

Appendix B.1

Natural Heritage Features

- **Surface Water and Aquatic Ecosystems**
- **Vegetation**
- **Wildlife**

Surface Water and Aquatic Ecosystems



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1.0 INTRODUCTION

SNC-Lavalin Inc. (SLI) was retained by the City of Hamilton (through Steer Davies Gleave) to carry out a review of the aquatic conditions along the proposed east/west Light Rail Transit (LRT) corridor, known as the B-Line Corridor (Main Street/Queenston Road - King Street - Main Street) between Eastgate Square and McMaster University. The B-Line corridor is part of the City of Hamilton plan to implement rapid transit, with a long term vision encompassing five corridors, connecting key destinations across the City. The purpose of this report is to document the existing aquatic habitat conditions of all the watercourses within the B-Line corridor.

The proposed LRT B-Line corridor crosses two watercourses, specifically Chedoke Creek and Red Hill Creek (Refer to Figure 1 - Key Plan). Chedoke Creek is located within the Spencer Creek watershed and Red Hill Creek is within the Red Hill Valley Creek watershed. Both watercourses are influenced by extensive surrounding urbanization, have reaches that have been altered, and are generally considered to have degraded habitat conditions for aquatic life.

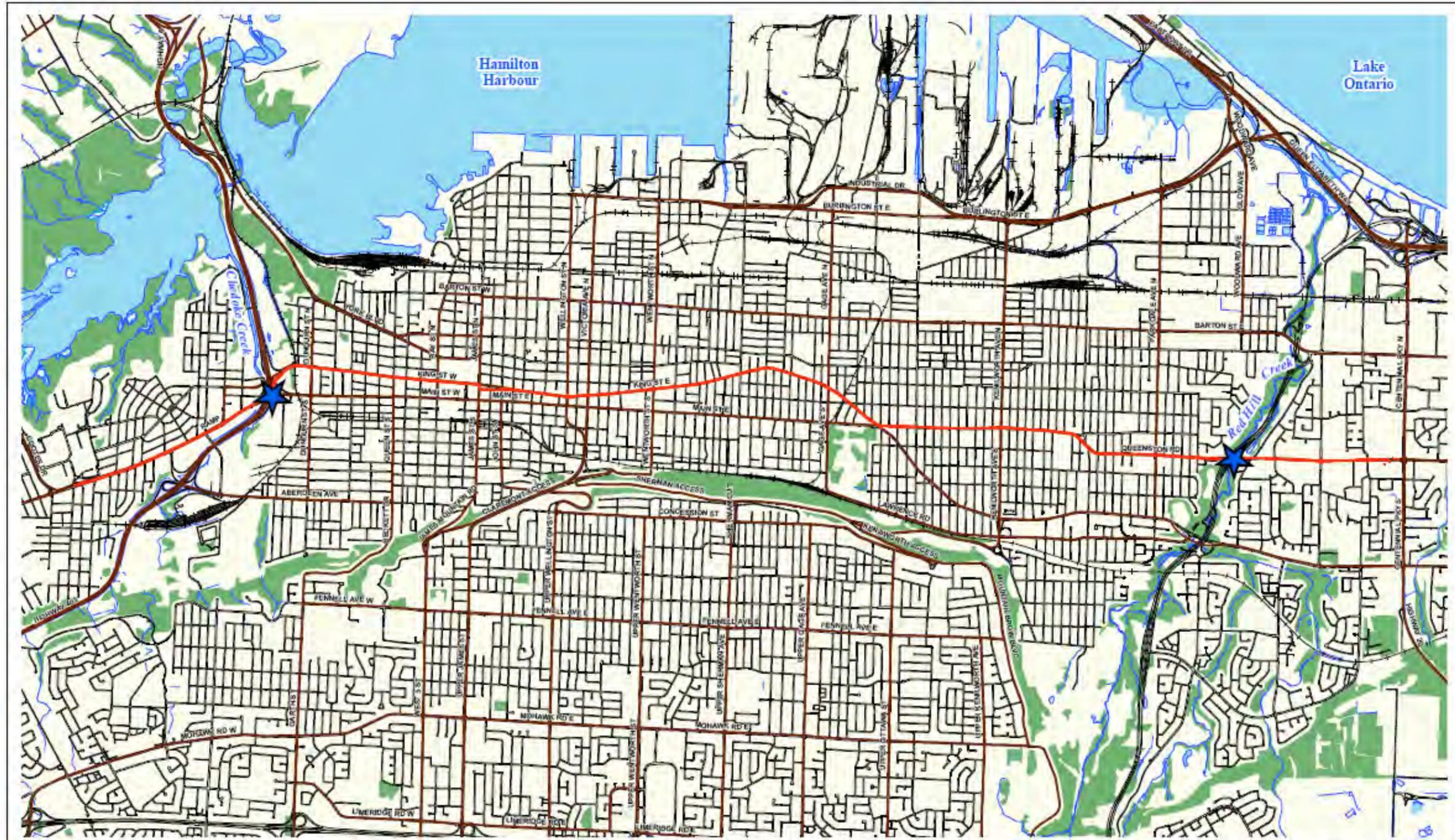
2.0 METHODOLOGY

The description of the existing aquatic conditions involved the collection and review of secondary source information and primary collection of data during field investigations by SLI. The compilation of the background inventory was based on a review of all relevant background information available. The variety of background sources reviewed is listed below and the field approach is summarized briefly below.

2.1 Background Data Collection

Background data were obtained from various published and non-published sources. Sources of information include:

- City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, Dillon Consulting Limited, March 2009.
- Fisheries and the Red Hill Creek Realignment Study. C. Portt and Associates. 2003.
- Chedoke Channels Maintenance Study. City of Hamilton Municipal Class Environmental Assessment Study, McCormick Rankin Corporation (MRC). 2008.
- Guelph District Ontario Ministry of Natural Resources (MNR)
- Hamilton Conservation Authority (HRCA)
- Class EA Ecological Assessment Requirements for Baseline Conditions, S. Faulkenham, HRCA, March 26, 2009.
- Natural Heritage Information Center (NHIC) website 2010
- City of Hamilton
- Urban Hamilton Official Plan, Schedule B, Natural Heritage System, July 2009.



- Legend:**
- Proposed LRT B-Line
 - Major Road
 - Waterbody
 - ★ Aquatic Biology Study Areas
 - Roads
 - Wetland
 - Vegetation
 - + Rail
 - Drainage



Hamilton Rapid Transit Preliminary Design and Feasibility Study B-Line		
Key Plan		
Date: November, 2010	File Number: 503785	Site Code: ENR1
Figure: 1.0	Rev: 0	



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- COSEWIC. 2009. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Web site: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm [accessed 25 Sept 2010].
- Species at Risk in Ontario (SARO) List. Updated September 11, 2009.

2.2 Field Surveys

To confirm background conditions and the sensitivity of fish and fish habitat reported by others, a field investigation was conducted on November 12, 2010 to fully characterize and assess habitat features present at the two (2) watercourse crossings in the study area for the B-Line corridor. Field data collection methods included:

- **Documented information** on stream type, substrate, morphology, bank stability, in-stream cover, near shore cover vegetation, migratory obstructions and presence of any critical habitat (i.e., spawning);
- **Photographic Documentation** of existing fish habitat conditions for the watercourses within the study area.

The field investigation study area for the watercourse crossings included the proposed B-Line corridor, plus 50 m upstream and 200 m downstream of the assumed right-of-way of the corridor.

Fish community sampling and inventory was not completed as background data was deemed sufficiently for the assessment of the fish community present at the watercourses in the study area. Information reported on fish species present is primarily from MNR historical fish collection records available and the Hamilton Harbour and Watershed Fisheries Management Plan (MNR/HRCA, 2009). The timing of the field investigations in November, 2010 (fall) was considered appropriate to confirm and assess existing physical (e.g., flow regime, temperature) and biotic (e.g., aquatic vegetation) habitat conditions, and specific fish use of interest.

The fish habitat assessment was conducted utilizing the methods outlined in the MNR Ontario Stream Assessment Protocol (2005). Information recorded includes:

- Watercourse size, flow (permanent/intermittent) and thermal regime (coldwater/warmwater);
- Physical channel dimensions and characteristics – width, depth (including bankfull and wetted widths and depths), substrate type, bank stability/erosion, channel morphology and evidence of any groundwater seepage or upwelling areas.
- In-stream/overhead cover opportunities (e.g., woody debris, undercut banks, vegetation);
- Riparian vegetation;
- Physical barriers to fish movement in the vicinity of the crossings;
- Identification of potential critical or specialized habitat areas or features (i.e., potential spawning or nursery areas); and,



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- Observations of habitat alterations/land use (i.e., channel modification, potential pollutant sources).

2.3 Aquatic Species at Risk

The designation of species of national significance is given by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The designation of species of Provincial significance is made by the MNR and is based on recommendations made by the Committee on the Status of Species at Risk in Ontario (COSSARO).

From the review of the federal Department of Fisheries and Oceans Canada (DFO) "Distribution of Aquatic Species at Risk" mapping for the study area, there is one designated aquatic Species at Risk (Redside dace) that is known to occur in Chedoke Creek within the B-Line corridor. Reside dace (*Clinostomus elongates*) is designated nationally "Endangered" by the COSEWIC, and was recently (February 2009) up-listed provincially to "Endangered" by the COSSARO. Under the federal *Species at Risk Act* (SARA), Redside dace is considered to be of "Special Concern" (Schedule 3), and this species is listed as "Endangered" under the Ontario *Endangered Species Act* (2007).

Although Redside dace has historically present in Chedoke Creek, and is currently identified on DFO's Aquatic Species at Risk mapping for the creek, fish community surveys and current habitat conditions at the B-Line crossing indicate that Redside dace are no longer considered present in Chedoke Creek. The MNR has prepared a recovery strategy for Reside dace and is responsible for their protection under the *Endangered Species Act*. As part of this study, Hamilton Conservation Authority confirmed that Redside dace is not considered to be present in Chedoke Creek (pers. comm., Shari Faulkenham, HCA Ecologist).

There are no aquatic species at risk identified within the Red Hill Creek watershed.

2.4 Fish Habitat Evaluation Criteria

Watercourses located within the study area were evaluated based on DFO's delineation of fish habitat as direct or indirect fish habitat and MNR's classification of fish habitat as "Cold", "Cool" or "Warm" and also "Critical", "Important" or "Marginal".

These evaluations were based on a combination of the desktop and field information and were applied within the context of the habitats' productive capacity and potential contribution to the local fisheries. The following sections describe how the evaluations were applied to various types of habitats in the area.

Habitat Indicators

Criteria considered in the evaluation of fish habitat, or in the determination of whether or not a waterbody provided fish habitat, included:

- Physical habitat variables (depth, flow, cover, etc.). These variables were used primarily in the ranking of fish habitat quality and sensitivity; and



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- Habitat connectivity, which is a major constraint to the ability of fish to utilize habitats, as some habitats are highly fragmented by urban infrastructure (e.g., roads, sewers).

Fish Habitat Evaluation Categories

Utilizing the MNR classification system, fish habitat falls into 1 of 3 categories: Type 1, Type 2 or Type 3, the definitions of which have been determined by MNR (2000). Habitat type is based on the sensitivity and significance of current or potential habitats in a waterbody.

- Type 1, or critical, habitat is the most sensitive and requires the highest level of protection. Examples of Type 1 habitat include critical spawning and rearing areas, migration routes, over-wintering areas, productive feeding areas and habitat occupied by sensitive species.
- Type 2, or important, habitat is less sensitive and requires a moderate level of protection. These areas include feeding areas for adult fish and unspecialized spawning habitat.
- Type 3, or marginal, habitat is considered to be highly degraded and does not contribute directly to fish productivity. Examples include channelized streams and artificially created watercourses.

3.0 AQUATIC HABITAT RESOURCES

3.1 Fish Habitat Assessment

3.1.1 Chedoke Creek

Chedoke Creek is a warmwater permanent watercourse that originates south of the proposed B-Line corridor and is conveyed through a large concrete channel within the study area. Chedoke Creek continues to flow north into Cootes Paradise, which is in close proximity to the project study area.

The *Hamilton Harbour and Watershed Fisheries Management Plan* (2009) has classified Chedoke Creek as a small warmwater riverine system. The fisheries management objective for this system is to maintain the capacity for native coolwater and warmwater fish (e.g., minnows and darters). However, if it is possible to lower the stream temperatures, through stormwater management and habitat restoration initiatives, to convert a warmwater stream to a coldwater stream, then priority should be given to cool/cold water species, such as Brook trout (*Salvelinus fontinalis*), where the physical habitat determines.

Chedoke Creek is a highly urbanized and degraded watercourse with respect to habitat and water quality. Much of its length has been straightened and channelized and a significant length of stream is conveyed underground between Main Street, King Street West and Highway 403. The reach upstream of Main Street is conveyed in a concrete lined channel that is approximately 5-6 m wide with water depths of approximately 0.2 m.



There is no in-stream cover and the riparian vegetation is absent, as the concrete extends to the top-of-bank of the channel. Vegetation at the top-of-bank and through the valley consists of species typical of old fields and disturbed areas, such as Norway maple (*Acer platanoides*), white ash (*Fraxinus americana*), white birch (*Betula papyrifera*), along with shrubs, such as staghorn sumac (*Rhus typhina*) and common buckthorn (*Rhamnus cathartica*).

Downstream of Highway 403 and the Main Street Interchange, Chedoke Creek is conveyed through a more naturalized reach of stream, although it has been straightened and is characterized as more of a large drainage canal to Cootes Paradise.

Fish Community

Chedoke Creek is located within the Spencer Creek watershed. The fish community of the Spencer Creek watershed is very diverse, with 44 species of fish recorded (Table 1-1). However, the fish community of Chedoke Creek is very limited due to the altered and degraded nature of the habitat conditions. According to the *Hamilton Harbour and Watershed Fisheries Management Plan* (2009) the fish community of Chedoke Creek is comprised of the following warmwater species: creek chub (*Semotilus atromaculatus*), brook stickleback (*Culaea inconstans*) and pumpkinseed (*Lepomis gibbosus*).

Within the proposed B-Line corridor, Chedoke Creek has been assessed as Type 3, or marginal, fish habitat due to the highly altered nature of the watercourse. The reaches upstream of Main Street do not contribute directly to the fish habitat potential of the system, but do provide indirect fish habitat in terms of allochthonous (food) matter inputs to downstream habitats. Downstream reaches are connected directly to Cootes Paradise and likely provide overall general habitat for feeding, rearing and over-wintering.

An overview of existing aquatic habitat conditions at Chedoke Creek is presented in Figure 2.0.

Table 1- 1: Fish Community of the Spencer Creek Watershed¹

Family	Scientific Name	Common Name
Petromyzontidae	<i>Lampetra appendix</i>	American brook lamprey
	<i>Petromyzon marinus</i>	Sea lamprey
Salmonidae	<i>Oncorhynchus mykiss</i>	Rainbow trout
	<i>Salmo trutta</i>	Brown trout
	<i>Salvelinus fontinalis</i>	Brook trout
Umbridae	<i>Umbra limi</i>	Central mudminnow
Esodidae	<i>Esox lucius</i>	Northern pike
Cyprinidae	<i>Chrosomus eos</i>	Northern redbelly dace
	<i>C. neogaeus</i>	Finescale dace
	<i>Clinostomus elongates</i>	Redside dace

¹ *Hamilton Harbour and Watershed Fisheries Management Plan*. 2009.



Family	Scientific Name	Common Name
	<i>Carassius auratus</i>	Goldfish
	<i>Cyprinus carpio</i>	Carp
	<i>Notropis atherinoides</i>	Emerald shiner
	<i>Hybognathus hankinsoni</i>	Brassy minnow
	<i>Nocomis biguttatus</i>	Hornyhead chub
	<i>N. micropogon</i>	River chub
	<i>Luxilus cornutus</i>	Common shiner
	<i>Notemigonus crysoleucas</i>	Golden shiner
	<i>Notropis heterolepis</i>	Blacknose shiner
	<i>N. hudsonius</i>	Spottail shiner
	<i>N. rubellus</i>	Rosyface shiner
	<i>N. ludibundus</i>	Sand shiner
	<i>Cyprinella spiloptera</i>	Spotfin shiner
	<i>Notropis volucellus</i>	Mimic shiner
	<i>Pimephales notatus</i>	Bluntnose minnow
	<i>P. promelas</i>	Fathead minnow
	<i>Rhinichthys atratulus</i>	Blacknose dace
	<i>R. cataractae</i>	Longnose dace
	<i>Semotilus atromaculatus</i>	Creek chub
	<i>Luxilus chrysocephalus</i>	Striped shiner
	<i>Semotilus margarita</i>	Pearl dace
Catostomidae	<i>Hypentelium nigricans</i>	Northern hog sucker
	<i>Castostomus commersoni</i>	Common white sucker
Ictaluridae	<i>Ameiurus nebulosus</i>	Brown bullhead
Gasterosteidae	<i>Culaea inconstans</i>	Brook stickleback
Centrarchidae	<i>Lepomis gibbosus</i>	Pumpkinseed
	<i>Micropterus salmoides</i>	Largemouth bass
	<i>Ambloplites rupestris</i>	Rock bass
	<i>Lepomis cyanellus</i>	Green sunfish
	<i>L. macrochirus</i>	Bluegill
	<i>Pomoxis nigromaculatus</i>	Black crappie
Percidae	<i>Perca flavescens</i>	Yellow perch
	<i>Etheostoma caeruleum</i>	Rainbow darter
	<i>E. flabellare</i>	Fantail darter



3.1.2 Red Hill Creek

Fish Habitat Assessment

Red Hill Creek is a coldwater permanent watercourse that originates south of the proposed B-Line corridor above the Niagara Escarpment near Upper James Street and Rymal Road in the City of Hamilton. The reach of Red Hill Creek through the proposed corridor has been significantly changed due to the construction of the Queenston Road Bridge, as well as the construction of the Red Hill Valley Parkway. The portion of the valley system throughout the study corridor has been altered to accommodate the construction of the Parkway and approximately 7 km of Red Hill Creek was realigned from the QEW to Mount Albion Road. The realignment was designed utilizing natural channel design methodologies, which has resulted in improved hydraulic function, better habitat conditions and a riparian zone composed of native species.

