recharge and groundwater discharge. Table 4 summarizes the total deliverables as they relate to the Terrestrial, Drainage and Aquatic Restoration Zones. There are many valuable and important natural features that exist on the Brock Lands some that have resulted from the site's past disturbances. The planning, design and implementation of restoration activities recognizes these unique features, however top priority will be given to restoration works that benefit the overall system.

Table 4. Total deliverables of future restored areas by activity

Activity	Deliverable
Terrestrial Restoration	139 ha of improved landform, soil conditions and diversified native vegetation communities
Wetland Restoration	26 ha of new and restored wetland habitat
Hydrologic Restoration	14 sub-catchments restored to capture flow of water generated by 1,035 ha of land
River and Riparian Restoration	142 ha of improved stream edge habitat or 14.7 km of improved stream length
Essential Wildlife Habitat	Installation of essential habitat structures such as nest boxes, log tangles, and downed woody debris

4.1 Priority Selection Criteria

Sites were assessed by TRCA to identify priority restoration opportunities within the Brock Lands. Aquatic, terrestrial, and drainage issues were considered when determining restoration priorities of the Brock Lands. Top priority was given to highly altered and degraded sites. These areas include sites with multiple aquatic, hydrologic and/or terrestrial degradations, as well as opportunities for restoration confined to a relatively small area. Areas demonstrating a major impairment or that would yield significant benefits to the system were also considered high priority. For example, a major impairment site such as a large creek crossing in disrepair could be restored to allow fish passage, which could result in dramatically positive impacts to downstream fish populations. Figures 23 and 24 represent the most immediate priority sites for the Brock Lands. Figure 23 focuses on terrestrial and drainage opportunities, while Figure 24 illustrates aquatic opportunities. Each site has been identified (in no particular order) and described in the rest of this section as a basis for moving forward with detailed design and implementation of the Restoration Plan.

There are also priorities that are not restricted to any specific site, as they are generally evident throughout the property. For example, there are many disturbed areas that are regenerating in non-native invasive species as a result of poor soil conditions. Furthermore, there is old infrastructure scattered throughout the property. Invasive species management, infill plantings, soil amendments, essential habitat creation and infrastructure removal opportunities apply to most areas of the property. These works need to be strategically implemented across the entire property, recognizing existing communities of concern and the overall restoration vision.

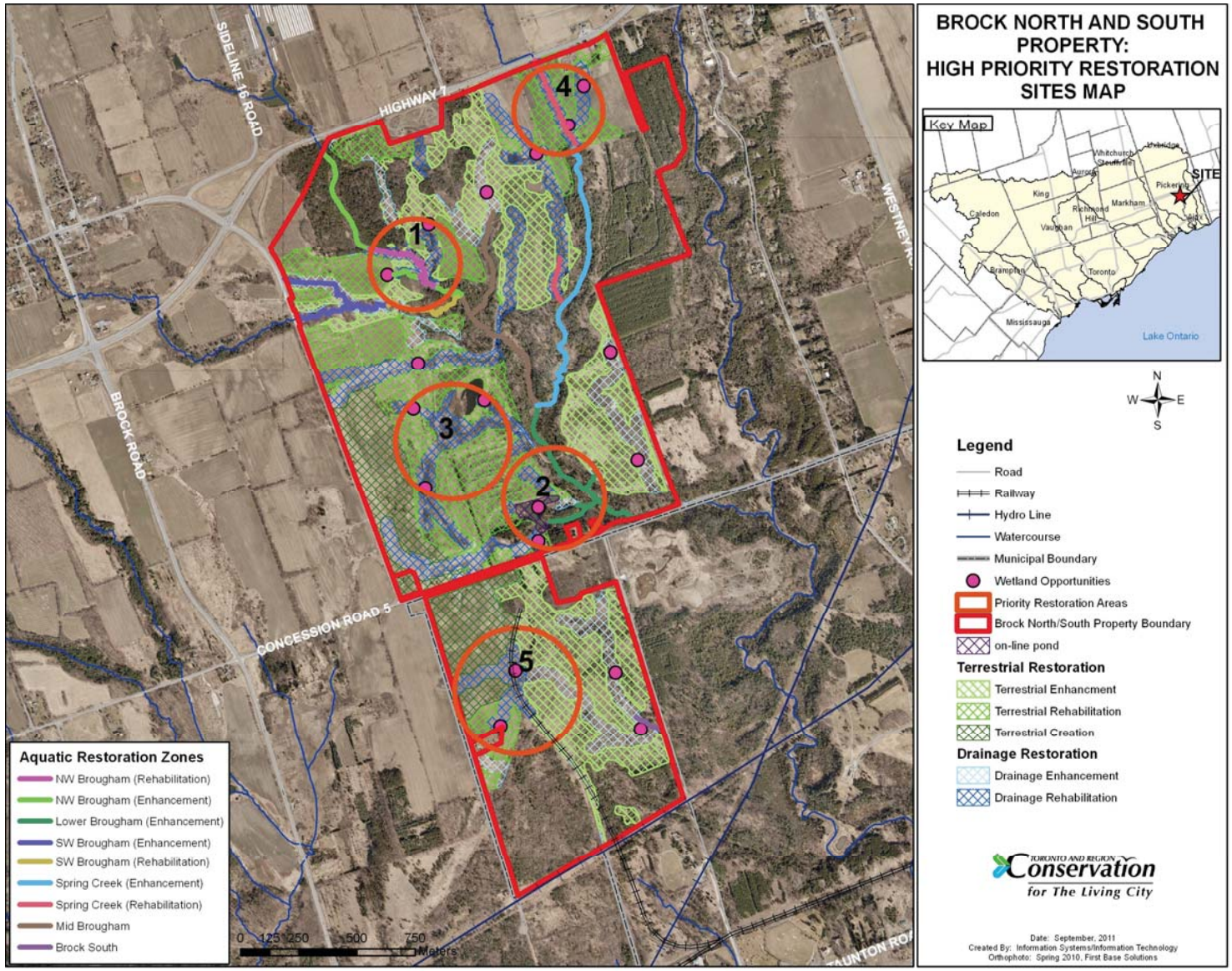

Figure 23. High priority restoration sites

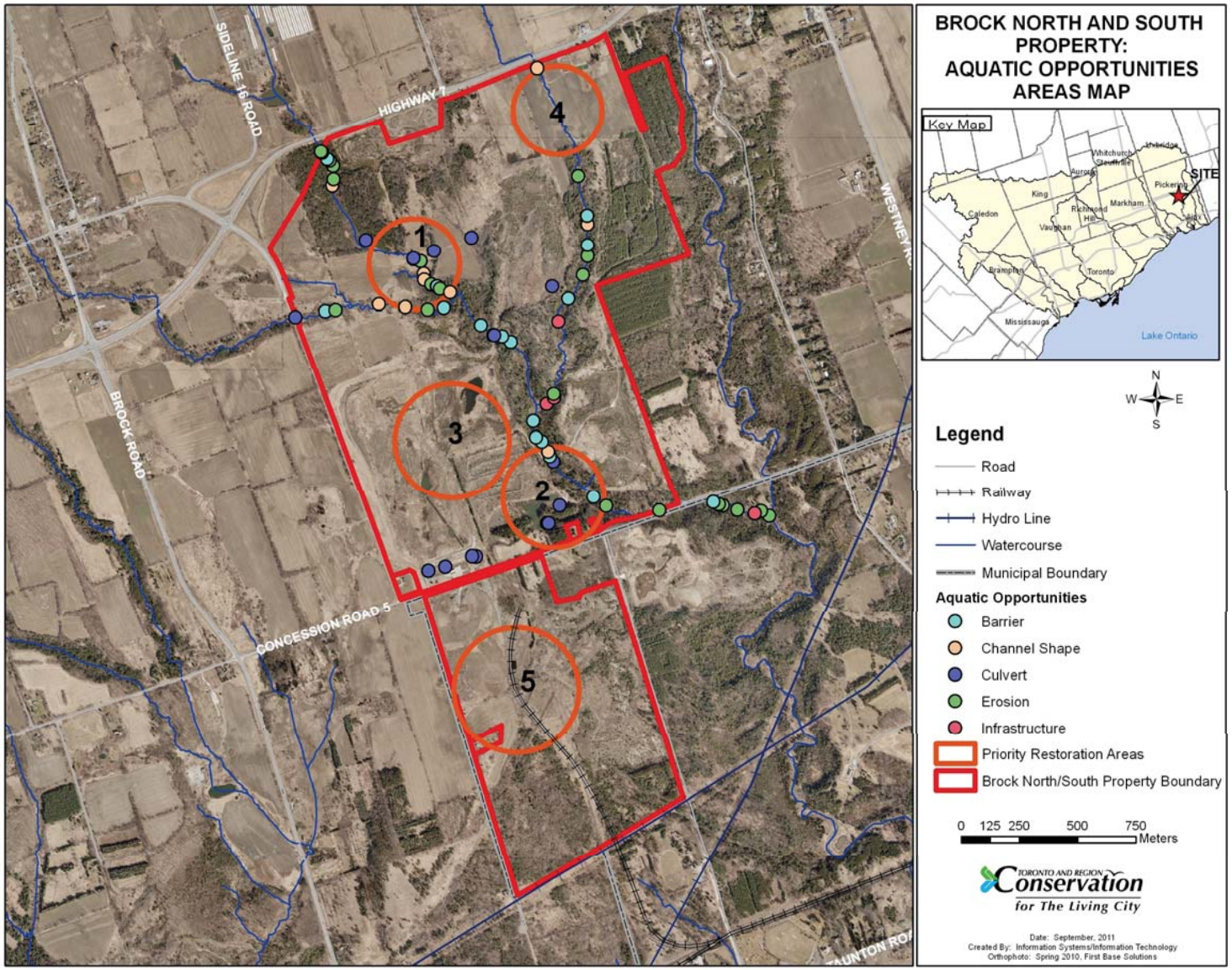

Figure 24. Aquatic restoration opportunities

4.2 Five Year High Priority Sites

The following sites have been determined to be the top priorities to be implemented over a five year time frame. As stated above, strategic infrastructure removal, invasive species management, soil amendments, and installation of structural habitat features should also be considered a priority during and after implementation of the five year plan.