The *Hamilton Harbour and Watershed Fisheries Management Plan* (2009) has classified Red Hill Creek as an intermediate coldwater riverine system. The objective for this system is to increase the habitat capacity for rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). Atlantic salmon (*Salmo salar*) reintroduction is also being considered where successful brown trout reproduction proves that the spawning habitat is suitable.

Within the B-Line corridor, the realigned Red Hill Creek flows within a slightly meandering channel, with a series of rock vortex weirs spaced approximately 10 m apart for much of the length. The stream channel width through this reach varies from 1 - 2 m, with average water depths of 0.2 - 0.3 m. As is typical with many heavily urbanized watersheds, Red Hill Creek is a very flashy system and, based on the amount of debris caught in the riparian vegetation, it appears that water levels frequently overtop the banks during routine storm events. Due to the flashy nature of the stream and the resultant erosion forces, the stream banks have been lined with quarried limestone not only to ensure stream bank stabilization but also to provide in-stream cover for the resident fish community.

The valley restoration through this reach has been quite significant and there have been many native species planted in the riparian zone, including eastern white pine (*Pinus strobus*), white ash (*Fraxinus americana*), white birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), along with shrubs such as staghorn sumac (*Rhus typhina*), downy serviceberry (*Amelanchier arborea*), common buckthorn (*Rhamnus cathartica*), grey dogwood (*Cornus foemina*), red osier dogwood (*Cornus stolonifera*), and slender willow (*Salix petiolaris*) found in the wetter areas.

Fish Community

The fish community of Red Hill Creek is healthy and diverse, with a total of 24 species dominated mainly by warmwater species, with a small assemblage of coldwater and



coolwater species (Table 1-2).² Within the vicinity of the B-Line corridor, 14 species of fish have been sampled, including fathead minnow (*Pimephales. promelas*), common white sucker (*Catostomus commersoni*), blacknose dace (*Rhinichthys atratulus*), longnose dace (*Rhinichthys cataractae*), creek chub (*Semotilus atromaculatus*), brook stickleback, common shiner (*Luxilus cornutus*), Chinook salmon (*Oncorhynchus tshawytscha*), threespine stickleback (*Gasterosteus aculeatus*), common carp (*Cyprinus carpio*), spottail shiner (*Notropis hudsonius*), pumpkinseed, emerald shiner (*Notropis atherinoides*) and logperch (*Percina caprodes*).³

Fish community sampling conducted in 1997 resulted in a total of eight (8) species sampled from the reaches immediately upstream and downstream of Queenston Road, including fathead minnow, common white sucker, blacknose dace, longnose dace, creek chub, brook stickleback, white perch (*Morone americana*) and pumpkinseed.⁴

Table 1- 2: Fish Community of Red Hill Creek⁵

Family	Scientific Name	Common Name
Salmonidae	<i>Oncorhynchus tshawytscha</i>	Chinook salmon
	<i>Salmo trutta</i>	Brown trout
	<i>Oncorhynchus mykiss</i>	Rainbow trout
Cyprinidae	<i>Chrosomus eos</i>	Northern redbelly dace
	<i>Carassius auratus</i>	Goldfish
	<i>Cyprinus carpio</i>	Carp
	<i>Notropis atherinoides</i>	Emerald shiner
	<i>Luxilus cornutus</i>	Common shiner
	<i>N. hudsonius</i>	Spottail shiner
	<i>P. promelas</i>	Fathead minnow
	<i>Rhinichthys atratulus</i>	Blacknose dace
	<i>R. cataractae</i>	Longnose dace
	<i>Semotilus atromaculatus</i>	Creek chub
Catostomidae	<i>Castostomus commersoni</i>	Common white sucker
	<i>Hypentelium nigricans</i>	Northern hog sucker
Ictaluridae	<i>Ameiurus nebulosus</i>	Brown bullhead
Gasterosteidae	<i>Culaea inconstans</i>	Brook stickleback
	<i>Gasterosteus aculeatus</i>	Threespine stickleback
Centrarchidae	<i>Lepomis gibbosus</i>	Pumpkinseed
Percidae	<i>Percina caprodes</i>	Logperch
	<i>Morone americana</i>	White perch

The reach of Red Hill Creek within the study area provides direct fish habitat to the local fish community for feeding and rearing and also provides non-specialized spawning habitat. Red Hill Creek has been assessed as Type 2, or important, fish habitat, as the

² Fisheries and the Red Hill Creek Realignment Study. 2003. C. Portt and Associates.

³ Ibid, 2003.

⁴ Ibid, 2003.

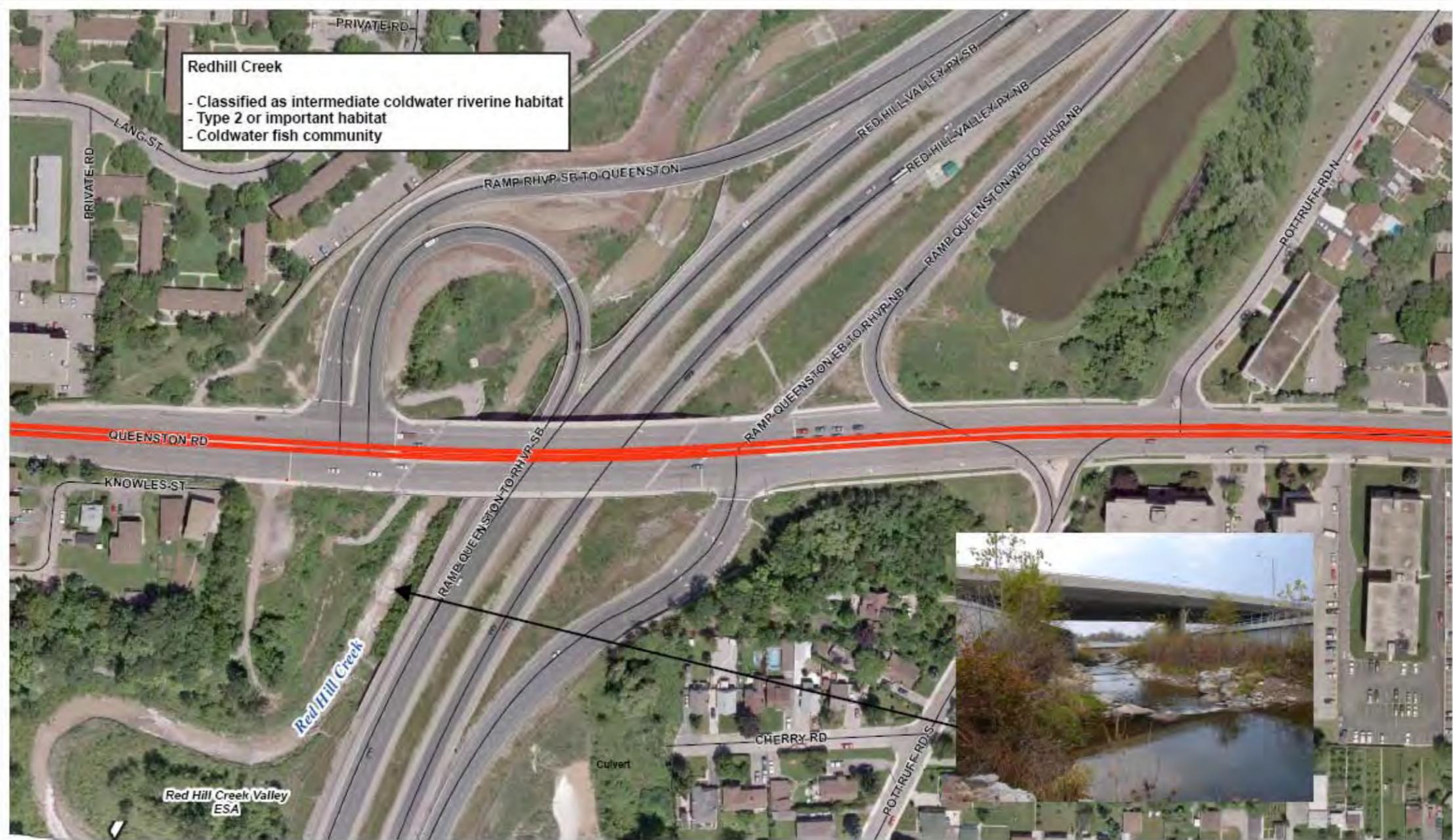
⁵ Hamilton Harbour and Watershed Fisheries Management Plan. 2009.



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habitat is relatively common and widespread throughout the realignment and it does not provide any specialized spawning habitat or other habitat critical to a specific life stage of fish.

An overview of existing aquatic habitat conditions at Red Hill Creek is presented in Figure 3.





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Chedoke Channels Maintenance Study – Municipal Class Environmental Assessment Final Project File Report. MRC. November, 2008.

City of Hamilton Airport Employment Growth District – Phase 2. Draft Subwatershed Study and Draft Stormwater Master Plan. Dillon Consulting. April, 2000.

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<https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do>

OMNR Species at Risk in Ontario (SARO) List. updated September 11, 2009.
<http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html>

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http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm

Species at Risk Act (SARA), Ministry of Environment.
http://www.sararegistry.gc.ca/sar/index/default_e.cfm

Terrestrial Ecosystems

1.1 Introduction

SNC Lavalin was retained by the City of Hamilton to carry out a review and confirmation of the 2009 Terrestrial conditions report conducted by Dillon Consulting Limited along the proposed Light Rail Transit (LRT) system, Main/King B-Line, Corridor between Red Hill Creek Escarpment Valley (Queenston Road and Red Hill Expressway) and Chedoke Creek (Main Street and Highway 403). The purpose of this report is to document spring conditions and to confirm the Dillon habitat assessment and potential impacts of the proposed LRT on the terrestrial community.

As described by Dillon, the majority of the corridor is an urban section of downtown Hamilton, which contains individual tree plantings spaced intermittently along Main Street, King Street and Queenston Road. Dillon identified four areas of natural/semi-natural vegetation that occur in distinct locations within the corridor. These were then designated as study areas for field investigation.

Initial review of the aerial photography available confirmed this initial assessment and designation of the general study areas, but the Coldwater Creek crossing was not included in these investigations due to a reassessment of the terminus of the line and the decision to end at McMaster University. The study areas were also reduced to those areas affected by the refined alignment, as identified in Design Workbook 1. The study areas relevant to this report are shown on Figure 1.1 and include:

- Chedoke Creek valley/Cathedral Park;
- Gage Park; and
- Red Hill Creek Escarpment Valley;

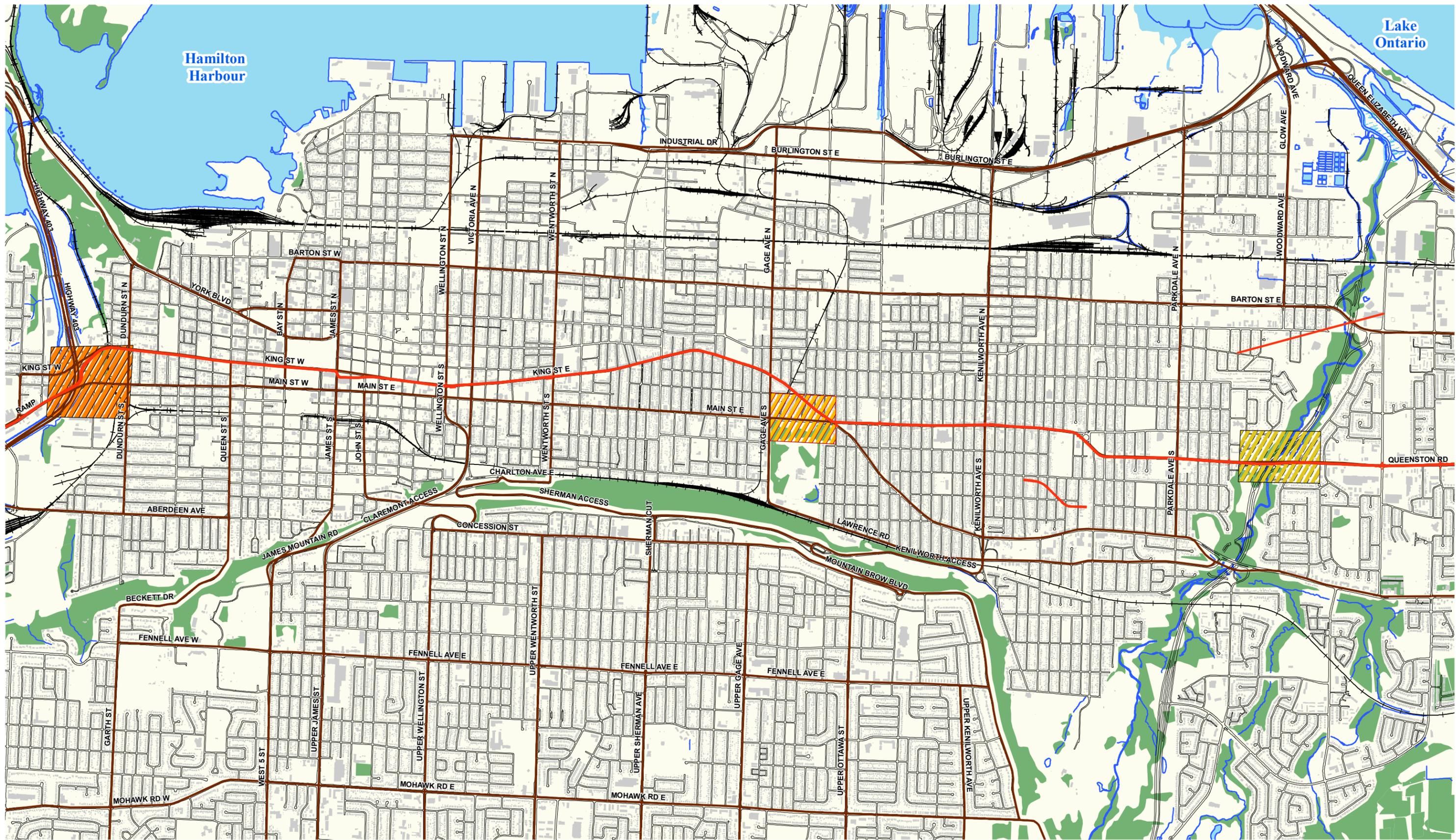
2.0 Methods

Site investigations for this study were carried out over two days from June 16th to the 17th 2010. The purpose of the June 2010 investigations was to confirm the Dillon field assessment conducted in January of 2009 as part of the City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, March 2009.

2.1 *Background*

Background data were obtained from various published and non-published sources. Sources of information included:

- City of Hamilton Rapid Transit Initiative Terrestrial and Avian Ecology Report, Dillon Consulting Limited, March 2009;
- Guelph District Ontario Ministry of Natural Resources (MNR);
- Hamilton Conservation Authority (HRCA);
- Class EA Ecological Assessment Requirements for Baseline Conditions, S. Faulkenham, Hamilton Conservation Authority, March 26, 2009;

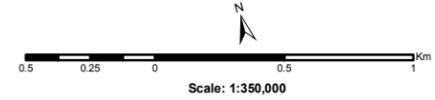


Hamilton Harbour

Lake Ontario

- Legend:**
- Study Areas**
- Chedoke Creek Crossing
 - Gage Park
 - Red Hill Creek Crossing

- Proposed LRT B-Line
- Major Road
- Buildings
- Roads
- Waterbody
- Rail
- Wetland
- Drainage
- Vegetation



Hamilton Rapid Transit Initiative

Natural Heritage Study Areas

Date: October, 2010 File Number: 503795 Sub Code: ENVR

Figure: 1.1 Rev. 0

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- Natural Heritage Information Center (NHIC) website 2010;
- City of Hamilton RT team;
- Urban Hamilton Official Plan, Schedule B, Natural Heritage System, July 2009;
- COSEWIC. 2009. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Web site: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm [accessed 25 Sept 2010];
- Species at Risk in Ontario (SARO) List, updated September 11, 2009.

2.2 Field Surveys

Field surveys were conducted with the goal of confirming previous investigations, and entailed the confirmation of the ELC classifications, as well as supplementing the botanical survey with spring field investigations to ensure that seasonal emergent species are included in the assessment.

Field surveys were conducted on June 16th and 17th using wandering transects in each significant vegetative assemblage regardless of size. Vegetation assemblages were identified using aerial photography and characterized using a modified Ecological Land Classification (ELC) protocol, due primarily to the limited extent (< 0.5 ha) of the majority of the vegetative units identified. All units were identified to the Vegetation Type (V-Type) level. Those units that did not fit into current V-Type designations were given codes with the appropriate Ecosite designation followed by the next logical vegetation number. Paved areas and trails were designated as disturbed, and groomed areas or parklands were designated as Manicured Grass/Trees (MGT).

Plant species were documented as they were encountered during the field surveys. A complete list of the vascular plant species found is presented in Appendix A. Nomenclature is based on the Ontario plant list (Newmaster et al. 2003).

3.0 Provincially and Locally Identified Natural Heritage Features

3.1 Red Hill Creek Escarpment Valley

The Red Hill Creek Escarpment Valley is designated by MNR as a life science site of regional significance, and an Environmentally Significant Area (ESA) according to Map 4 of the Hamilton-Wentworth Official Plan (Official Plan). It is approximately 600 hectares in size and is part of a branching urban greenspace that includes floodplain lands, and active and passive recreational greenspace. The area is surrounded both east and west by urban development and is crossed by numerous roads, rail lines, transmission corridors and sewage mains. The Red Hill Creek Parkway also connects the QEW to areas to the south via the valley lands. Regardless of the significant disruption that has occurred within the area, it still maintains a diverse ecosystem due to the variety of topographical features, soils, moisture regimes, and micro-climates found in the valley system. In addition, the City has completed considerable restoration of the

valleyland vegetation communities following construction of the Parkway. There are close to 600 plant species in the valley, of which about 20 are considered rare in Hamilton (Hamilton Naturalists Club, 2010). The NHIC database feature report, and the City of Hamilton Site Summary for this feature can be found in Appendix B. An approximate boundary of the Red Hill Creek Escarpment Valley ESA derived from the Official Plan ESA boundary is shown on Figure 2. MNR does not maintain mapping for this feature.

The LRT B-Line crosses over the Red Hill Creek Escarpment Valley between Pottruff Road and Reid Avenue South utilizing the Queenston Road Bridge. This portion of the valley is significantly degraded due to the construction of the Queenston Bridge and the more recent Red Hill Parkway construction. No construction activities related to the LRT B Line are expected within the valley system.

3.2 Gage Park

Gage Park is a large municipal multipurpose park with recreational facilities, large open areas, and historical significance. It is classified as, and is located along the south side of Main Street between Gage Avenue and King Street (see Figure 3). This park has large areas of manicured lawn, and numerous areas of planted trees, shrubs and gardens, some of which are exotic or rare to the area. The LRT B-Line alignment from the east transfers to the King Street corridor just east of Gage Park. Therefore, no direct short term impacts from construction activities related to the LRT B-Line are expected to occur within the park.

3.3 Chedoke Creek (Cootes Paradise)

Chedoke Creek flows through a large concrete box culvert within the study area. To the north it flows through Cootes Paradise, which is proximal to the project study area. Cootes Paradise is wetland forest complex located in between the Dundas Valley and Hamilton Harbour, on the northwest fringe of the Hamilton-Ancaster-Dundas urban centre. It contains the Cootes Paradise Drowned Valley life science Area of Natural and Scientific Interest (ANSI), and a Provincially Significant Wetland (PSW), as defined by MNR. It is also designated as an ESA in the City of Hamilton Official Plan.

The PSW wetland is the largest remaining Great Lakes shoreline marsh at the western end of Lake Ontario. This wetland is surrounded by significant terrestrial habitats of the Dundas Valley and the significant aquatic habitats of the Hamilton Harbour. Numerous nationally and provincially significant plant and animal species occur here. Many of the plant species present in this area have not been reported elsewhere in the City of Hamilton. Cootes Paradise is also an important staging ground for waterfowl and provides connectivity between the significant terrestrial habitats in the Dundas Valley and significant aquatic habitats in Hamilton Harbour (Hamilton Naturalists Club 1995a).

The NHIC database feature report, and the City of Hamilton Site Summary for this feature can be found in Appendix B.

4.0 Vegetation Communities

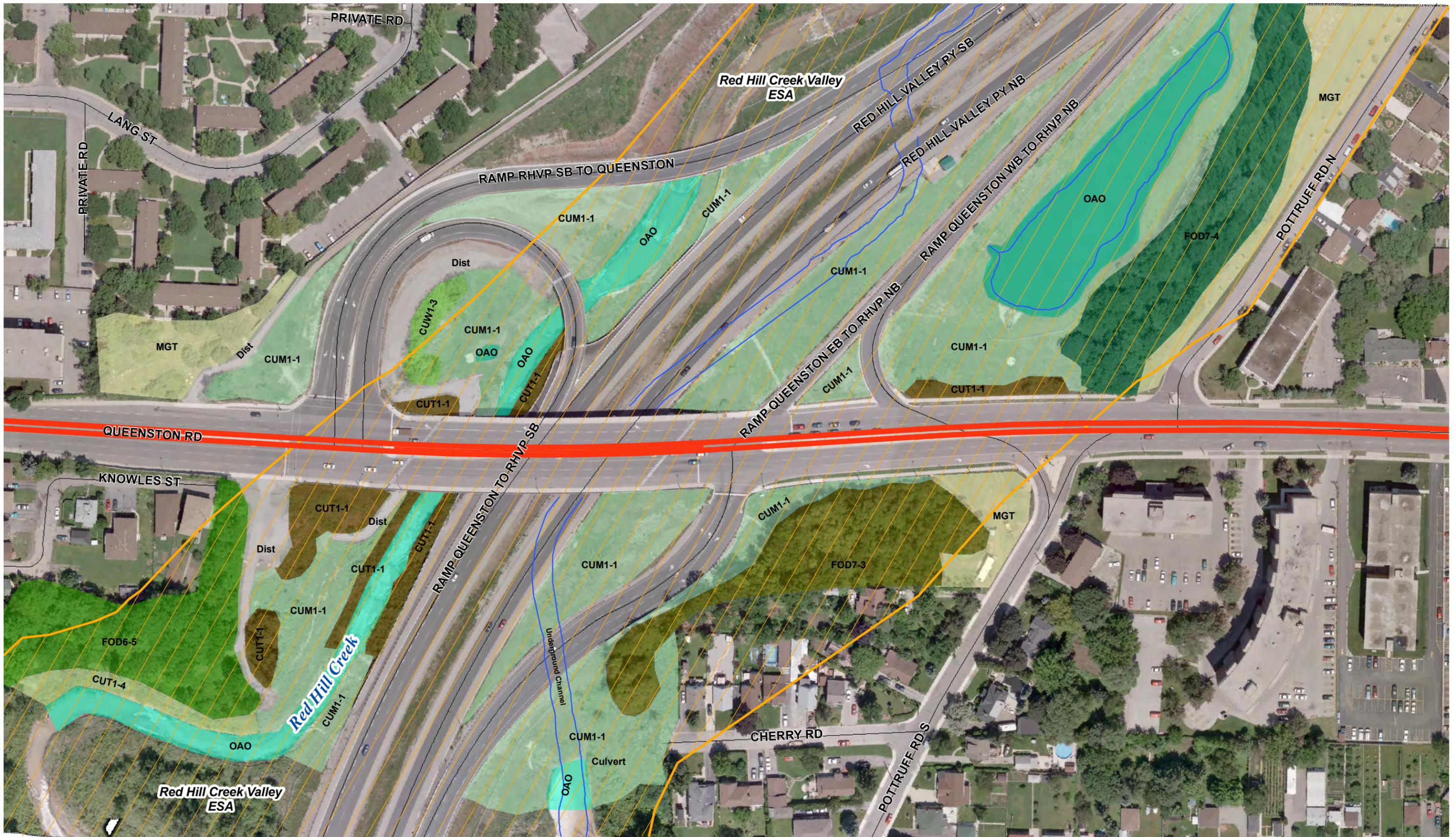
The study areas identified in this report were selected based on the presence of reasonably large blocks of vegetation in the highly urbanized setting through which the proposed LRT B-Line will run. These areas have been subjected to significant anthropomorphic pressure, which has degraded the natural attributes of those vegetative assemblages that remain. A number of these landscapes have also been created to provide park settings and landscaped property holdings, which are subject to constant maintenance. All areas examined exhibit significant degradation of the historic natural systems and remnants still present. Cultural meadow or groomed open spaces dominate all sites, with some small remnant woodlots or pockets of planted wooded areas present in all areas. Appendix C provides a photo record of each site.

4.1 Red Hill Creek Valley

The proposed LRT B-Line will cross the Red Hill Creek Valley using the existing Queenston Road Bridge. The lands surrounding the Red Hill Creek study area are largely urban in nature. There has also been significant road development in the form of the Queenston Road Bridge, and Red Hill Valley parkway and associated ramps, resulting in the degradation of the natural features remaining. Figure 4.1 shows the ELC classifications assigned to the vegetative units found within the study area. A number of areas designated as Hedgerow in the 2009 report have been re-assigned as Cultural Woodlot to more accurately reflect the remnant nature of the features and provide a more descriptive code.

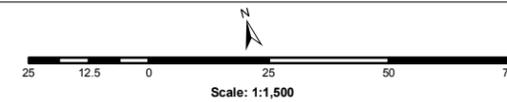
The majority of the habitat found within this study area is best described as manicured open space and cultural meadow, which is dominated by grasses, along with sun tolerant broad-leaf vegetation typical of old fields and disturbed areas. Herbaceous vegetation in the cultural meadow areas consists of old field type vegetation, such as introduced forage grasses (e.g., smooth brome (*Bromus inermis*), timothy (*Phleum pratense*), reed canary grass (*Phalaris arundinacea*), perennial ryegrass (*Lolium perenne*), creeping red fescue (*Festuca rubra*) and Kentucky blue grass (*Poa pratensis*)). Broad-leaved ground cover includes common milkweed (*Asclepias syriaca*), common mullien (*Verbascum thapsus*), common burdock (*Arctium minus*), daisy fleabane (*Erigeron annuus*), wild carrot (*Daucus carota*), rough cinquefoil (*Potentilla norvegica*), garlic mustard (*Alliaria petiolata*), white sweet clover (*Melilotus alba*), bittersweet nightshade (*Solanum dulcamara*), crown vetch (*Coronilla varia*), common St. John's wort (*Hypericum perforatum*), common ragweed (*Ambrosia artemisiifolia*), yarrow (*Achillea millefolium*), bull thistle (*Cirsium vulgare*), teasel (*Dipsacus fullonum*), as well as perennial asters and goldenrods.

There are also a number of naturalized and planted isolated and clustered trees and shrubs of various ages within these areas. These include tree species such as Eastern white pine (*Pinus strobus*), Norway maple (*Acer platanoides*), white ash (*Fraxinus Americana*), white birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), along with shrubs such as staghorn sumac (*Rhus typhina*), downy serviceberry (*Amelanchier arborea*), common buckthorn (*Rhamnus cathartica*), and grey dogwood (*Cornus*



Legend

- CUT1-1: Dry Fresh Staghorn Sumac Cultural Thicket
- FOD7-4: Fresh Moist Black Walnut Lowland Deciduous Forest
- MGT: Manicured Grass/Trees*
- SensitiveAreas_JH_Digitized
- CUT1-4: Fresh Moist Manitoba Maple Cultural Thicket*
- CUW1-3: Dry Fresh Manitoba Maple Mineral Cultural Woodlot*
- Dist: Disturbed
- Proposed LRT B-Line
- FOD6-5: Fresh Moist Sugar Maple Deciduous Forest
- CUM1-1: Dry Moist Old Field Cultural Meadow
- Road
- FOD7-3: Fresh Moist Willow Lowland Deciduous Forest
- OAO: Open Aquatic
- Drainage



Hamilton Rapid Transit Initiative
Gage Park Study Area
**Natural Features ELC Designations/
 Sensitive Areas**

Date: October, 2010 File Number: 503795 Sub Code: ENVR
 Figure: **4.1** Rev. **0**

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foemina), with red osier dogwood (*Cornus stolonifera*), and slender willow (*Salix petiolaris*) found in the wetter areas.

A few remnant wooded areas are found within the study area. On the eastern side of Red Hill Creek, these include one strip of valley slope vegetation designated as Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4) found to the north of Queenston Road, just west of the groomed verge of Potruff Road. This woodlot is dominated by black walnut (*Juglans nigra*), particularly within the lower slopes, with white ash, red ash (*Fraxinus pennsylvanica*), and Manitoba maple (*Acer negundo*) present in some numbers. Common buckthorn dominates the shrub layer, along with grey dogwood, riverbank grape (*Vitis riparia*), and Virginia creeper (*Parthenocissus quinquefolia*). The floodplain is open cultural meadow with a large stormwater pond extending to the north. There are some limited patches of broad-leaved cattail (*Typha latifolia*) and common reed (*Phragmites australis*), and red osier dogwood (*Cornus stolonifera*) associated with the pond.

Immediately to the south of Queenston Road, and west of the groomed verge of Potruff Road, a small Fresh-Moist Willow Lowland Deciduous Forest (FOD 7-3) follows a small drainage running parallel to Queenston Road into the valley, extending slightly to the south. It is bounded by residential development to the south and east. This woodlot is dominated by weeping willow (*Salix alba*), and white elm (*Ulmus Americana*), with some black cherry (*Prunus serotina*), and basswood (*Tilia americana*) present in the drier areas. Shrub composition was similar to that found to the north. The remaining areas are cultural meadow and another stormwater pod extends to the south. Also of note are a number of planted tulip (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*) and blue beech (*Carpinus caroliniana*) located within the groomed area at the corner of Queenston Road and Potruff Road.

To the west, major ramp construction related to the Red Hill Creek Parkway has removed the majority of the natural vegetation. In the southwest, a large block of Fresh-Moist Sugar Maple Hardwood Deciduous Forest (FOD 6-5) is found. This feature follows a meander in the creek and extends in a thin strip north to Queenston Road. It is dominated by sugar maple (*Acer saccharum*), with white ash and black walnut present in some numbers. The remainder is cultural meadow, with patches of Dry Fresh Staghorn Sumac Cultural Thicket (CUT1-1) adjacent to Queenston Road, the adjacent trail and along portions of the creek. Balsam poplar, slender willow and red osier dogwood were noted along the creek, and evidence of restoration plantings of the above species, as well as white birch, were found in a number of open areas.

To the north, all that remains following ramp construction is a very small remnant of Fresh Moist Manitoba Maple Cultural Woodlot (CUW1-3). This feature is dominated by Manitoba maple, with some white ash, and bur oak (*Quercus macrocarpa*). The remaining areas are cultural meadow with some exposed soils, with a few small cultural thicket areas along Queenston Road and the east side to the creek. A small pond is also found within the southbound off-ramp loop.

4.2 Gage Park

The new alignment of the proposed LRT B-Line from the east will veer to the north to follow King Street East at the Delta (Main Street East/King Street West intersection) at the eastern edge of Gage Park.

Gage Park is a large municipal multipurpose park with recreational facilities, large open areas. The entire property is manicured and contains a large number of planted and managed mature native and non-native trees. Tree assemblages were found to be grouped in numbers significant enough to designate these areas as Cultural Plantation under the ELC. Figure 4.2 shows the ELC classifications assigned to the vegetative units found within the study area. Two categories were deemed appropriate for this area. They are Dry Fresh Norway Maple Plantation (CUP1-11), and Dry Fresh Mixed Cultural Plantation (CUP2-2). Neither of these classifications are found within the existing ELC table, so the appropriate Ecosite designation followed by the next logical vegetation number was used. The remaining areas are manicured lawns and gardens. Of note are honey locust (*Gleditsia triacanthos*), and Kentucky coffee tree (*Gymnocladus dioica*) found in the east and central portions of the park, and a number of very large European beech (*Fagus sylvatica*), one almost 2 m in diameter, found in the southwestern portion of the park. This beech species was not found in either the Newmaster or the NHIC listings.

The field survey confirmed the roadside tree counts provided in the Dillon 2009 Terrestrial conditions report:

*“Trees found immediately adjacent to the road include northern catalpa (*Catalpa speciosa*) (2 individuals), horse chestnut (*Aesculus hippocastanum*) (3 individuals), white spruce (36 individuals), white ash (8 individuals), red ash (2 individuals), an introduced larch species (*Larix sp.*) (5 individuals), crab apple (*Malus sp.*) (4 individuals), eastern white cedar (29 individuals), non-native yew shrubs (*Taxus sp.*) (5 individuals), an ornamental beech hedge (*Fagus sp.*), red pine (7 individuals), sycamore (3 individuals), scotch pine (*Pinus sylvestris*) (1 individual), eastern hemlock (*Tsuga canadensis*) (1 individual), and an introduced fir species (6 individuals).”*

Other tree species found here include Norway maple, sugar maple (*Acer saccharum* ssp. *saccharum*), Norway maple, and basswood (*Tilia americana*), sycamore (*Platanus occidentalis*), Austrian pine (*Pinus nigra*), and red pine (*Pinus resinosa*), eastern white cedar (*Thuja occidentalis*).

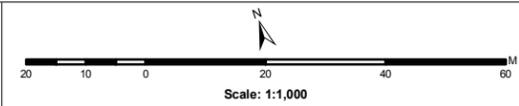
4.3 Chedokee Creek

The lands surrounding the Chedokee Creek study area are largely urban in nature. There has also been significant road development in the form of the King Street West and Main Street West Road Bridges over Highway 403, Highway 403, and its associated ramps, resulting in degradation of the natural features remaining in this area. Figure 4.3 shows the ELC classifications assigned to the vegetative units found within the study area. A number of areas designated as Hedgerow in the 2009 report have been re-assigned as Cultural Woodlot to more accurately reflect the remnant nature of the features and provide a more descriptive code.