4.2.1 Site 1: Northwest Brougham Creek Rehabilitation Areas

The site is characterized by a variety of land cover types including, upland and lowland forest, old field meadow, agricultural fields, and successional areas. Northwest Brougham Creek transects the site, and the Southwest Brougham Creek borders the area to the south. There are two culvert crossings. The culvert in Northwest Brougham Creek is in significant disrepair causing erosion and sedimentation downstream. A significant section of Northwest Brougham Creek is braided and lacking vegetative cover. There is also a bed crossing within Southwest Brougham Creek that has caused braiding. Tiles drains are suspected within the west agricultural field.

Table 5. Site 1 proposed work

Aquatic	All of the crossings throughout Northwest Brougham and Southwest Brougham Creek should be removed. Work involves restoring the morphology of the creek by constructing a single channel through the site with the appropriate riffle pool sequencing and riparian habitat to support aquatic species, particularly redside dace. The work involves heavy equipment and significant regrading of the site. The site has also been identified for barrier removals.
Wetlands	There are two opportunities for wetland projects in this area. Planning and design is needed to determine the exact form and function of these wetlands. Hydrologic improvements are needed (i.e., tile drain removal) to restore natural drainage. The work will involve heavy equipment and significant regrading of the site.
Reforestation and Riparian Plantings	There are many opportunities for reforestation and riparian plantings throughout this area. Succession of old fallow fields should be promoted by strategic plantings. Creek margins should be planted, leaving some open areas to promote optimal redside dace habitat. The former agricultural field should be reforested.
Essential Habitat Structures	Nest boxes (owl, songbird, Wood Duck, etc.) should be installed in appropriate habitats. Structures such as dens, hibernacula and brush piles should be created to restore and enhance wildlife habitat.

The overall benefits of restoring this area include creation of a connected vegetation corridor; an increase in forest patch size; better access and habitat for fish across the reach; erosion and sedimentation mitigation; an increase in wetland cover and hydrologic function; and habitat improvement for wildlife.