Legend

- CUP1-11: Dry Fresh Norway Maple Deciduous Plantation*
 - CUP2-2: Dry Fresh Austrian Pine-Sugar Maple Mixed Plantation*
 - MGT: Manicured Grass/Trees
 - Dist: Disturbed
 - Proposed LRT B-Line
 - Road
 - Drainage
- * V-Type assigned by SNC Lavalin

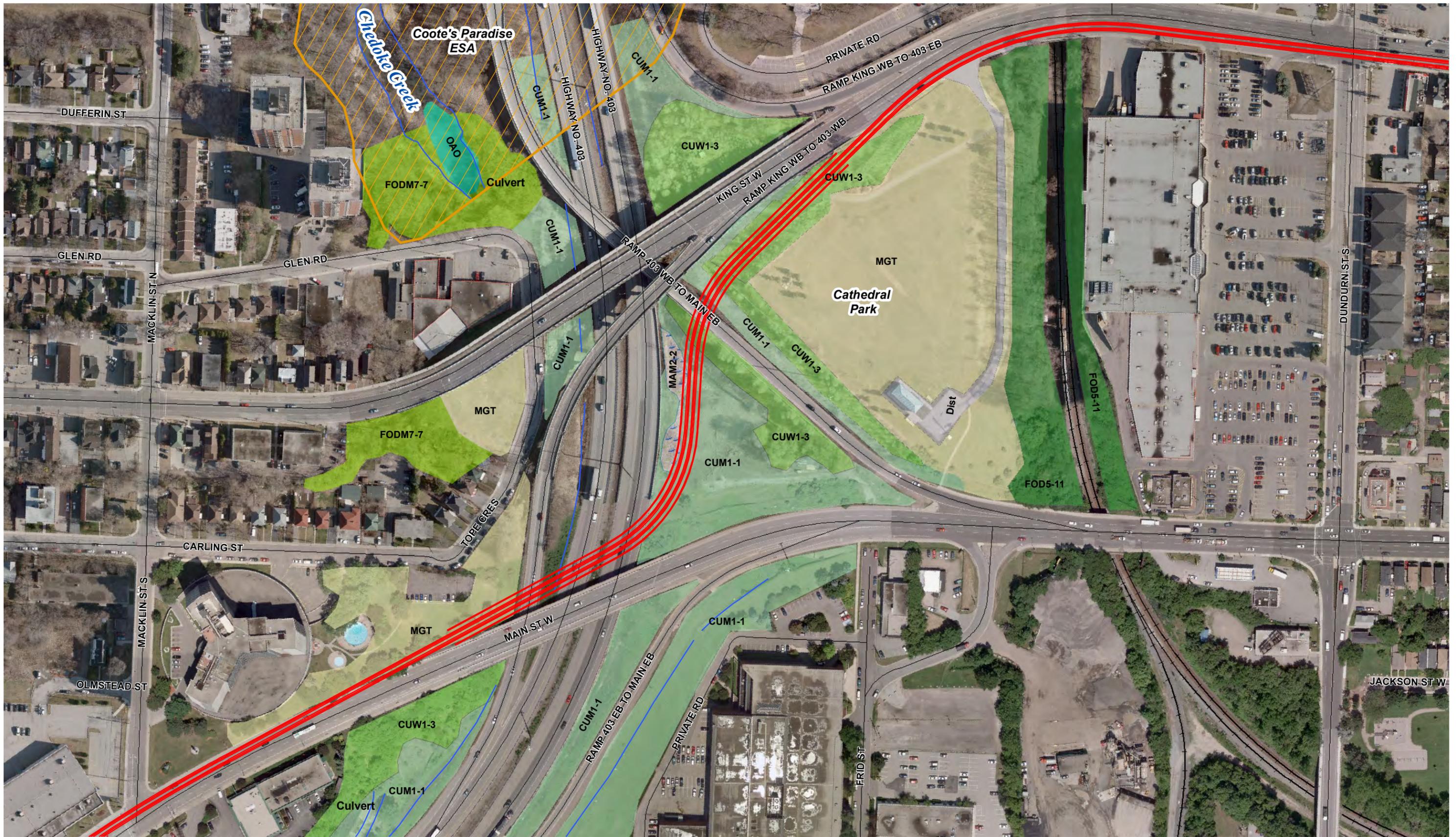


Hamilton Rapid Transit Initiative

**Gage Park Study Area
Natural Features ELC Designations/
Sensitive Areas**

Date: October, 2010 File Number: 503795 Sub Code: ENVR

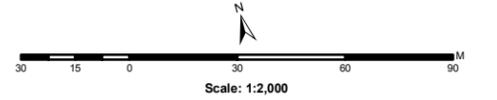
Figure: 4.2 Rev. 0



Legend

- FODM7-7: Fresh Moist Manitoba Maple Lowland Deciduous Forest
- FOD5-11: Dry Fresh Silver Maple Deciduous Forest*
- CUW1-3: Dry Fresh Manitoba Maple Mineral Cultural Woodlot*
- CUM1-1: Dry Moist Old Field Cultural Meadow
- OAO: Open Aquatic
- MGT: Manicured Grass/Trees
- Dist: Disturbed
- Coote's Paradise ESA
- Proposed LRT B-Line
- Road
- Drainage

* V-Type assigned by SNC Lavalin



Hamilton Rapid Transit Initiative
Gage Park Study Area
**Natural Features ELC Designations/
 Sensitive Areas**

Date: October, 2010	File Number: 503795	Sub Code: ENVR
Figure:	3.3	Rev. 0

The LRT alignment from the east follows King Street West until it gets to Cathedral Park, which incorporates above and below ground infrastructure associated with the City's Main/King Combined Sewer Overflow facility. At this point the alignment runs southwest, on a dedicated elevated guideway, through the northern edge of the park, before bending sharply south to intersect with Main Street West and continuing westward.

The majority of the habitat found within this study area is best described as manicured open space and cultural meadow, which is dominated by grasses, along with sun tolerant broad-leaf vegetation typical of old fields and disturbed areas. Herbaceous vegetation in the cultural meadow areas is similar to that described above in the Red Hill Creek area.

A number of naturalized and planted isolated and clustered trees and shrubs of various ages are found within these areas. These include tree species such as Chinese elm (*Ulmus parvifolia*), Siberian elm (*Ulmus pumila*), Norway maple, white ash, white birch, balsam poplar, along with shrubs such as staghorn sumac, common buckthorn, and grey dogwood, with red osier dogwood found in the wetter areas. Planted Honey locust, sugar maple, silver maple (*Acer saccharinum*), Norway maple, red oak (*Quercus rubra*), and blue spruce (*Picea pungens*) were observed within the Cathedral Park grounds, and a number of larger planted Austrian pine, basswood, black walnut, and white birch were found along the northern side of Main Street West, just east of Highway 403.

Very few wooded areas remain in the area. One remnant Dry Fresh Silver Maple Deciduous Forest (FOD5-11) is found lining the rail line to the east of Cathedral Park. This is dominated by silver maple, and Manitoba maple with some black locust (*Robinia pseudo-acacia*), basswood, sugar maple, Chinese elm, Siberian elm, and red ash present. Shrub growth is vigorous and includes grey dogwood, tartarian honeysuckle (*Lonicera tatarica*), common buckthorn and riverbank grape.

Two small pockets of Fresh Moist Manitoba Maple Lowland Deciduous Forest (FODM7-7) are found to the north and west of Highway 403. These are remnants of the historic Chedoke Creek valley slope and floodplain forests, and have experienced significant degradation due to the proximity of the low and high density residential uses in the surrounding areas. Coote's Paradise ESA extends into the northern most of these units.

The remaining wooded areas have been designated as Dry Fresh Manitoba Maple Mineral Cultural Woodlot (CUW1-3). These areas line the northern, and western edges of Cathedral Park, the west and east sides of the Highway 403 to Main Street West ramp, and the southern edge of Main Street West just west of Highway 403. All these areas are dominated by Manitoba maple to some degree with Chinese elm and some Norway maple present. The majority of the trees are very small giving it the appearance of a thicket in many places and evidence of restoration planting is found throughout. Shrub growth is vigorous with tartarian honeysuckle, Virginia creeper, lilac (*Syringa vulgaris*), and staghorn sumac. Some small white mulberry (*Morus alba*) were noted along the western side of the Highway 403 to Main Street West ramp. Finally a small wet pocket of Reed Canary Grass Meadow Marsh (MAM2-2) was found adjacent to the highway east of the Highway 403 to Main Street West ramp.

5.0 Vascular Plants

A complete species list of vascular plants observed and noted within the study areas can be found in Appendix A. The list is organized by scientific family name, genus and species. A total of 129 vascular plant species were observed. Of these 71 (55%) are listed as native species, and 58 (45%) are listed as invasive. A number of the species observed (18, or 14%) have a Coefficient of Conservation value of 6 or greater, but these values can be somewhat misleading if given too much significance. The majority of these species have been planted as part of landscape/restoration initiatives, and as such provide no real indication of the true floristic quality of the sites. The disturbed and fragmented nature of the areas studied is apparent in the small size of the vegetative communities found and the even distribution of native and non-native species observed within the majority of these units.

It should be noted that the species list, though relatively comprehensive, is not a complete list of the plants of the area. This is particularly applicable to short-term seasonal plants, since the area was not observed throughout the growing season. Nomenclature is primarily in accordance with the Ontario Plant List (Newmaster, 1998), and secondarily with NHIC (2010).

5.1 *Species At Risk*

Within the study area, one species (the Kentucky Coffee-tree) is listed as Threatened under COSEWIC (Committee on the Status of Endangered Wildlife in Canada), the federal Species at Risk Act (SARA), and the Committee on the Status of Species at Risk in Ontario (COSSARO). This species is also listed as S2 (Imperiled) by the Ministry of Natural Resources within their NHIC (Natural Heritage Information Centre) website. One other species, the Honey locust, also has an NHIC S-Rank of S2. Both of these species were found within landscaped settings (e.g., Gage Park), and are present as a result of planting programs. Two other species, Black Gum and Pin Oak have an S-Rank of S3 (Vulnerable), and were observed in similar locations. The remainder of the native vascular plant species observed were listed as S4 (Apparently Secure), or S5 (Secure).

The 2009 Dillon NHIC species occurrence database search listed 12 rare plants as being historically present the vicinity of their study area, which included Cold Creek.

These include:

- Giant pinedrops (*Pterospora andromedea*) (S2)
- Red mulberry (*Morus rubra*) (S2)
- Bluebells (*Mertensia virginica*) (S3)
- American chestnut (*Castanea dentata*) (S2)
- Few flowered club rush (*Trichophorum planifolium*) (S1)
- White wood aster (*Eurybia divaricata*) (S2)
- Spotted wintergreen (*Chimaphila maculata*) (S1)
- Eastern yellow star-grass (*Hypoxis hirsuta*) (S3)
- Yellow pond-lily (*Nuphar advena*) (S3)

- Square stemmed rose pink (*Sabatia angularis*) (SX)
- Shaggy false gromwell (*Onosmodium molle* ssp. *hispidissimum*) (S2)
- Puttyroot (*Aplectrum hyemale*) (S2)

In early 2010, NHIC re-worked its website and developed a new 1 km block species occurrence database, which allows for a somewhat more refined location search. A number of species listed in the results were also found to be either extirpated or the last recorded observation occurred prior to 1980. These records are not included in these lists, but the full lists are provided in Appendix D. A search of the new NHIC dataset yielded the following results.

Red Hill Creek

- Northern Hawthorn (*Crataegus dissona*) – S3, 1981
- Brainerd's Hawthorn (*Crataegus brainerdii*) – S2, 1981
- Fern-leaved Yellow False Foxglove (*Aureolaria pedicularia*) – S2?, 1989
- Soft-hairy False Gromwell (*Onosmodium molle* ssp. *Hispidissimum*) – S2, No Obs. Date
- Bowman's-root (*Porteranthus trifolius*) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (*Sabatia angularis*) – Presumed Extirpated (SX), No Obs. Date

Gage Park

- White-tinged Sedge (*Carex albicans* var. *albicans*) - S3, 1980
- Northern Hawthorn (*Crataegus dissona*) – S3, 1981
- American Chestnut (*Castanea dentata*) – S2, 1993
- Brainerd's Hawthorn (*Crataegus brainerdii*) – S2, 1981
- Perfoliate Bellwort (*Uvularia perfoliata*) – S1, 2001
- Soft-hairy False Gromwell (*Onosmodium molle* ssp. *Hispidissimum*) – S2, No Obs. Date
- Bowman's-root (*Porteranthus trifolius*) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (*Sabatia angularis*) – Presumed Extirpated (SX), No Obs. Date

Chedoke Creek

- White-tinged Sedge (*Carex albicans* var. *albicans*) - S3, 1980
- Northern Hawthorn (*Crataegus dissona*) – S3, 1981
- American Chestnut (*Castanea dentata*) – S2, 1993
- Brainerd's Hawthorn (*Crataegus brainerdii*) – S2, 1981
- Perfoliate Bellwort (*Uvularia perfoliata*) – S1, 2001
- Fern-leaved Yellow False Foxglove (*Aureolaria pedicularia*) – S2?, 1989
- Soft-hairy False Gromwell (*Onosmodium molle* ssp. *Hispidissimum*) – S2, No Obs. Date
- Bowman's-root (*Porteranthus trifolius*) – Presumed Extirpated (SX), No Obs. Date
- Square-stemmed Rose Pink (*Sabatia angularis*) – Presumed Extirpated (SX), No Obs. Date

None of the above species was observed during the field program. Due to the limited footprint of the project outside of established urban corridors, direct impacts to any rare vascular species that may occur in the vicinity of the study area are not expected.

6.0 Impacts/Mitigation

Impacts of proposed Hamilton LRT B-line construction will be limited to the existing road bed or R.O.W. of the associated roadways over the majority of the line. The following is a description of the potential impacts associated with the line construction.

6.1 Red Hill Creek Valley

The proposed LRT B-Line will cross the Red Hill Creek Valley using the existing Queenston Road Bridge (See Figure 4.1). All works will take place within the existing bridge structure and road bed or R.O.W. of the Queenston Road, and as such no impacts to vegetation are expected.

6.2 Gage Park

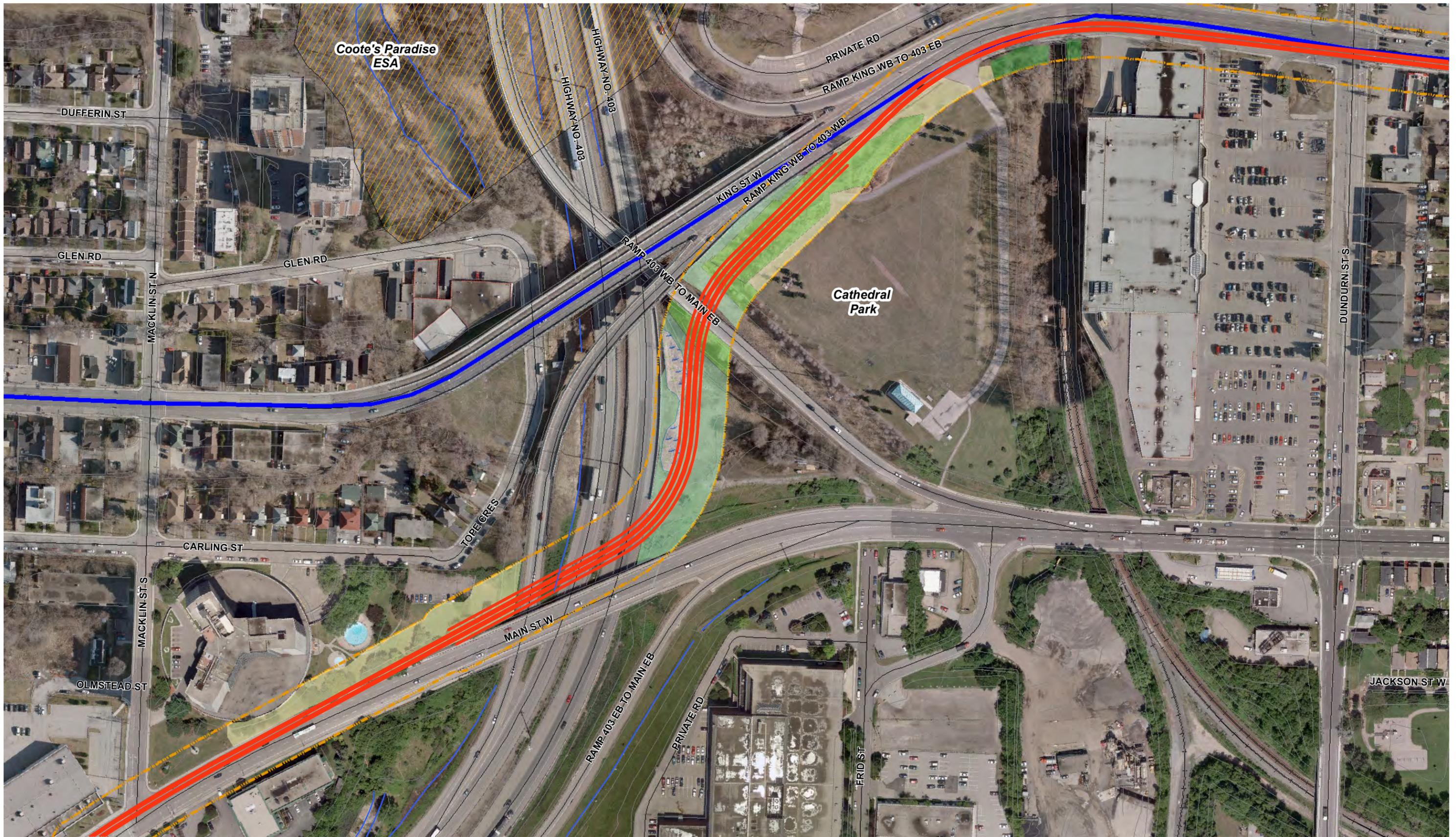
The new alignment of the proposed LRT B-Line will veer to the north to follow King Street East at the Main Street East/King Street West intersection found at the eastern edge of Gage Park (See Figure 4.2). All works will take place within the existing road bed or R.O.W. of the Main Street East and King Street West, and as such no impacts to vegetation are expected.

6.3 Chedoke Creek

The LRT alignment follows King Street West until it gets to Cathedral Park. At this point the alignment trends south west, through the northern edge of the park, before bending sharply south to intersect with Main Street West and continuing westward (See Figure 6.1). Assuming a working room requirement of 15 m to either side of the preferred line, this will result in the loss of approximately:

- 0.7 ha - Dry Fresh Silver Maple Deciduous Forest;
- 0.22 ha - Dry Fresh Manitoba Maple Mineral Cultural Woodlot;
- 0.9 ha - Dry Moist Old Field Cultural Meadow;
- 2.54 ha - Manicured Grass/Trees; and,
- 0.06 ha - Reed Canary Grass Meadow Marsh.

These areas are presently significantly degraded but urban development pressures in the surrounding lands, and with the exception of the small portion of Dry Fresh Silver Maple Deciduous Forest associated with the rail line, these areas are manicured or have been partially restored due to previous works in the area.