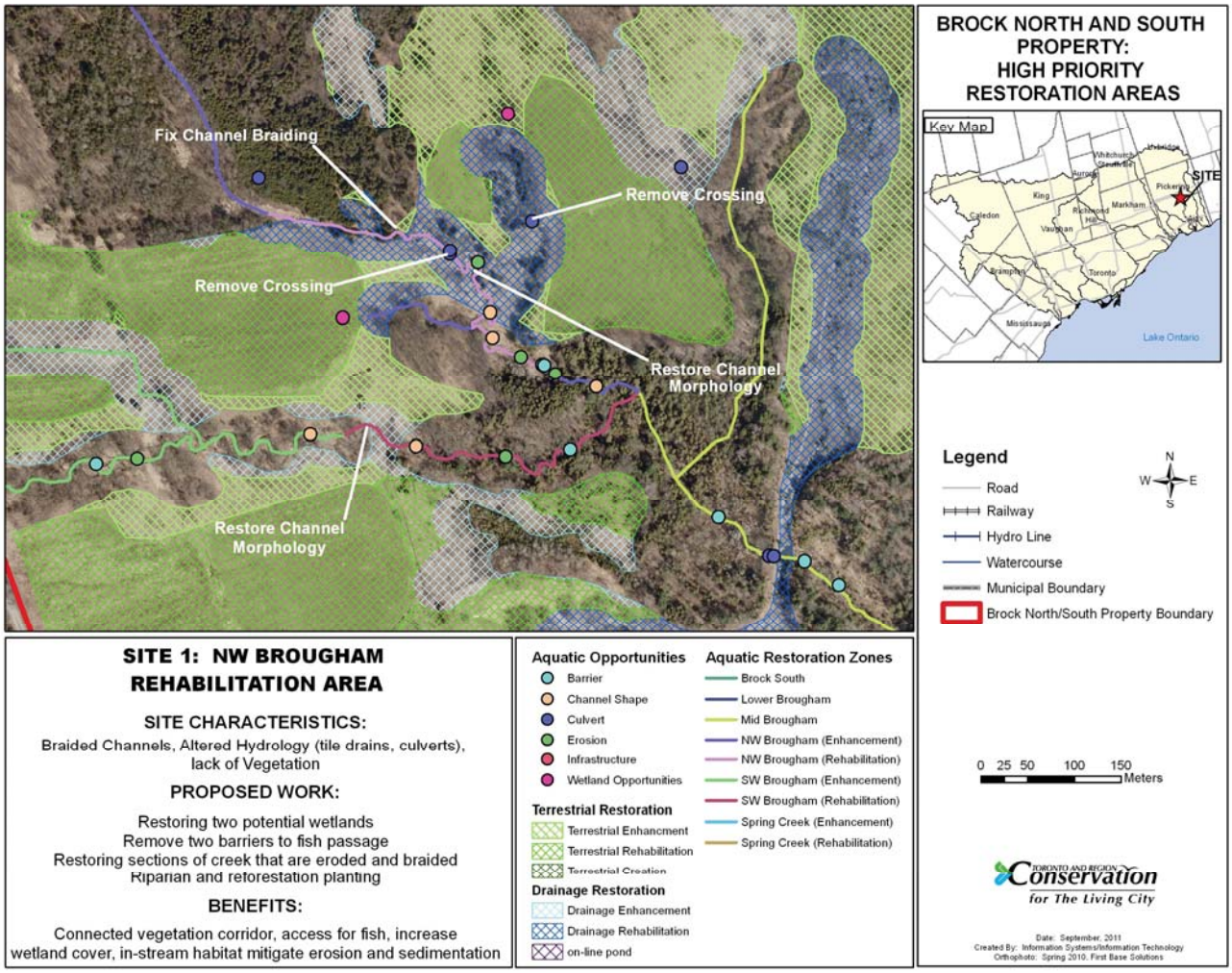

Figure 25. Site 1: Northwest Brougham Creek rehabilitation

4.2.2 Site 2: Lower Brougham Rehabilitation

Site 2 is characterized by a variety of land cover types including, upland and lowland forest, old field meadow, and successional areas. Many disturbed areas are succeeding with non-native invasive species such as common reed and Scot's pine. Lower Brougham Creek transects the site and represents a continuous corridor of coldwater riverine habitat, which is disrupted by a large culvert crossing. The crossing is in significant disrepair causing erosion, sedimentation and braiding downstream. There is an online pond that needs to be investigated to determine the appropriate measures required to take it offline. The site topography has been highly altered by past gravel extraction.

Table 6. Site 2 proposed work

Aquatic	The crossing through Lower Brougham Creek should be removed. Work involves restoring the morphology of the creek by constructing a single channel through the site with the appropriate riffle pool sequencing and riparian habitat. The work involves heavy equipment and significant regrading of the site. There are many beaver and debris dams through out the site that should be assessed and possibly removed to improve access for fish. The tributary running west of Lower Brougham Creek can be reconnected to the main tributary by taking the pond offline and creating a wetland.
Wetlands	There are two opportunities for wetland projects in this area. Planning and design is needed to determine the exact form and function of these wetlands. The objective will be to increase wetland habitat. The work will involve heavy equipment and significant regrading of the site.
Online Pond	There is an opportunity to take the existing pond off-line to remove any negative thermal impacts to the downstream watercourse and to reconnect the fragmented valley system. Planning and design is needed to determine exact form and function of the new creek connection. The work will involve heavy equipment and significant regrading of the site. An offline wetland would remain in the north section of the pond (indicated as a third wetland in Figure 26).
Reforestation and Riparian Plantings	There are many opportunities for reforestation and riparian plantings throughout this area. Old fallow fields should be planted to accelerate succession. Areas should be regraded and soils should be amended to reverse the impact of past gravel extraction practices.
Essential Habitat Structures	Nest boxes (owl, songbird, Wood Duck, etc.) should be installed in appropriate habitats. Structures such as dens, hibernacula and brush piles should be created to restore and enhance wildlife habitat.

The overall benefits of restoring this area include a connected vegetation corridor; an increase in forest patch size; better access and habitat for fish across the reach; erosion and sedimentation mitigation; an increase in wetland cover and hydrologic function; and habitat improvement for wildlife.

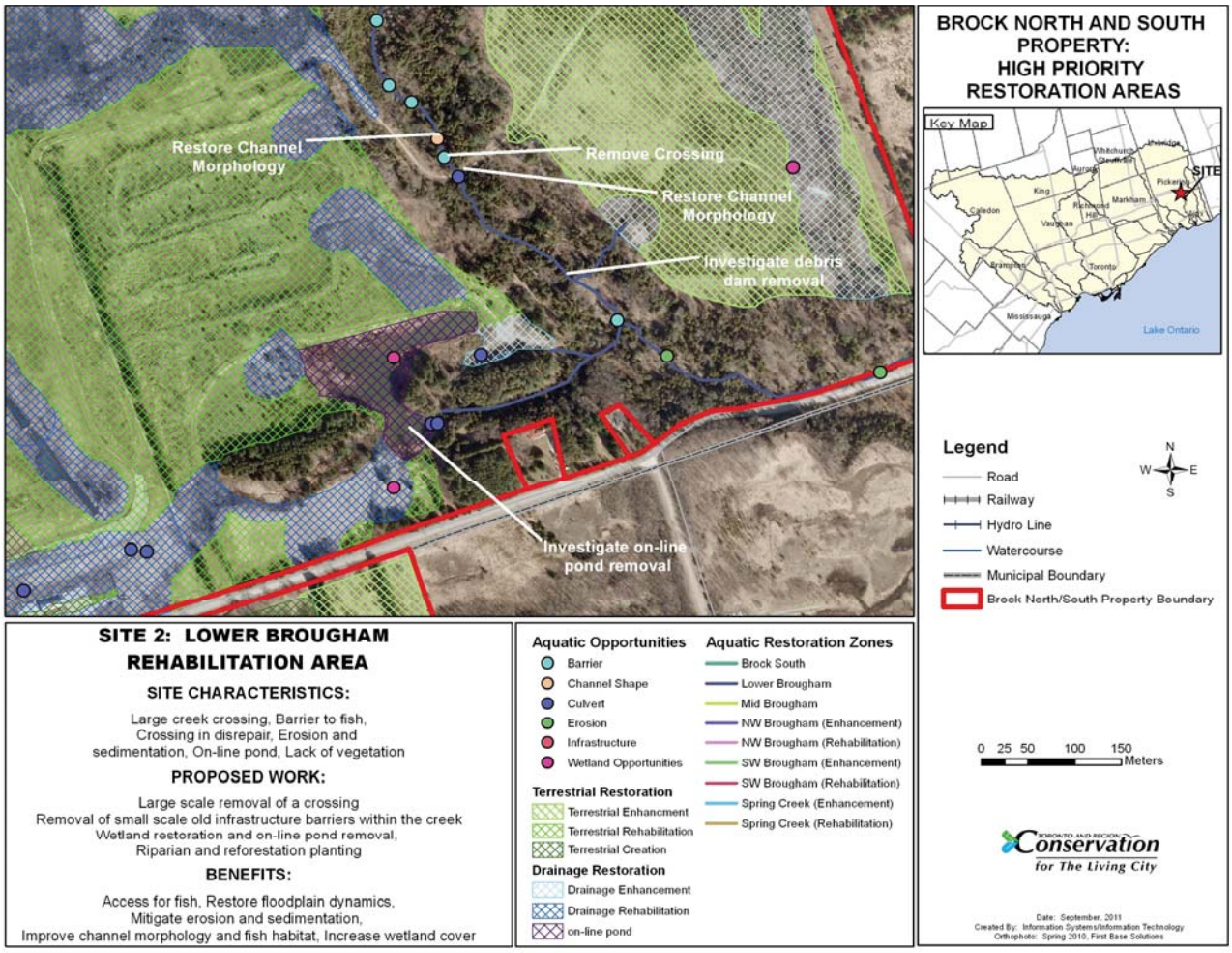

Figure 26. Site 2: Lower Brougham Creek rehabilitation

4.2.3 Site 3: Wetland Restoration Projects

Current cover types found within site 3 include upland and lowland successional areas, old field meadow and wetland habitat. Lower and Mid Brougham Creek border the site to the east and represent a continuous corridor of coldwater riverine habitat. The site topography has been highly altered by past gravel extraction, therefore much of the wetland features are the result of exposed groundwater and topography alterations. There is a significant lack of vegetation in this area due to poor soil conditions and many disturbed areas have been colonized by non-native invasive species. The site has above ground and below ground infrastructure that was installed to support former landfill operations and should be removed.

Table 7. Site 3 proposed work

Wetlands	There are three opportunities for wetland projects that represent one major drainage area, which has been fractured during past land use. The drainage needs to be reconnected to improve the function of the wetlands, but additional planning and design is needed to determine their exact form and function. Old infrastructure should be removed. The work involves heavy equipment and significant regrading of the site.
Reforestation and Riparian Plantings	There are many opportunities for reforestation and riparian plantings throughout this area. Areas should be regarded, soils should be amended and nodal plantings introduced to promote restoration of natural cover.
Essential Habitat Structures	Nest boxes (owl, songbird, Wood Duck, etc.) should be installed in appropriate habitats. Structures such as dens, hibernacula and habitat piles should be created to restore and enhance wildlife habitat.

The benefits of restoring Site 3 include increased natural corridor connections, forest patch size, wetland cover and hydrologic function; and improved wildlife habitat for wildlife.