Legend

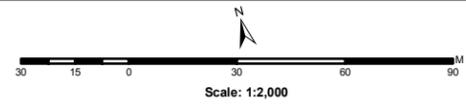
ELC Designations

- CUM1-1: Dry Moist Old Field Cultural Meadow
- FOD5-11: Dry Fresh Silver Maple Deciduous Forest*
- CUW1-3: Dry Fresh Manitoba Maple Mineral Cultural Woodlot*
- MAM2-2: Reed Canary Grass Meadow Marsh
- MGT: Manicured Grass/Trees

- 15m Working Room
- Coote's Paradise ESA

- Proposed LRT B-Line
- Road
- Drainage

* V-Type assigned by SNC Lavalin



Hamilton Rapid Transit Initiative

**Chedoke Creek Study Area
Projected Removals**

Date: October, 2010	File Number: 503795	Sub Code: ENVR
Figure:	6.1	Rev. 0

File: H:\Aerial\02254E.aerial\img\proj\GIS\MXD\TEK020309CooteLake\STK_CooteLake_350K_Regional.mxd

6.4 Mitigation

The following Mitigation measure should be implemented to minimize the effects of construction of the LRT B-Line on those natural and/or semi-natural vegetative assemblies found within the project area.

- Minimize encroachment on, or avoid remnant woodlots and large healthy trees where possible. Individual specimens to be saved will be marked on the ground before construction takes place;
- Trees and areas to be preserved within, and adjacent to the R.O.W will be protected with snow fence;
- Designated staging, refueling areas.
- Siltation control in areas where sedimentation could potentially affect un-impacted vegetation.
- Stormwater management to maximize runoff water quality, and provide some peak flow controls which will benefit nearby natural features;
- The movement of construction machinery will be limited to within the boundaries of the R.O.W and operated in a manner that minimizes damage to adjacent vegetation;
- Roots and branches, if damaged, will be treated using approved horticultural methods;
- Tree management as needed to remove any potentially hazardous trees along new wooded edges, and maintain forest health and balance;
- Trees felled will be dropped to fall within the R.O.W. to avoid damage to the remaining vegetation, where practicable;
- Retain dead standing trees where possible as long as there is no safety hazard;
- Wherever possible, construction activities will be restricted within the dripline of all trees not required for removal;
- No rare or endangered species have been identified within the study area. Specimens of rare or otherwise significant species, if observed, would be transplanted in nearby compatible habitat, where practical. The survival rate of any relocated rare and endangered species will also be monitored periodically.
- Utilize native species for identified restoration areas (e.g., Cold Creek re-alignment);
- Where practicable, use only native species for landscaping efforts along the highway R.O.W.;
- Provide dense edge plantings in areas of fresh forest edge exposure to protect from drying winds, sun exposure (desiccation and spread of invasive sun-tolerant plant species), and salt spray. These plantings may constitute an exception to the native species mandate, since non-native conifers may provide better screening/protection than native options.
- Return R.O.W. to pre-construction conditions, where possible.
- Provide environmental site inspection during key construction periods and at key locations to ensure environmental protection/re-vegetation measures are implemented and working and any required remedial action is undertaken.
- Check plantings of woody and herbaceous vegetation periodically for a period of one year to ensure an acceptable survival rate.

7.0 References

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Appendix A

Vascular Plant List

Appendix A
Vascular Plant Species List

Family	Genus	Species	Scientific Name	Common Names	Coefficient Conservation	Coefficient Wetness	GlobalRank	COSEWIC	COSSARO	SRank	Track	Introduced
	Coronilla	varia	<i>Coronilla varia</i>	Trailing Crown-vetch	0	5	G?			SE5		I
	Gleditsia	triacanthos	<i>Gleditsia triacanthos</i>	Honey Locust	3	0	G5			S2		
	Gymnocladus	dioicus	<i>Gymnocladus dioicus</i>	Kentucky Coffee-tree	6	5	G5	THR	THR	S2		
	Lathyrus	latifolius	<i>Lathyrus latifolius</i>	Everlasting Pea	0	5	G?			SE4		I
	Lotus	corniculatus	<i>Lotus corniculatus</i>	Bird's-foot Trefoil	0	1	G?					I
	Medicago	lupulina	<i>Medicago lupulina</i>	Black Medick	0	1	G?			SE5		I
	Melilotus	alba	<i>Melilotus alba</i>	White Sweet-clover	0	3	G5			SE5		I
	Melilotus	officinalis	<i>Melilotus officinalis</i>	Yellow Sweet-clover	0	3	G?			SE5		I
	Robinia	pseudo-acacia	<i>Robinia pseudo-acacia</i>	Black Locust	0	4	G5			SE5		I
	Trifolium	pratense	<i>Trifolium pratense</i>	Red Clover	0	2	G?			SE5		I
	Trifolium	repens	<i>Trifolium repens</i>	White Clover	0	2	G?			SE5		I
	Vicia	cracca	<i>Vicia cracca</i>	Cow Vetch	0	5	G?			SE5		I
FAGACEAE												
	Fagus	grandifolia	<i>Fagus grandifolia</i>	American Beech	6	3	G5			S5		
	Quercus	alba	<i>Quercus alba</i>	White Oak	6	3	G5			S5		
	Quercus	macrocarpa	<i>Quercus macrocarpa</i>	Bur Oak	5	1	G5			S5		
	Quercus	palustris	<i>Quercus palustris</i>	Pin Oak	9	-3	G5			S3		
	Quercus	rubra	<i>Quercus rubra</i>	Red Oak	6	3	G5			S5		
GROSSULARIACEAE												
	Ribes	cynosbati	<i>Ribes cynosbati</i>	Prickly Gooseberry	4	5	G5			S5		
HIPPOCASTANACEAE												
	Aesculus	hippocastanum	<i>Aesculus hippocastanum</i>	Horse Chestnut	0	5	G?			SE2		I
JUGLANDACEAE												
	Carya	cordiformis	<i>Carya cordiformis</i>	Bitternut Hickory	6	0	G5			S5		
	Juglans	nigra	<i>Juglans nigra</i>	Black Walnut	5	3	G5			S4		
LAMIACEAE												
	Prunella	vulgaris	<i>Prunella vulgaris ssp. lanceolata</i>	Heal-all	5	5	G5			S5		
MAGNOLIACEAE												
	Liriodendron	tulipifera	<i>Liriodendron tulipifera</i>	Tulip Tree	8	2	G5			S4		
MORACEAE												
	Morus	alba	<i>Morus alba</i>	White Mulberry	0	0	G?			SE5		I
NYSSACEAE												
	Nyssa	sylvatica	<i>Nyssa sylvatica</i>	Black Gum	9	-4	G5			S3		
OLEACEAE												
	Fraxinus	americana	<i>Fraxinus americana</i>	White Ash	4	3	G5			S5		
	Fraxinus	pennsylvanica	<i>Fraxinus pennsylvanica</i>	Red Ash	3	-3	G5			S5		
	Syringa	vulgaris	<i>Syringa vulgaris</i>	Common Lilac	0	5	G?			SE5		I
ONAGRACEAE												
	Oenothera	biennis	<i>Oenothera biennis</i>	Common Evening-primrose	0	3	G5			S5		
PINACEAE												
	Larix	laricina	<i>Larix laricina</i>	Tamarack	7	-3	G5			S5		
	Picea	glauca	<i>Picea glauca</i>	White Spruce	6	3	G5			S5		
	Pinus	nigra	<i>Pinus nigra</i>	Austrian Pine	0	-5	G?			SE2		I
	Pinus	resinosa	<i>Pinus resinosa</i>	Red Pine	8	3	G5			S5		
	Pinus	strobus	<i>Pinus strobus</i>	Eastern White Pine	4	3	G5			S5		
	Pinus	syvestris	<i>Pinus syvestris</i>	Scots Pine	0	5	G?			SE5		I
	Tsuga	canadensis	<i>Tsuga canadensis</i>	Eastern Hemlock	7	3	G5			S5		
	Picea	pungens	<i>Picea pungens</i>	Blue Spruce			G5			SE1		I
PLANTAGINACEAE												
	Plantago	lanceolata	<i>Plantago lanceolata</i>	Ribgrass	0	0	G5			SE5		I
	Plantago	major	<i>Plantago major</i>	Common Plantain	0	-1	G5			SE5		I
PLATANACEAE												
	Platanus	occidentalis	<i>Platanus occidentalis</i>	Sycamore	8	-3	G5			S4		
POACEAE												
	Agrostis	gigantea	<i>Agrostis gigantea</i>	Redtop Grass	0	0	G4G5			SE5		I
	Bromus	inermis	<i>Bromus inermis ssp. inermis</i>	Smooth Brome	0	5	G4G5			SE5		I
	Dactylis	glomerata	<i>Dactylis glomerata</i>	Orchard Grass	0	3	G?			SE5		I
	Festuca	rubra	<i>Festuca rubra</i>	Red Fescue		1	G5			S5		
	Lolium	perenne	<i>Lolium perenne</i>	Perennial Rye Grass	0	3	G?			SE4		I
	Phalaris	arundinacea	<i>Phalaris arundinacea</i>	Reed Canary Grass	0	-4	G5			S5		
	Phleum	pratense	<i>Phleum pratense</i>	Timothy	0	3	G?			SE5		I

Appendix A
Vascular Plant Species List

Family	Genus	Species	Scientific Name	Common Names	Coefficient Conservation	Coefficient Wetness	GlobalRank	COSEWIC	COSSARO	SRank	Track	Introduced
	Phragmites	australis	<i>Phragmites australis</i>	Common Reed	0	-4	G5			S5		
	Poa	pratensis	<i>Poa pratensis ssp. pratensis</i>	Kentucky Blue Grass	0	1	G?			S5		
POLYGONACEAE												
	Polygonum	cuspidatum	<i>Polygonum cuspidatum</i>	Japanese Knotweed	0	3	G?			SE4		I
	Rumex	crispus	<i>Rumex crispus</i>	Curly Dock	0	-1	G?			SE5		I
RANUNCULACEAE												
	Ranunculus	acris	<i>Ranunculus acris</i>	Tall Buttercup	0	-2	G5			SE5		I
	Ranunculus	repens	<i>Ranunculus repens</i>	Creeping Buttercup	0	-1	G?			SE5		I
	Thalictrum	dioicum	<i>Thalictrum dioicum</i>	Early Meadow-rue	5	2	G5			S5		
	Thalictrum	pubescens	<i>Thalictrum pubescens</i>	Tall Meadow-rue	5	-2	G5			S5		
RHAMNACEAE												
	Rhamnus	cathartica	<i>Rhamnus cathartica</i>	Common Buckthorn	0	3	G?			SE5		I
ROSACEAE												
	Amelanchier	arborea	<i>Amelanchier arborea</i>	Downy Serviceberry	5	3	G5			S5		
	Crataegus	sp	<i>Crataegus sp</i>	Hawthorn Species								
	Geum	aleppicum	<i>Geum aleppicum</i>	Yellow Avens	2	-1	G5			S5		
	Geum	canadense	<i>Geum canadense</i>	White Avens	3	0	G5			S5		
	Geum	laciniatum	<i>Geum laciniatum</i>	Rough Avens	4	-3	G5			S4		
	Malus	pumila	<i>Malus pumila</i>	Common Apple	0	5	G5			SE5		I
	Potentilla	norvegica	<i>Potentilla norvegica ssp. monspeliensis</i>	Rough Cinquefoil	0	0	G5			S5		
	Prunus	avium	<i>Prunus avium</i>	Sweet Cherry	0	5	G?			SE4		I
	Prunus	serotina	<i>Prunus serotina</i>	Black Cherry	3	3	G5			S5		
	Prunus	virginiana	<i>Prunus virginiana ssp. virginiana</i>	Choke Cherry	2	1	G5			S5		
	Rosa	blanda	<i>Rosa blanda</i>	Smooth Wild Rose	3	3	G5			S5		
	Rubus	allegheniensis	<i>Rubus allegheniensis</i>	Common Blackberry	2	2	G5			S5		
	Rubus	idaeus	<i>Rubus idaeus ssp. melanolasius</i>	Wild Red Raspberry	0	-2	G5			S5		
SALICACEAE												
	Populus	balsamifera	<i>Populus balsamifera ssp. balsamifera</i>	Balsam Poplar	4	-3	G5			S5		
	Salix	alba	<i>Salix alba</i>	White (Weeping) Willow	0	-3	G5			SE4		I
	Salix	fragilis	<i>Salix fragilis</i>	Crack Willow	0	-1	G?			SE5		I
	Salix	petiolaris	<i>Salix petiolaris</i>	Slender Willow	3	-4	G5			S5		
SCROPHULARIACEAE												
	Verbascum	thapsus	<i>Verbascum thapsus</i>	Common Mullein	0	5	G?			SE5		I
SOLANACEAE												
	Solanum	dulcamara	<i>Solanum dulcamara</i>	Bittersweet Nightshade	0	0	G?			SE5		I
	Solanum	pychanthum	<i>Solanum ptychanthum</i>	Eastern Black Nightshade	3	5	G5			S5		
TILIACEAE												
	Tilia	americana	<i>Tilia americana</i>	Basswood	4	3	G5			S5		
TYPHACEAE												
	Typha	latifolia	<i>Typha latifolia</i>	Broad-leaved Cattail	3	-5	G5			S5		
ULMACEAE												
	Ulmus	americana	<i>Ulmus americana</i>	White Elm	3	-2	G5?			S5		
	Ulmus	parvifolia	<i>Ulmus parvifolia</i>	Chinese Elm			G?			SE1		I
	Ulmus	pumila	<i>Ulmus pumila</i>	Siberian Elm	0	5	G?			SE3		I
URTICACEAE												
	Urtica	dioica	<i>Urtica dioica ssp. dioica</i>	European Stinging Nettle	0	-1	G5?			SE2		I
VIOLACEAE												
	Viola	sororia	<i>Viola sororia</i>	Common Blue Violet	4	1	G5			S5		
VITACEAE												
	Parthenocissus	quinquefolia	<i>Parthenocissus quinquefolia</i>	Virginia Creeper	6	1	G5			S4?		
	Vitis	riparia	<i>Vitis riparia</i>	Riverbank Grape	0	-2	G5			S5		

Appendix B

Provincially and Locally Identified Natural Heritage Features Background Data

RED HILL CREEK ESCARPMENT VALLEY

Municipality	ESA #	Conservation Authority
City of Hamilton	52	Hamilton
Formerly	Lot	Watershed
City of Hamilton	1-4	Red Hill Creek
Approximate Area	Concession	Ownership
594 hectares	7-8	Mostly Public

GENERAL SUMMARY

This large natural area, located on the east side of the City of Hamilton, encompasses much of the re-entrant in the Niagara Escarpment now occupied by Red Hill Creek. It is part of a branching urban greenspace that includes floodplain lands, and active and passive recreational greenspace. Most of the study area is publicly owned parkland⁴⁵⁹.

The study area is bordered by the urban development of Hamilton and Stoney Creek, to west and east respectively, by industrial and suburban development to the south and by the Lake Ontario shoreline transportation corridor and associated industries to the north. It is traversed by roads, railways, hydro corridors, and sewage mains. The proposed Red Hill Creek Expressway will use this natural corridor to form a north-south connector between the Queen Elizabeth Expressway (QEW) and Highway 403⁴⁵⁹.

This area is part of the continuous corridor of natural vegetation along the Niagara Escarpment. Although disrupted, the ecosystem is inherently diverse due to the varied topography, substrates, moisture regimes, and micro-climates present. This diversity is reflected in the number of flora and fauna species recorded here, including many rare and uncommon species⁴⁵⁹.

This area was included in the 1976 study and the 1991 NAI. Nature Counts surveyors collected data on birds, butterflies, herpetofauna, plants, mammals, and ELC.

HISTORICAL EVALUATION

1976 Study⁵⁶

Identified the following significant features:

- represents a distinctive and unusual landform within municipality, Ontario, or Canada
- serves a vital ecological function such as maintaining the hydrologic balance over a widespread area
- plant and animal communities of the area are identified as unusual or of high quality locally within the municipality, Ontario, or Canada
- has unusually high diversity of biological communities and associated plants and animals due to a variety of geomorphological features, soils, water, sunlight, and associated vegetation and microclimate effects
- provides habitat for rare or endangered species that are endangered regionally, provincially, or nationally
- combination of landforms and habitats is identified as

having high aesthetic value in the context of the surrounding landscape and any alteration would significantly lower its amenity value

NAI⁴⁵⁹

Significant Natural Area

- serves an important ecological function
- exhibits a high diversity of abiotic features
- provides habitat for significant wildlife species

OMNR- none

PRESENT EVALUATION

ESA Criteria

- Significant Earth Science Feature
 - the area encompasses locally significant features
- Significant Ecological Function
 - the area contains interior forest habitat (100-200m from forest edge)
 - the area contains a high diversity of native plant species
 - the area contains rare biotic communities
 - the riparian area serves as a link between natural areas
 - the area provides habitat for significant species

Significant Site Criteria

- Aesthetic Value
 - the waterfalls and vistas along this section of the Niagara Escarpment and in the upper valley, and the contrast between this area and the surrounding developed area are aesthetically important
- Educational or Research Value
 - the natural features of the area have been the subject of scientific research projects
 - the unusual features of this area make it suitable for educational purposes

PHYSICAL DESCRIPTION

Physiography and Topography

The Red Hill Creek Escarpment Valley includes parts of three major physiographic regions: the Iroquois Plain, the Niagara Escarpment, and the Haldimand Clay Plain. The study area is located within a broad northeast-opening notch carved into this north-facing, 50 m high cuesta of the prominent Niagara Escarpment. Waterfalls are present at the head of this notch where two small creeks cross the escarpment⁴⁵⁹.

The area below the escarpment is a north-sloping plain exhibiting stranded shoreline features, and with locally steeper slopes due to dissection of the underlying overburden and soft shale bedrock. Above the escarpment, the topography is gently rolling reflecting the irregular bedrock surface and the presence of low moraines⁴⁵⁹.

Total surface relief is some 125 m, mostly due to the height of the Niagara Escarpment. The entire area is part of the Red Hill Creek watershed and drains northerly into Lake Ontario via Hamilton Harbour⁴⁵⁹.

Bedrock Geology

This study area crosses the trend of the bedrock structure and includes a relatively complete cross-section of the regional geology. The sedimentary rocks underlying the Red Hill Creek Escarpment Valley range in age from upper Ordovician through to the middle Silurian (460 to 425 million years before present)⁴⁵⁹.