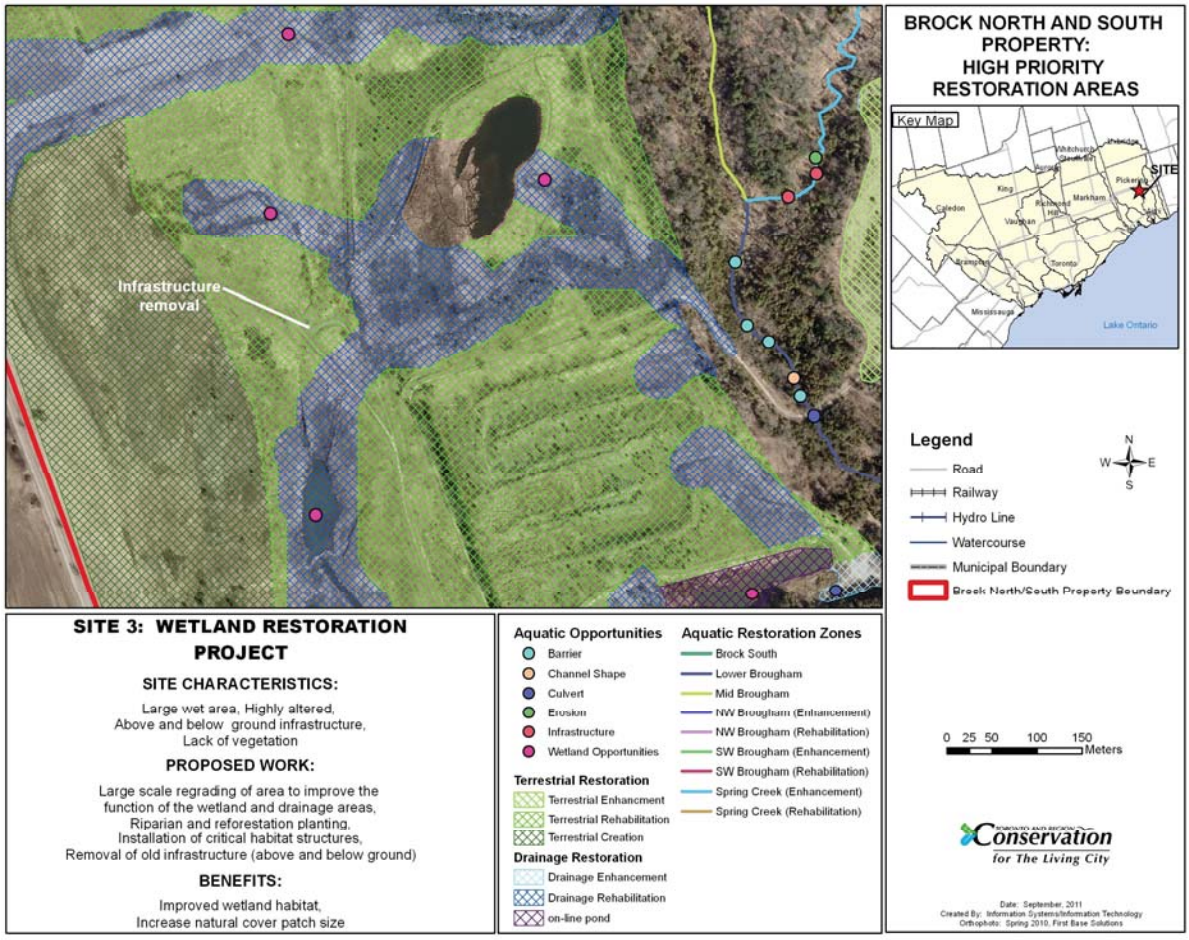

Figure 27. Site 3: Wetland restoration

4.2.4 Site 4: Spring Creek Restoration Area

The Spring Creek Restoration Area is characterized by a variety of cover types including upland and lowland forest, successional areas, agricultural fields, old field meadow, forest plantation and wetland habitat. Located within the northeast end of Brock North, Spring Creek transects the site. The Creek provides coldwater riverine habitat, but was historically straightened to facilitate agricultural uses. A ditch runs off the west side of creek through the adjacent fallow agricultural fields. There are some topographic alterations that have occurred along the south end of the site as a result of the past gravel extraction. There is a significant lack of natural vegetation and certain areas are succeeding with non-native invasive species.

Table 8. Site 4 proposed work

Aquatic	There is an opportunity to use natural channel design techniques to restore the natural morphology of Spring Creek. This includes using heavy equipment to realign the creek to create natural meanders with the appropriate riffle and pool sequencing and riparian habitat.
Wetlands	There are two opportunities for wetland projects. Planning and design is needed to determine the exact form and function of these wetlands. Site alterations are needed to address a ditch blockage and tile drains to ensure the proper hydrological restoration. This work will involve heavy equipment to facilitate infrastructure removal and wetland creation.
Reforestation and Riparian Plantings	There are many opportunities for reforestation and riparian plantings throughout this area. Old fallow fields should be restored by removing tile drains and reforestation. Open areas along the creeks should be planted leaving gaps to the benefit of redside dace. The current agricultural field should be reforested if agricultural uses cease.
Essential Habitat Structures	Nest boxes (owl, songbird, Wood Duck, etc.) should be installed in appropriate habitats. Structures such as dens, hibernacula and habitat piles should be created to restore and enhance wildlife habitat.

The overall benefits of restoring this area include natural corridor connections; an increase in forest patch size; better habitat and access to habitat for fish across the reach; erosion and sedimentation mitigation; an increase in wetland cover and hydrologic function; and improved habitat for wildlife.

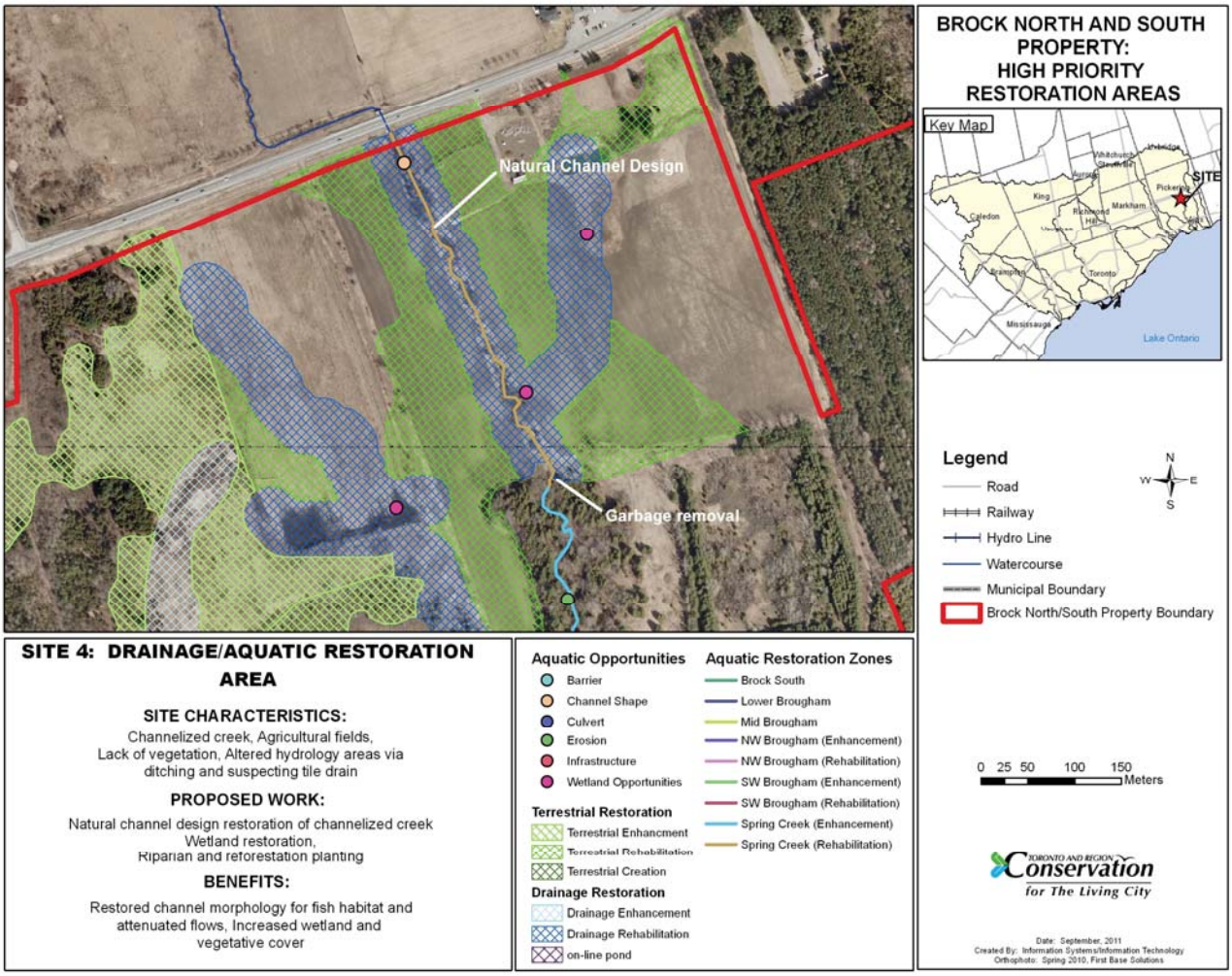

Figure 28. Site 4: Spring Creek restoration

4.2.5 Site 5: Brock South Restoration Area

The site is characterized by a variety of cover types including upland and lowland successional areas, old field meadow and wetland habitat. The area drains southeast toward a small tributary. The site topography has been highly altered by past gravel extraction, therefore much of the wetland features are the result of exposed groundwater and topography alterations. There is a significant lack of vegetation in this area. The site has infrastructure such as an old road and sump pond that was installed to support previous uses and should be removed. Tiles drains are suspected within the southwest agricultural field.

Table 9. Site 5 proposed work

Wetlands	There are two opportunities for wetland projects in the area. The north site is a drainage collection area that was created as a sump pond during gravel extraction. A hardwood swamp could be established in the location of the sump pond to improve hydraulic function. The exact form of the wetland needs to be tied in the terrestrial creation project adjacent to the north. The south wetland opportunity is located in an old field. The field will be assessed to determine the need for drain removal and heavy equipment will be required to contour the land to promote wetland creation and drainage.
Reforestation and Riparian Plantings	There are opportunities for reforestation and riparian plantings throughout this area. Old fallow fields should be accelerated into succession with strategic nodal plantings. Areas should be regraded and soils should be amended to reverse the impact of gravel extraction. Old field habitats should be reforested.
Essential Habitat Structures	Nest boxes (owl, songbird, Wood Duck, etc.) should be installed in appropriate habitats. Structures such as dens, hibernacula and habitat piles should be created to restore and enhance wildlife habitat.

The overall benefits of restoring this area include a connected natural corridor with different habitat types; an increase in forest patch size; an increase in wetland cover and hydrologic function; and improved habitat for wildlife.