Below the Niagara Escarpment, red shales of the Queenston Formation are present. These are locally exposed, particularly in bluffs alongside the creek. The steep escarpment face and slope is comprised of the sequence from the Grimsby Formation upwards to the Ancaster chert beds (in the Goat Island Member of the Lockport Formation). This section is particularly well exposed in the vicinity of Albion Falls, at the head of the main valley⁴⁵⁹.

Above the falls, the Vinemount shale beds of the unnamed lower member of the Lockport Formation outcrop in the creek bed. In the southern section of the study area, the bedrock surface forms a broad basin bounded on three sides by the discontinuous, low scarp face of the Eramosa Escarpment, and is truncated to the north by the Niagara Escarpment. Dolostone of the Eramosa Member of the Lockport Formation was formerly quarried along the Eramosa Escarpment near Hannon, at the southern edge of the study area. Bedrock elevations range from about 198 m along the Eramosa scarp, to just under 180 m at the lip of Albion Falls⁴⁵⁹.

Red Hill and Buttermilk Creeks have cut small gorges into the Niagara Escarpment at the head of the larger Mount Albion re-entrant. A narrow, linear bedrock valley extends northeast from the escarpment to the present Lake Ontario shoreline. The present Red Hill Creek is coincident with this bedrock valley in part, but in many places, the older valley is completely filled with overburden⁴⁵⁹.

The rocks of the Niagara Escarpment in Hamilton exhibit the transition between the Appalachian basin and the Algonquin Arch sedimentary environments. Comparison of the rock exposures at Albion Falls with other natural and man-made exposures in the area provides important information about complex depositional environments of the western margin of the Appalachian basin⁴⁵⁹.

Overburden Geology

Except along the escarpments and locally along the stream courses, this area is covered by overburden deposited during or since the last glaciation. Halton Till deposits are found throughout most of the study area as a till-lain of variable thickness⁴⁵⁹.

Above the escarpment, the till layer varies from 0 to 10 m in thickness due to the irregular bedrock surface and the presence of the Vinemount Moraine. This moraine is the northernmost of the series of low-end moraines, which generally parallel the escarpment brow. The low ridge of the Vinemount Moraine has been breached and eroded by the Red Hill Creek drainage, and is apparent only in the southwestern arm of the study area. Except for the bedrock exposures and till exposures along the moraine, the upper tableland is covered with a thin blanket of clay and silt sediments deposited at the northern margin of Lake Warren, an extensive proglacial lake⁴⁵⁹.

Below the escarpment, the Halton Till may be up to 30 m thick on the shale plain or where lodged against the lower escarpment. Following the retreat of the Lake Ontario lobe of the glacier, the area below the escarpment was, depending on the level of the predecessors of present-day Lake Ontario, variously submerged or exposed. A large area of sand in the eastern part of the study area along Mount Albion Road was deposited in a lake some 70 m higher than the present Lake Ontario. King Street is built on beach sands and gravels deposited as a barrier bar across the mouth of the Red Hill re-entrant by Lake Iroquois, which was some 30 m higher than Lake Ontario shoreline. Red Hill Creek flows through a breach in this bar. Davis Creek and the smaller drainages are blocked by the bar and run west parallel to the bar before joining Red Hill Creek⁴⁵⁹.

Several of the landform features of the Red Hill re-entrant, including the Vinemount Moraine and the Red Hill barrier bar, have been excluded from the present study area. This is because they have been built on and are therefore not considered part of the "natural area". These features, however, are geologically linked to the Red Hill re-entrant and are visible from vistas within the Red Hill Creek Escarpment Valley study area. Thus, they contribute to the physical significance of the area, and also to its visual diversity and educational potential⁴⁵⁹.

Soils

The soils of the study area are well-drained. Much of the site encompasses an active stream system with little soil development on the recent stream alluvium and ravine slopes. Elsewhere, Oneida loam and silt loam have developed on the till and glaciolacustrine sediments respectively. Small patches of Grimsby and Winona sandy loam and Farmington loam are also present⁴⁵⁹.

Hydrogeology

Well data near the edge of the escarpment and below the escarpment are sparse. Groundwater flow is northerly,

towards Lake Ontario. Piezometric elevations are at approximately 190 m above the escarpment and at 80 m near the lake. A collection system is in place to intercept leachate from the Upper Ottawa landfill site.

Groundwater in the Queenston shales below the escarpment is of poor quality, being high in minerals and salts⁴⁵⁹.

Groundwater recharge is likely occurring in the areas of shallow soils and along the moraines above the escarpment. Groundwater discharge from the high quality Lockport aquifer occurs as seeps along the escarpment face, and is also contributing to the baseflow of Red Hill Creek and its tributaries. Available data are insufficient to assess the volume or significance of groundwater recharge and discharge. Retention of the groundwater discharge regime, however, is important to any future rehabilitation of surface waters⁴⁵⁹.

Hydrology and Surface Drainage

The Red Hill Creek Escarpment Valley study area encompasses much of the waterfalls, ravines, and floodplain areas of the Red Hill Creek watershed. This stream system receives stormwater drainage from a highly urbanized watershed. A small mill pond on Red Hill Creek immediately above Albion Falls has been restored; elsewhere, the stream channel has been straightened and there are few retention areas. Consequently, flow volumes fluctuate markedly and water quality is generally poor. The hydrological characteristics of the present vegetation and stream channels in this large natural area moderate these conditions by filtering and retaining surface runoff⁴⁵⁹.

ECOLOGICAL LAND CLASSIFICATION

Summary

This natural area encompasses terrestrial, aquatic, and wetland habitats. Upland, escarpment, and floodplain woods and second-growth fields, thickets, and plantations are most common. The present plant community structure and composition is strongly influenced by past disturbances. The Red Hill Creek Escarpment Valley ecosystem, however, is inherently diverse due to the varied topography, substrates, moisture regimes, and micro-climates^{56, 459}.

Prominent escarpment features include open carbonate cliff communities at Albion Falls and Buttermilk Falls (Map 63, Polygon 16). Mature treed cliff surrounds Buttermilk Falls gorge while common lilac (*Syringa vulgaris*) thicket or disturbed treed thicket is more common around the open and much larger Albion Falls gorge.

Sugar maple (*Acer saccharum* ssp. *saccharum*), black maple (*Acer saccharum* ssp. *nigrum*), and occasionally white ash (*Fraxinus americana*) and hemlock (*Tsuga canadensis*) dominate mature talus slopes at the head of the Mount Albion re-entrant (Map 63, Polygon 8). Sugar maple – ironwood – white ash treed carbonate cliffs occur

intermittently above the talus community. Deeper soils at the base of the talus slope and adjacent to the lowland forest support moist - sugar maple - black maple forest. Blue cohosh (*Caulophyllum thalictroides*), wild ginger (*Asarum canadense*), and zig-zag goldenrod (*Solidago flexicaulis*) are abundant in the rich ground layer.

Disturbed talus slopes with scattered trees and vines including basswood (*Tilia americana*), Norway maple (*Acer platanoides*), and horse chestnut (*Aesculus hippocastanum*) surround a large open coltsfoot (*Tussilago farfara*) seep east of Albion Falls. Oak – hardwood forest (Map 63, FOD2-4) dominates a south-facing corner of this community above the confluence of Buttermilk and Red Hill Creek.

Mature black maples dominate the rocky floodplain terrace below the escarpment (Map 63, Polygon 7). Associates include sugar maple, white ash, basswood, hemlock, and black walnut (*Juglans nigra*). Prickly-ash (*Zanthoxylum americanum*) occurs in the open shrub layer. Zig-zag goldenrod, wild ginger, blue cohosh, early meadow-rue (*Thalictrum dioicum*), squirrel-corn (*Dicentra canadensis*), violet (*Viola* spp.), toothwort (*Cardamine* spp.), and trillium species (*Trillium* spp.) are abundant in the rich herbaceous layer.

Downstream, adjacent to the golf course, the black maple lowland is more disturbed with variable associates. Choke cherry (*Prunus virginiana* ssp. *virginiana*), honeysuckle (*Lonicera* spp.), and raspberry species (*Rubus* spp.) are found in the shrub layer. Garlic mustard (*Alliaria petiolata*) dominates the lower layers (Map 63, Polygon 11).

Mature upland sugar maple forest covers the steep valley slope east of the floodplain (Map 63, Polygon 12). Large oaks (*Quercus* spp.) are predominant on the dry ridge. A younger beech forest (Map 63, FOD4-1) borders the open meadow the east. Choke cherry forms the understory with garlic mustard, trout lily (*Erythronium americanum* ssp. *americanum*), and false Solomon's seal (*Maianthemum racemosum* ssp. *racemosum*) abundant in the ground layer.

Sugar maple forest also dominates a north-facing escarpment slope (Map 63, Polygon 9). Black cherry (*Prunus serotina*) and butternut (*Juglans cinerea*) are occasional associates. Choke cherry, alternate-leaved dogwood (*Cornus alternifolia*), garlic mustard, false Solomon's seal, and wild ginger are abundant in the sparse understory layers.

The sugar maple slope forest surrounds a section of disturbed tableland. Young white ash is abundant in this old Scots pine plantation with both species co-dominant in the canopy (Map 63, Polygon 10). Sugar maple and black walnut occur occasionally. Hawthorn savannah dominates canopy gaps and is abundant in the sub-canopy with maple, ash, and common apple (*Malus pumila*). Grey dogwood (*Cornus foemina* ssp. *racemosa*) forms the

shrub layer with honeysuckle and raspberry species. Garlic mustard dominates the ground layer.

Extensive bottomlands in the northern segments of the natural area are open or loosely forested with an abundance of Manitoba maple (*Acer negundo*), willow species (*Salix* spp.), scattered eastern cottonwoods (*Populus deltoides* ssp. *deltoides*), and mature black walnuts (Map 63, Polygon 14). Garlic mustard and grasses dominate the floodplain meadows with numerous ash, white elm (*Ulmus americana*), hawthorn (*Crataegus* spp.), grey dogwood, honeysuckle, and raspberry thickets also present.

Disturbed valley slopes above the floodplain support similar bottomland species. Grasses dominate open meadow slopes with scattered black walnut, Manitoba maple, ash species, and eastern cottonwood (Map 63, Polygon 15). Undisturbed slopes support mature to mid-age sugar maple forest with red oak (*Quercus rubra*), black cherry, shagbark hickory (*Carya ovata*) and to a lesser extent, American beech (*Fagus grandifolia*), white pine (*Pinus strobus*), and white oak (*Quercus alba*). Hop hornbeam (*Ostrya virginiana*) dominates the sub-canopy with choke cherry and maple-leaved viburnum (*Viburnum acerifolium*) in the understory layer. Garlic mustard is prolific in the ground layer. Tableland ridges and upland knolls support mature red, white and occasionally black oak (*Quercus velutina*) forests with sugar maple and American beech as associates (Map 63, FOD2-4).

Large and very mature red oaks, with sugar maple, white oak, white ash, and rarely black oak as associates, stand along the dry escarpment crest (Map 63, Polygon 13). Hop hornbeam, white cedar (*Thuja occidentalis*), and serviceberry species (*Amelanchier* spp.) form the open sub-canopy. Choke cherry, round-leaved dogwood (*Cornus rugosa*), and snowberry (*Symphoricarpos albus*) occur in the understory. Occasional open rims on the valley crest sustain uncommon species such as yellow pimpernel (*Taenidia integerrima*). North of Buttermilk Falls, even-aged red oak woodland, which is mowed and maintained as a park, provides restoration potential for oak savannah habitat.

Adjacent old field meadows dominate large tableland areas (Map 63, Polygon 1). Grey dogwood and hawthorn thickets are common with patches of regenerating woodland. Red Hill Creek flows through the southern most section of the old field meadow complex. Immediately north of Rymal Road, an abandoned quarry sustains an open aquatic community, which drains into Red Hill Creek (Map 63, Polygon 2). Exposed bedrock and open limestone cliff rim the quarried area (Map 63, CLO1-5).

Bedrock is also exposed along the terraced creek bed and banks on a short section of the creek west of the quarry and just north and south of Rymal Road. Mature black maple, sugar maple and rarely, white oak, shagbark

hickory, swamp white oak (*Quercus bicolor*), and rock elm (*Ulmus thomasi*) line this section of the creek. Reed canary grass meadow marsh dominates the open creek channel south of Rymal Road (Map 63, Polygon 17). Norway maple dominates a narrow stand of trees between the abandoned quarry and the creek valley (Map 63, Polygon 3).

Small forest remnants exist north and south of the Lincoln Alexander Parkway. White ash, green ash (*Fraxinus pennsylvanica*), shagbark hickory, and red oak dominate the vernal flooded remnant to the north (Map 63, Polygon 5). Higher elevations contain upland forest with red, white, and black oak. South of the highway, red oak and shagbark hickory dominate the well-drained upper slopes with shagbark hickory and bur oak (*Quercus macrocarpa*) at lower elevations along the creek (Map 63, Polygon 4). White elm is abundant in the sub-canopy. Adjacent to the highway, the tableland section of this forest remnant supports scattered vernal pools with black ash (*Fraxinus nigra*), green ash, jewelweed (*Impatiens capensis*), and sedge species (*Carex* spp.) abundant in the standing water. A small bur oak swamp with swamp white oak and ash species as associates occur to the north (Map 63, SWD1-2).

Community Descriptions⁴⁶⁰

Polygon 1- Dry – Moist Old Field Meadow Type (CUM1-1)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Pioneer Meadow
Ranking	None

Polygon 1 Complex- Gray Dogwood Cultural Thicket Type (CUT1-4)

Polygon 1 Complex- Hawthorn Cultural Savannah Type (CUS1-1)

Polygon 1 Complex- Mineral Cultural Woodland Ecosite (CUW1)

Polygon 1 Complex- Dry – Fresh Aspen Deciduous Forest Type (FOD3-1)

Ranking- G5, S5

Polygon 2- Open Aquatic (OAO)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Pioneer Thicket
Ranking	None

Polygon 2 Inclusion- Open Carbonate Cliff Rim Type (CLO1-5)

Ranking- G5, S2

Polygon 3- Dry - Fresh Sugar Maple Deciduous Forest Ecosite (FOD5)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Mature Forest
Ranking	S5

Polygon 4- Dry – Fresh Oak – Hickory Deciduous Forest Type (FOD2-2)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Mature Forest
Ranking	G4?, S3S4

Polygon 4 Complex- Fresh – Moist Shagbark Hickory Deciduous Forest Type (FOD9-4)
Ranking- S4

Polygon 4 Complex- Ash Mineral Deciduous Swamp Ecosite (SWD2)

Polygon 4 Inclusion- Bur Oak Mineral Deciduous Swamp Type (SWD1-2)
Ranking- G2G3Q, S3

Polygon 5- Fresh – Moist Ash Lowland Deciduous Forest Type (FOD7-2)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Mid – Age Forest
Ranking	S4S5

Polygon 6- Hawthorn Cultural Savannah Type (CUS1-1)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Pioneer Savannah
Ranking	None

Polygon 6 Complex- Gray Dogwood Cultural Thicket Type (CUT1-4)

Polygon 6 Complex- Fresh – Moist White Elm Lowland Deciduous Forest Type (FOD7-1)
Ranking- S4S5

Polygon 7- Fresh – Moist Black Maple Lowland Deciduous Forest Type (FOD7-5)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Mature Forest
Ranking	S3

Polygon 8- Fresh – Moist Sugar Maple Carbonate Treed Talus Type (TAT1-4)

Polygon Description	Environmental Characteristic
Topographic Features	Talus
Community	Mature Forest
Ranking	G3G5, S3

Polygon 8 Complex- Sugar Maple – Ironwood – White Ash Treed Carbonate Cliff Type (CLT1-2)
Ranking- G?, S3

Polygon 8 Complex- Fresh – Moist Sugar Maple – Black Maple Deciduous Forest Type (FOD6-2)
Ranking- G?, S3?