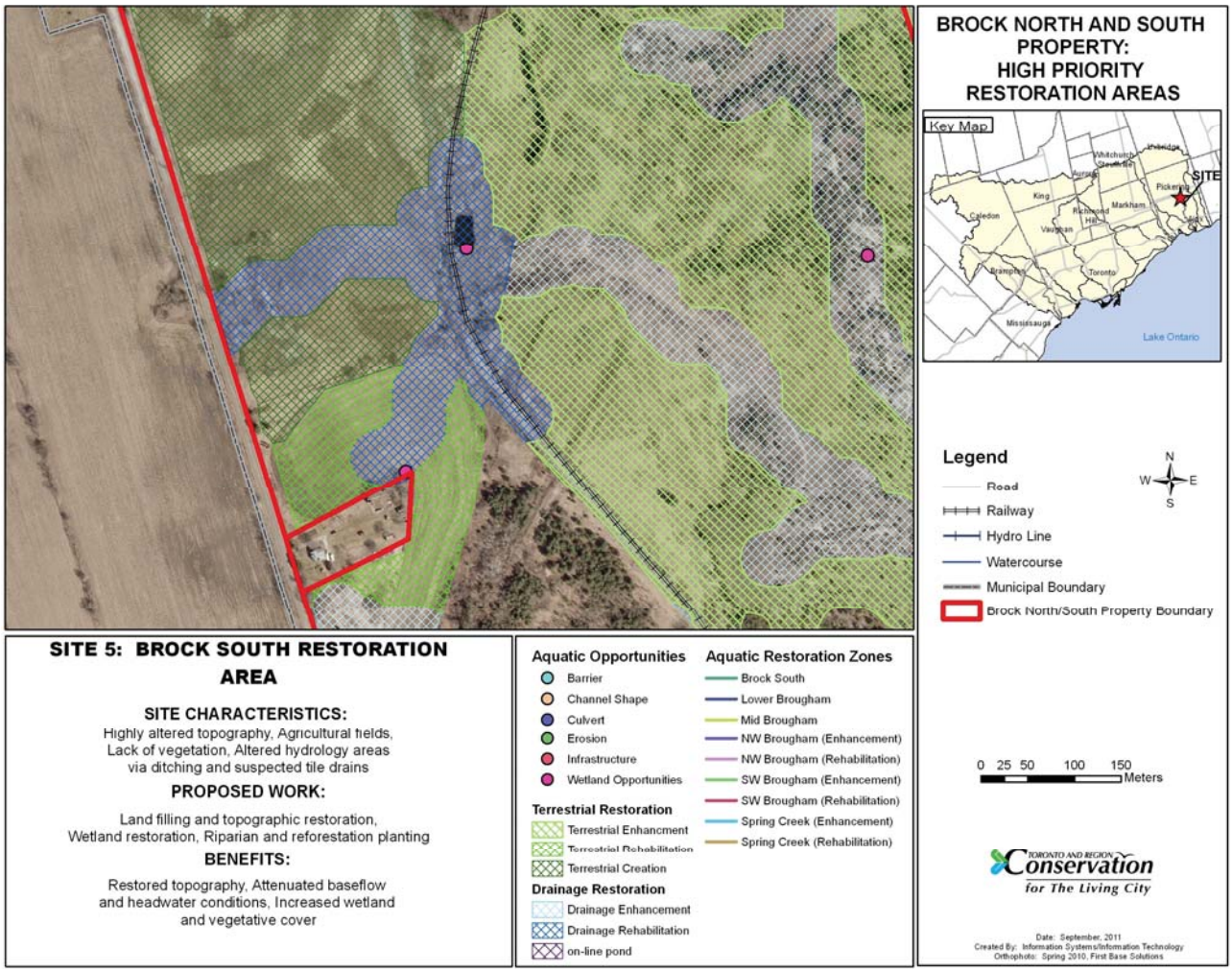

Figure 29. Site 5 Brock South restoration

4.2.6 Project Planning and Detailed Design

Table 10 is a summary of the deliverables for each restoration priority site. Project planning and implementation will commence following the securement of funding. Any documents that are created during the planning, detailed design and approval phases will be added as Annexes to this report. The intention is to have this report survive as a "living document" that becomes more robust with the ongoing restoration of the Brock Lands.

Table 10. Summary deliverables within the restoration priority sites

Project	Type	Deliverables
Site 1	Crossing Removal/Stream Naturalization	300 m
	Wetland Restoration	2 wetlands
	Riparian Plantings	3 ha
	Tree and Shrub Nodes	4 ha
	Reforestation	8 ha reforestation
	Other Aquatic Improvements	3 barrier removals, erosion control
Site 2	Crossing Removal	One large crossing
	Stream Naturalization	60 m
	Wetland Restoration	2 wetland projects
	Riparian Plantings	2 ha
	Tree and Shrub Nodes	10 ha
	On-line pond	On-line pond removal; re-establishing 100m of creek
	Other Aquatic Improvements	5 barrier removals, erosion control, informal trail infrastructure removal
Site 3	Wetland Restoration	3 wetland projects
	Riparian Plantings	10 ha
	Tree and Shrub Nodes	10 ha
Site 4	Natural Channel Design	500 m
	Other Aquatic Improvements	garbage removal
	Riparian Plantings	5 ha
	Tree and Shrub Nodes	8 ha
	wetland	2 wetlands
Site 5	Riparian Plantings	4 ha
	Tree and Shrub Nodes	8 ha
	wetland	2.5 ha
Various Sites	Project Planning	
	Maintenance	
	Invasive Management	

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