Polygon 8 Inclusion- Dry – Fresh Oak – Hardwood Deciduous Forest Type (FOD2-4)
Ranking- S4S5

Polygon 9- Dry – Fresh Sugar Maple – Ironwood Deciduous Forest Type (FOD5-4)

Polygon Description	Environmental Characteristic
Topographic Features	Valley Slope
Community	Mature Forest
Ranking	G?, S5

Polygon 10- Dry – Fresh White Ash Deciduous Forest Type (FOD4-2)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Pioneer Thicket
Ranking	G?, S5

Polygon 10 Complex-Scotch Pine Coniferous Plantation Type (CUP3-3)

Polygon 10 Complex- Hawthorn Cultural Savannah Type (CUS1-1)

Polygon 11- Fresh – Moist Black Maple Lowland Deciduous Forest Type (FOD7-5)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Mature Woodland
Ranking	S3

Polygon 11 Complex- Fresh -- Moist Lowland Deciduous Forest Ecosite (FOD7)

Polygon 12- Dry – Fresh Sugar Maple Deciduous Forest Type (FOD5-1)

Polygon Description	Environmental Characteristic
Topographic Features	Valley Slope
Community	Mature Forest
Ranking	G5?, S5

Polygon 12 Inclusion- Dry – Fresh Beech Deciduous Forest Type (FOD4-1)
Ranking- G4G5, S4S5

Polygon 13- Dry – Fresh Red Oak Deciduous Forest Type (FOD1-1)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Mature Woodland
Ranking	G?, S5

Polygon 13 Complex- Dry – Fresh Oak – Hardwood Deciduous Forest Type (FOD2-4)
Ranking- S4S5

Polygon 14- Fresh – Moist Black Walnut Lowland Deciduous Forest Type (FOD7-4)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Young Woodland
Ranking	G4?, S2S3

Polygon 14 Inclusion- Bur-reed Mineral Shallow Marsh Type (MAS2-7)
Ranking- G4G5, S4

Polygon 14 Inclusion- Narrow-leaved Sedge Mineral Shallow Marsh Type (MAS2-3)
Ranking- G4?, S5

Polygon 15- Dry – Fresh Sugar Maple Deciduous Forest Type (FOD5-1)

Polygon Description	Environmental Characteristic
Topographic Features	Valley Slope
Community	Mid – Age Forest
Ranking	G5?, S5

Polygon 15 Complex- Dry-Fresh Black Walnut-White Ash Successional Forest Type (FOD4-4)

Polygon 15 Inclusion- Dry – Fresh Oak – Hardwood Deciduous Forest Type (FOD2-4)
Ranking- S4S5

Polygon 15 Inclusion- Scotch Pine Coniferous Plantation Type (CUP3-3)

Polygon 16- Open Carbonate Cliff Rim Type (CLO1-5)

Polygon Description	Environmental Characteristic
Topographic Features	Cliff
Community	N/A
Ranking	G5, S2

Polygon 16 Complex- Carbonate Treed Cliff Ecosite (CLT1)

Polygon 17- Reed-canary Grass Mineral Meadow Marsh Type (MAM2-2)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Mature Stream
Ranking	None

Polygon 17 Inclusion- Reed-canary Grass Bedrock Meadow Marsh Type (MAM1-1)

Polygon 18- Hawthorn Cultural Savannah Type (CUS1-1)

Polygon Description	Environmental Characteristic
Topographic Features	Bottomland
Community	Young Thicket
Ranking	None

Polygon 18 Complex- Gray Dogwood Cultural Thicket Type (CUT1-4)

Polygon 19- Dry – Moist Old Field Meadow Type (CUM1-1)

Polygon Description	Environmental Characteristic
Topographic Features	Tableland
Community	Young Meadow
Ranking	None

Polygon 19 Inclusion- Cultural Woodland (CUW)

FLORA AND FAUNA SUMMARY

Vascular Plants

Adequate coverage. Nature Counts surveyors recorded 194 species in 2001 or 2002. Of these, one is a locally uncommon species and 46 (24%) are introduced species¹⁰⁰¹. Many floral surveys were completed in this area previous to 2001. A total of 352 species have been documented including 17 locally uncommon species, 15 locally rare species, two locally and provincially significant species, 17 Carolinian species and 46 (13%) introduced species^{57, 479, 996, 1000}.

Butterflies

Adequate coverage. During 2001 or 2002, Nature Counts surveyors recorded 12 species¹⁰⁰¹. From 1989 to 1991, 36 species were observed in this area including one locally rare species and one COSEWIC special concern species^{998, 1000}.

Fish

Red Hill Creek flows through the Red Hill Creek Escarpment Valley natural area. The creek drops over the Niagara Escarpment at Albion Falls, then tumbles rapidly down through stepped pools in the steep gorge, being then joined by the tiny Buttermilk Creek. It flows through steep terrain across a golf course, past playing fields and riparian wetlands and forests then under large culverts for railway and road crossings. The stream valley has been constricted by filling in the lower reaches, including two closed landfill sites. Flows are very flashy as a result of urbanization in the watershed of the main stream channel above the Niagara Escarpment. That channel is almost entirely within a large storm sewer.

Fish have been assessed in the Red Hill Creek Escarpment Valley between 1967 and 1997^{134, 291, 294, 357, 359}. In total, 26 species have been collected with 15

species recorded since 1990. Northern redbelly dace (*Phoxinus eos*) and pearl dace (*Margariscus margarita*) have not been recorded in the 1990s, while brown bullhead (*Ameiurus nebulosus*), brown trout (*Salmo trutta*), common carp (*Cyprinus carpio*), Chinook salmon (*Oncorhynchus tshawytscha*), emerald shiner (*Notropis atherinoides*), gizzard shad (*Dorosoma cepedianum*), lake chub (*Couesius plumbeus*), logperch (*Percina caprodes*), northern hognose sucker (*Hypentelium nigricans*), northern pike (*Esox lucius*), pumpkinseed (*Lepomis gibbosus*), rainbow trout (*Oncorhynchus mykiss*), spottail shiner (*Notropis hudsonius*), threespine stickleback (*Gasterosteus aculeatus*), and white perch (*Morone americana*) were found in the 1990s, but not recorded before that decade.

Herpetofauna

Adequate coverage. Nature Counts surveyors recorded seven species including one COSEWIC special concern species¹⁰⁰¹. From 1984 to 1999, 12 species were observed including one COSEWIC special concern species^{398, 999, 1000}.

Breeding Birds

Adequate coverage. This area provides habitat for a rich diversity of bird species including a number of species that utilize interior forest. Nature Counts surveyors recorded 88 species in 2001 or 2002. Of these, 28 are locally uncommon species, eight are locally rare species, and nine are interior forest species¹⁰⁰¹. A total of 55 species were observed from 1968 to 2000 including 12 locally uncommon species and six locally rare species^{56, 95, 393, 400, 436, 500}.

Mammals

Adequate coverage for small mammals. The Nature Counts project conducted small mammal trapping in July, August and September of 2002. Eight species were recorded during this time¹⁰⁰¹. A study was conducted during the late 1990s and the early 2000s documenting a number of southern flying squirrels (*Glaucomys volans*) in the area⁴⁵³. From 1976 to 1999, 11 species were observed including one COSEWIC special concern species^{57, 398, 1000}. Five species were documented previous to the 1300s including the black bear (*Ursus americanus*).

SIGNIFICANT SPECIES

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants				
Giant Ragweed, <i>Ambrosia trifida</i> (1995, 2000) ⁴⁷⁹			S5	rare
Smooth Rock-cress, <i>Arabis laevigata</i> (1991, 1995) ^{479, 1000}			S5	rare
Vascular Plants (cont'd)				
Tall Brome Grass, <i>Bromus latiglumis</i> (1995) ⁴⁷⁹			S4	rare
Sharp-scaled Oak Sedge, <i>Carex albicans</i> var. <i>albicans</i> (1995) ⁴⁷⁹				rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Awnead Sedge, <i>Carex atherodes</i> (1995) ⁴⁷⁹			S4S5	rare
Umbellate Sedge, <i>Carex umbellata</i> (1995) ⁴⁷⁹			S5	rare
Coarse Cyperus, <i>Cyperus odoratus</i> (1995) ⁴⁷⁹			S5	rare
Goldie's Wood Fern, <i>Dryopteris goldiana</i> (1995) ⁴⁷⁹			S4	rare
River Bank Wild-rye, <i>Elymus riparius</i> (1995) ⁴⁷⁹			S4?	rare
Green Violet, <i>Hybanthus concolor</i> (1976, 1991, 1995) ^{57, 479, 1000}			S2	uncommon
Slender Satin Grass, <i>Muhlenbergia tenuiflora</i> (1995) ⁴⁷⁹			S2	rare
Sycamore, <i>Platanus occidentalis</i> (1976, 1995) ^{57, 479}			S4	rare
River Bulrush, <i>Scirpus fluviatilis</i> (1995) ⁴⁷⁹			S4S5	rare
American Bulrush, <i>Scirpus pungens</i> (1991, 1995) ^{1000, 479}			S5	rare
Soapberry, <i>Shepherdia canadensis</i> (1976, 1991, 1995) ^{57, 479, 1000}			S5	rare
Hairy Goldenrod, <i>Solidago hispida</i> var. <i>hispida</i> (1991, 1995) ^{1000, 479}			S5	rare
Horned Pondweed, <i>Zannichellia palustris</i> (1997) ⁴⁷⁹			S4	rare
Butterflies				
Monarch, <i>Danaus plexippus</i> (1991) ^{998, 1000}	SC	NIAC	S5	
Northern Cloudy-Wing, <i>Thorybes pylades</i> (1991) ^{998, 1000}			S5	rare
Herpetofauna				
Eastern Milk Snake, <i>Lampropeltis triangulum triangulum</i> (1984, 1988, 1991, 2000) ^{436, 999, 1000}	SC		S4	
Breeding Birds				
Black-crowned Night-Heron, <i>Nycticorax nycticorax</i> (2000) ⁴³⁶			S3S, SZN	rare
Blue-winged Teal, <i>Anas discors</i> (Pre 1300) ⁴⁰⁰			S5	rare
Carolina Wren, <i>Thryothorus ludovicianus</i> (1998, 2002) ^{393, 1001}			S4	rare
Cooper's Hawk, <i>Accipiter cooperii</i> (1995, 2001, 2002) ^{393, 1001}	NAR	NIAC	S4B	rare
Common Nighthawk, <i>Chordeiles minor</i> (2001, 2002) ¹⁰⁰¹			S4	rare
Long-eared Owl, <i>Asio otus</i> (1968, 2002) ^{500, 1001}			S4	rare
Louisiana Waterthrush, <i>Seiurus motacilla</i> (1997) ³⁹³	SC	VUL	S3	rare

Breeding Birds (cont'd)				
Northern Saw-whet Owl, <i>Aegolius acadicus</i> (1985) ⁹⁵			S4	rare
Purple Finch, <i>Carpodacus purpureus</i> (2002) ¹⁰⁰¹			S5	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Short-eared Owl, <i>Asio flammeus</i> (1976) ⁵⁶	SC		S3S4B, SZN	rare
Sedge Wren, <i>Cistothorus platensis</i> (2002) ¹⁰⁰¹	NAR		S4	rare
Sharp-shinned Hawk, <i>Accipiter striatus</i> (2002) ¹⁰⁰¹	NAR	NIAC	S5	rare
Yellow-breasted Chat, <i>Icteria virens</i> (1988) ⁵⁰⁰	SC	VUL	S2S3B, SZN	rare
Yellow-billed Cuckoo, <i>Coccyzus americanus</i> (2001) ¹⁰⁰¹			S4	rare

LAND USE AND LINKAGES

Present Land Use

The Red Hill Creek valley system encompasses a large greenspace area located in a heavily urbanized setting. The natural areas within this greenspace are generally confined to hazard lands and, consequently, form strips along the stream ravines and along the escarpment. This elongate, branching study area is over 6 km long, but is less than a kilometre wide. In many places, the natural area is restricted to a ribbon of riparian vegetation less than 300 m wide⁴⁵⁹.

Much of the present study area is used for passive recreational activities only, including the Bruce Trail. Active recreational facilities have been developed in parts of this greenspace, both above and below the escarpment. These recreation areas are mostly on the periphery of the greenspace, but locally extend into the escarpment and riparian corridors, creating gaps in the natural vegetation. Refuse dumping and trampling problems are evident in some areas⁴⁵⁹.

Land use on adjoining lands above the escarpment is rapidly changing from agricultural to industrial. Other adjoining land uses above the escarpment are suburban residential areas, two closed landfill sites, and the Canadian National rail line. Below the escarpment, the greenspace is surrounded by dense urbanization (residential and industrial)⁴⁵⁹.

Several east-west arterial roads and railways cross the natural area. At present the north-south Red Hill Creek valley is used by a few utility corridors⁴⁵⁹.

Linkages with Other Natural Areas

The Red Hill Creek Escarpment Valley study area encompasses parts of two natural corridors, the Niagara Escarpment corridor and the Red Hill Creek corridor. The Niagara Escarpment corridor is a provincially significant natural corridor some 700 km in length. The short incised segment of the escarpment included in the Red Hill Creek Escarpment Valley study area is continuous with the Hamilton Escarpment (HAMI-65) study area to the west, and the Felker's Falls Escarpment (HAMI-72) study area to the east⁴⁵⁹.

The Red Hill Creek valley system provides a natural riparian corridor linking Hamilton Harbour (HAMI-66) and Van Wagner's Ponds and Marshes (HAMI-61) study

areas with the Niagara Escarpment. The Red Hill Creek Escarpment Valley study area is continuous with the Van Wagner's Marsh study area broken only by a railway crossing. In addition to being used for local movement by resident wildlife, the Red Hill Creek riparian corridor is used by migrating songbirds as a route inshore from the urbanized Lake Ontario shoreline to the natural areas of the Niagara Escarpment⁴⁵⁹.

This study area is not directly linked to the parallel Stoney Creek Ravine study area (HAMI-62), located 2.5 km east. Above the escarpment, some tenuous linkages such as hedgerows and ditches are present in the remaining agricultural lands, but no such linkages have been integrated into the developed areas⁴⁵⁹.

Due to its size and strategic position at the intersection of two natural corridors, the Red Hill Creek Escarpment Valley area serves an important ecological function. The setting of this natural area within a large urban greenspace is also an important consideration⁴⁵⁹.

RECOMMENDATIONS

1. The area should be protected from development or other impacts.
2. The continuity of the existing ribbons of natural vegetation along the Red Hill Creek corridor and the Niagara Escarpment corridor should be maintained, particularly the nodal area at the corridor intersection.
3. The natural area should be enhanced by naturalizing manicured greenspace and maintained stream channels, and by improving water quality and regulating stormwater runoff should be assessed.
4. Future studies should include the monitoring of significant species populations and communities.

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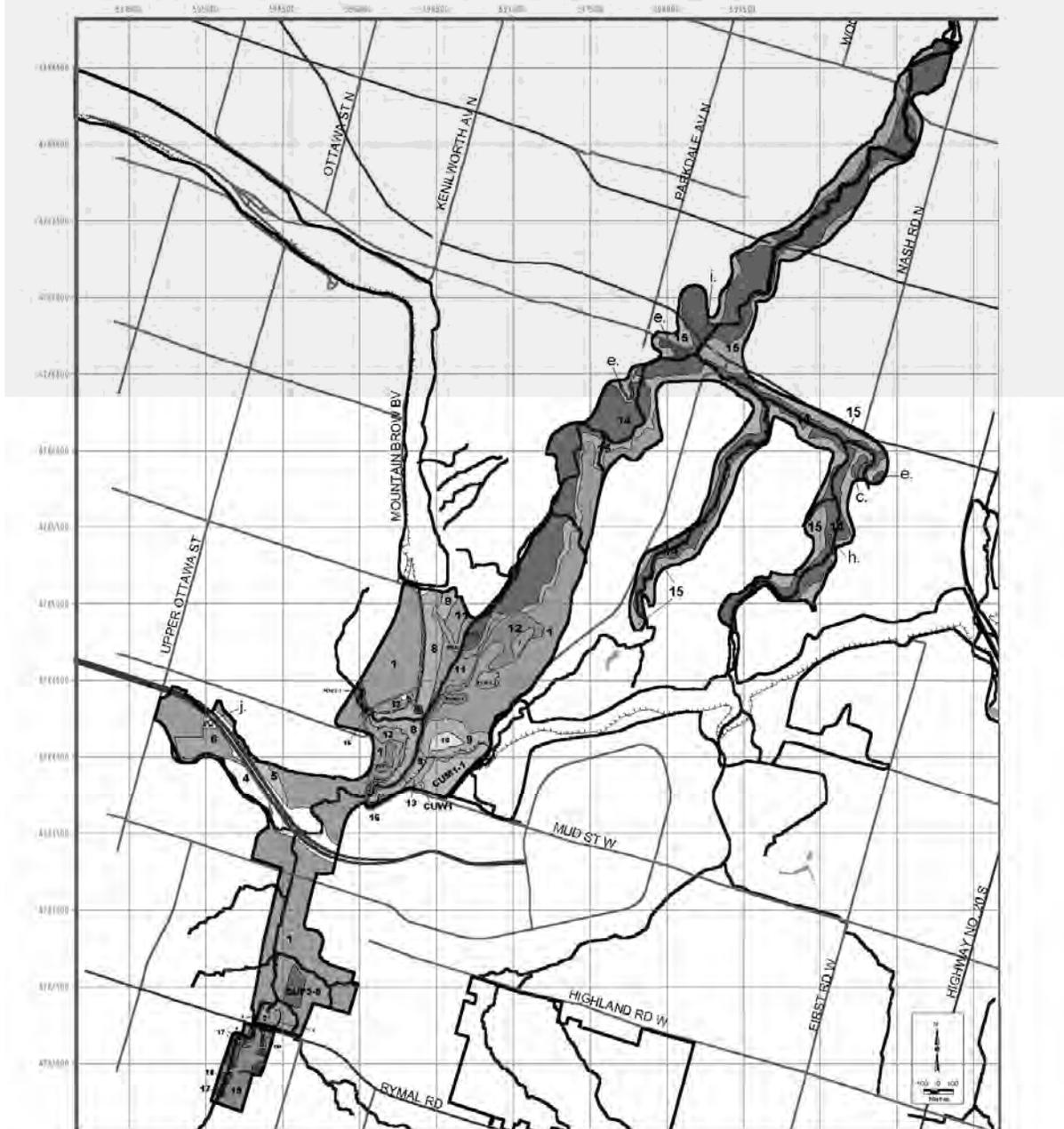
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SITE VISITS

Date	Duration	Purpose	Observers
30-May-1991	6.0 h	Flora/Birds	A. Wormington, B. Lamond
31-May-1991	5.0 h	Flora/Birds	A. Wormington, B. Lamond
19-June-1991		Birds	A. Wormington, B. Lamond
27-June-1991	2.0 h	Birds/ Butterflies	A. Wormington, G. Tako
02-Oct-1991	3.0 h	Flora	B. Lamond
01-Oct-1991	6.0 h	Flora	B. Lamond
Aug-1991	Small mammal trapping; 33 traps x 2 nights.		
27-April-2001	1.3 h	Fauna	B. Curry
14-May-2002	1.0 h	ELC	A. Garofalo, L. Bertoni
15-May-2002	5.0 h	ELC	A. Garofalo, L. Bertoni
16-May-2002	5.0 h	ELC	A. Garofalo, L. Bertoni
21-May-2002	3.0 h	ELC	B. Bullough, A. Garofalo, M. Ogilvie
22-May-2002	3.0 h	ELC	B. Bullough, A. Garofalo, L. Bertoni, M. Ogilvie
23-May-2002	5.0 h	ELC	B. Bullough, A. Garofalo, T. Lanthier, M. Ogilvie
05-June-2001		Flora	A. Goodban
18-June-2002	1.25 h	Fauna	B. Curry
10-July-2002	1.0 h	Fauna	B. Curry
04-Sept-2002	2.0 h	ELC	A. Garofalo, M. Ogilvie

Map 63. Red Hill Creek Escarpment Valley (HAMI-69) ELC mapping.



HAMI-69 VEGETATION TYPES

- 1 CUM1-1 Dry - Moist Old Field Meadow Type
- 2 OAO Open Aquatic
- 3 FOD6 Dry-Fresh Sugar Maple Deciduous Forest Ecotone
- 4 FOD2-2 Dry - Fresh Oak - Hickory Deciduous Forest Type
- 5 FOD7-2 Fresh - Moist Ash Lowland Deciduous Forest Type
- 6 CUS1-1 Hawthorn Cultural Savannah Type
- 7 FOD7-4 Fresh - Moist Black Maple Lowland Deciduous Forest Type
- 8 TAT1-4 Fresh - Moist Sugar Maple Carbonate Tree Tralus Type
- 9 FOD6-4 Dry - Fresh Sugar Maple - Ironwood Deciduous Forest Type
- 10 FOD4-2 Dry - Fresh White Ash Deciduous Forest Type
- 11 FOD7-5 Fresh - Moist Black Maple Lowland Deciduous Forest Type
- 12 FOD6-1 Dry - Fresh Sugar Maple Deciduous Forest Type
- 13 FOD1-1 Dry - Fresh Red Oak Deciduous Forest Type
- 14 FOD7-4 Fresh - Moist Black Walnut Lowland Deciduous Forest Type
- 15 FOD6-1 Dry - Fresh Sugar Maple Deciduous Forest Type
- 16 CL01-5 Open Carbonate Cliff Rim Type
- 17 MA02-2 Reed-canopy Grass Mineral Meadow Marsh Type
- 18 CUS1-1 Hawthorn Cultural Savannah Type
- 19 CUM1-1 Dry - Moist Old Field Meadow Type
- CM Culturally Maintained
- CUM1-1 Dry - Moist Old Field Meadow Type
- CUP1-1 Red Pine Coniferous Plantation Type
- CUP2-3 Scotch Pine Coniferous Plantation Type
- CUP3-9 Norway Spruce - European Larch Coniferous Plantation Type
- FOD1-1 Fresh - Moist White Elm Lowland Deciduous Forest Type
- MG6 Manufactured Golf Course
- CUM1 Mineral Cultural Woodland Ecotone

HAMI-69 INCLUSIONS

- a. CL01-5 Open Carbonate Cliff Rim Type
- c. CUP2-3 Scotch Pine Coniferous Plantation Type
- d. CUM Cultural Woodland
- e. FOD2-4 Dry - Fresh Oak - Hardwood Deciduous Forest Type
- f. FOD4-1 Dry - Fresh Green Deciduous Forest Type
- g. MA01-1 Reed-canopy Grass Mineral Meadow Marsh Type
- h. MA02-3 Narrow-leaved Sedge Mineral Shallow Marsh Type
- i. MA02-2 Bur-reed Mineral Shallow Marsh Type
- j. SWD1-2 Bur Oak Mineral Deciduous Swamp Type

HAMI-69 COMPLEXES

- Polygon 1 CUM1-4 Grey Dogwood Cultural Thicket Type
- Polygon 1 CUS1-1 Hawthorn Cultural Savannah Type
- Polygon 1 CUM1 Mineral Cultural Woodland Ecotone
- Polygon 1 FOD2-4 Dry - Fresh Peppal Deciduous Forest Type
- Polygon 4 FOD9-4 Fresh-Moist Shagbark Ironwood Deciduous Forest Type
- Polygon 4 SWD1 Ash Mineral Deciduous Swamp Ecotone
- Polygon 6 CUM1-4 Grey Dogwood Cultural Thicket Type
- Polygon 6 FOD7-4 Fresh-Moist White Elm Lowland Deciduous Forest Type
- Polygon 8 CLT1-2 Sugar Maple - Ironwood-Whiteash Tree Carbonate Cliff Type
- Polygon 8 FOD6-2 Fresh-Moist Sugar Maple - Black Maple Deciduous Forest Type
- Polygon 10 CUP2-3 Scotch Pine Coniferous Plantation Type
- Polygon 10 CUS1-1 Hawthorn Cultural Savannah Type
- Polygon 11 FOD7 Fresh-Moist Lowland Deciduous Forest Ecotone
- Polygon 13 FOD2-4 Dry-Fresh Oak - Hardwood Deciduous Forest Type
- Polygon 15 FOD4-4 Dry-Fresh Black Walnut White Ash Successional Forest Type
- Polygon 15 CLT1 Carbonate Tree Cliff Ecotone
- Polygon 16 CUM1-4 Grey Dogwood Thicket Type

Map Symbols

- ▭ Haldimand County Study Area Boundary
- ▬ Top of Niagara Escarpment
- ▬ Major Highway
- ▬ Minor Highway
- ▬ Major Watercourse
- ▬ Tributary
- ▭ Lake

DATE(S) SURVEYED: See Previous Page SURVEYORS: JAG, MG, BT, LG, KW MAP PROJECTION: UTM, Zone 17 DATUM: NAD 83
BASIC MAP INFO SUPPLIED BY THE CITY OF HAMILTON ROADS TECHNICAL DEPARTMENT

COOTES PARADISE

Municipality City of Hamilton Formerly Town of Dundas/City of Hamilton Approximate Area 1100 hectares	ESA # 42 Lot 16-22 Concession 1-2	Conservation Authority Hamilton Watershed Spencer, Borer's, & Hopkins Creeks Ownership Mostly Public
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GENERAL SUMMARY

The Cootes Paradise study area is located between the Dundas Valley and Hamilton Harbour, on the northwest fringe of the Hamilton-Ancaster-Dundas urban centre. This large natural area is centred on Cootes Paradise, a shallow flooded basin of open water and marsh habitat created behind the Hamilton Bar landform. The surrounding terrestrial habitat, consisting of rolling hills and ravines covered with woods and successional communities, is also included in the study area. Most of this area is publicly owned land managed as a nature reserve and conservation education centre by the Royal Botanical Gardens (RBG)⁴⁵⁹.

The topography and landforms in this area demonstrate the effects of the marked variations in the water levels in the Lake Ontario basin over the past 12,000 years. The Cootes Paradise wetland is the largest remaining Great Lakes shoreline marsh at the western end of Lake Ontario^{143, 144}. Numerous nationally and provincially significant plant and animal species occur here. Many of the plant species present in this area have not been reported elsewhere in the City of Hamilton⁴⁵⁹.

This large wetland lies between the significant terrestrial habitats of the Dundas Valley and the significant aquatic habitats of Hamilton Harbour. These three adjacent areas are hydrologically and ecologically connected and constitute an outstanding natural heritage resource situated at the apex of the highly urbanized Golden Horseshoe region⁴⁵⁹.

As a result of surveys conducted by Nature Counts naturalists, an extension has been added to this natural area (Map 12, Proposed ESA Extension). This addition connects two arms of the study area making it a more continuous habitat.

HISTORICAL EVALUATION

1976 Study⁵⁶

Identified the following significant features

- plant and animal communities of the area are identified as unusual or of high quality locally within the municipality, Ontario, or Canada
- unusual habitat with limited representation in the municipality, Ontario, or Canada
- has unusually high diversity of biological communities and associated plants and animals due to a variety of geomorphological features, soils, water, sunlight, and

- associated vegetation and microclimate effects
- provides habitat for rare or endangered species that are endangered regionally, provincially, or nationally
- area is large and undisturbed, potentially affording a sheltered habitat for species which are intolerant of human disturbance
- location of the area, combined with its natural features, make it particularly suitable for scientific research and conservation education purposes
- combination of landforms and habitats is identified as having high aesthetic value in the context of the surrounding landscape and any alteration would significantly lower its amenity value

NAI⁴⁵⁹

Significant Natural Area

- serves an important ecological function
- serves an important hydrological function
- exhibits a high diversity of biotic features
- encompasses significant biotic communities
- provides habitat for significant species

OMNR

Provincial Life Science ANSI
Provincially Significant Wetland

PRESENT EVALUATION

ESA Criteria

- Significant Earth Science Feature
 - the area contains an array of drowned valley landform features which demonstrate the evolution of Lake Iroquois and Lake Ontario
- Significant Ecological Function
 - the area contains significant species
 - the area contains interior forest habitat (at least 100-200m from forest edge)
 - the area contains a high diversity of native plant species
 - the area contains rare biotic communities
 - the area provides an essential staging area for waterfowl and provides habitat for species requiring extensive shallow water or upland woods habitat
 - the area contains the largest Great Lakes shoreline marsh and shallow water pond communities in Hamilton

- Significant Hydrological Function
 - the area acts as a nutrient and sediment trap for waters entering the western end of Hamilton Harbour
- Educational or Research Value
 - the natural features of the area have been the subject of scientific research projects
 - the unusual features of this area make it suitable for educational purposes
- Aesthetic Value
 - the area contains natural landscapes that are aesthetically important

PHYSICAL DESCRIPTION

Physiography and Topography

The Cootes Paradise study area is located along the axis of the Dundas Valley buried gorge, between the Dundas Valley and Hamilton Harbour. The central feature of this study area is the broad, shallow wetland and open water pond area known as Cootes Paradise or Dundas Marsh. The waterbody is some 2 km long, and up to 1 km wide. This lagoon is separated from Hamilton Harbour by the Hamilton Bar, a baymouth bar formed in post-glacial Lake Iroquois⁴⁵⁹.

This area is situated in the Iroquois Plain physiographic region and exhibits many characteristic geomorphological features of the region. Erosion of the sand and gravel sediments deposited in Lake Iroquois some 12,000 years before present created the rolling hills and ravines that surround the central wetland. The shoreline of this post-glacial lake forms a bluff that encircles the study area, and a baymouth bar in Lake Iroquois formed the gravel bar at the eastern end of Cootes Paradise. A gradual, long-term rise in the level of Lake Ontario as a result of glacial rebound created the present lagoon, which is a relatively recent feature. The higher lake levels have partially inundated the dissected topography west of the Hamilton Bar, resulting in the formation of the “drowned valley” landscape⁴⁵⁹.

The rising level of Lake Ontario has produced similar “drowned valley” landforms at the mouth of most stream systems at the western end of the lake. The Cootes Paradise drowned valley, however, is unique because of its size, the juxtaposition of the Dundas Valley buried gorge, the Lake Iroquois bar and lagoon, and the Lake Ontario drowned valley landform. The educational and scientific value of the geomorphological features of Cootes Paradise are enhanced by the proximity of the bedrock and glacial features of the Dundas Valley and Spencer Gorge areas to the west, and the Lake Ontario shoreline in the Hamilton Harbour area to the east⁴⁵⁹.

Bedrock Geology

Cootes Paradise lies immediately east of the opening of the prominent Dundas Valley re-entrant in the Niagara Escarpment. This area is situated on the axis of the deep buried bedrock gorge that extends for more than 18 km, from the head of the Dundas Valley, through Cootes

Paradise and Hamilton Harbour, and under Lake Ontario⁴⁵⁹.

The entire study area is underlain by red shales of the Queenston Formation; bedrock outcrops only along the ravines and stranded shoreline bluff in the northern portion of the study area. The bedrock surface slopes from the north (120 to 30 m elevation) and south (60 to 30 m elevation) into the narrow ENE-trending gorge of unknown depth⁴⁵⁹.

The origin of the Dundas Valley re-entrant and the associated buried gorge is controversial. Various researchers attribute its formation wholly to erosion by pre-glacial and inter-glacial rivers, wholly to erosion by glacial meltwater streams, or to a combination of fluvial and glacial processes³⁰⁰.

Overburden Geology

Halton Till is present in the bedrock gorge and underlies most of the study area. The till forms a plain, which is generally blanketed by Lake Iroquois and Lake Ontario lacustrine sediments. Till is only locally exposed on steep banks in the northern and western portions of the study area⁴⁵⁹.

This area was flooded by Lake Iroquois some 12,000 years before present, when drainage down the St. Lawrence Valley was still blocked by glacial ice. Lake Iroquois occupied the Lake Ontario basin at a level some 35 m higher than the present-day Lake Ontario. The present study area formed an inlet in Lake Iroquois, extending west into the Dundas Valley re-entrant. The stranded shoreline of Lake Iroquois is marked by a fairly continuous bluff at between 105 and 100 m elevation that encircles the study area⁴⁵⁹.

A large alluvial fan complex, known as the Dundas Fan, developed near the head of this inlet at the mouth of the ancestor of Spencer Creek drainage²⁰². The gravel fan slopes east, from the base of the Niagara Escarpment at Spencer Gorge to the western end of the Cootes Paradise. Much of the town of Dundas is built on this fan⁴⁵⁹.

The eastern boundary of the study area follows the Burlington Heights causeway, which is built on a natural, 6 km long, gravel bar known as the Hamilton Bar. The Hamilton Bar, and the associated Aldershot Bar to the northeast, formed as baymouth bars across the mouth of the Dundas Valley inlet in Lake Iroquois. These bars are similar in origin and form to the present Burlington Bar, which separates Hamilton Harbour from Lake Ontario. Silty sand accumulated on the floor the lagoon created behind the bars. The lagoon sediments formed a level plain, at about 100 m elevation, known as the Westdale Plain²⁰².

During the low water period that followed the drainage of Lake Iroquois, the Iroquoian bars and sediments were exposed to sub-aerial and fluvial process. Ancestral

Spencer Creek and other streams dissected ravines into the sediments and alluvium in the former lagoon; however, the drainage apparently continued to flow around the northern end of the Hamilton Bar⁴⁵⁹.

Gradual uplift of the eastern outlet of the Lake Ontario basin, amounting to some 60 metres over the last 10,000 years, has resulted in the gradual rise in the level of Lake Ontario to its present day elevation of approximately 75 metres above sea level. Water from Lake Ontario has backed up through the Harbour to behind the Hamilton Bar, creating a broad shallow pond. The lower reaches of the ravines created during the low water stage are now flooded and form inlets along the shoreline of the pond. Siltation is occurring at a rapid rate, particularly at the western end of the wetland. The naturally high rate of siltation in the flooded stream valley is exacerbated by the increased sediment loading due to agricultural and urban development in the upstream drainage area⁴⁵⁹.

Soils

The wetland/water area in the centre of this area is underlain by recent sediments and muck formed in the marsh. Well-drained Grimsby sand loam and Springvale sandy loam soils have developed on the surrounding uplands except along the steep eroded ravine slopes⁴⁵⁹.

Hydrogeology

No water well data are available for this area. Regional groundwater flow patterns indicate that groundwater is flowing east towards Hamilton Harbour and Lake Ontario⁴⁵⁹.

Hydrology and Surface Drainage

Cootes Paradise is the receiving body for Spencer Creek, Borer's Creek, Chedoke Creek, and a few other small creeks. Water flows from Cootes Paradise into Hamilton Harbour via the cut made in the Hamilton Bar for the Desjardins Canal. The water level in Cootes Paradise is directly affected by fluctuations in the level of Lake Ontario and Hamilton Harbour. Although much reduced in extent, the marsh vegetation in this area serves an important hydrological function in filtering contaminants from the surface water⁴⁵⁹.

ECOLOGICAL LAND CLASSIFICATION

The Royal Botanical Gardens completed limited ELC surveys. The Nature Counts project did not conduct ELC inventories within this area.

PLANT COMMUNITIES⁴⁵⁹

This study area is centred on a large shallow pond-wetland area, but also includes the surrounding rolling uplands and ravine systems. Much of this large natural area is managed as a nature preserve by the RBG and is the subject of ongoing biological studies. Consequently, no fieldwork was carried out at this study area during the 1991 NAI.

The following summary of the main communities is largely based on the 1984-85 vegetation study¹¹⁵. More information on plant communities within this area may be found in Riley et. al. (1996)⁴⁴⁰.

Community Description

GREAT LAKES

POND

Shallow open water pond.

Connected to Hamilton Harbour and Lake Ontario via the Desjardins Canal. Macrophyte vegetation has undergone major changes in the century due to increased sedimentation, high turbidity and destructive action of carp. Some patches of water lilies (*Nymphaea odorata*, *Nuphar variegatum*). Sago pondweed (*Potamogeton pectinatus*) dominant submergent species.

SHORELINE MARSH

Dominated by broadleaf cattail in deeper water, rough manna grass (*Glyceria maxima*) and nodding beggarticks (*Bidens cernua*) in shallower water¹¹⁵.

Formerly much more extensive, now largely restricted to protected inlets, but this is changing due to carp exclusions added in 1998.

TERRESTRIAL

BROADLEAF UPLAND WOODS

Red oak, white oak, sugar maple, and red maple dominated upland woods.

Black cherry and American beech are also common canopy species. Witch hazel is the prevalent subcanopy species.

Manitoba maple and red ash. Wet-mesic

Common on wet-mesic soils in ravines and lowland areas.

MIXED UPLAND WOODS

Oak-maple woods as above but with white pine and eastern hemlock on north-facing slopes.

BROADLEAF FLOODPLAIN FOREST

Crack Willow - Black Willow

Other canopy species include Manitoba maple, red ash, trembling aspen, eastern cottonwood. Speckled alder and basket willow are present along riverbank. Manna grass is the dominant ground cover.

TALL SHRUB THICKET

Hawthorn and Large-toothed Aspen – Wild Apple – Wild Pear – Hawthorn

Late successional communities.

OLD FIELD

Most open areas are regularly mowed.

CONIFEROUS PLANTATION

MAINTAINED SITES

Parts of this large area have been developed as a botanical garden and as parkland. An extensive trail system is present.

FLORA AND FAUNA SUMMARY

Vascular Plants

Adequate coverage. This area has received thorough coverage in the past; therefore, Nature Counts botanists only conducted brief surveys. A total of 172 species were observed in 2001 and 2002. Of these, six are locally rare, seven are locally uncommon, two are locally and provincially rare, and one is locally uncommon and a COSEWIC threatened species^{531, 1000}. Prior to 2001, 853 species were recorded including 75 locally uncommon species, 118 locally rare species, one locally uncommon and COSEWIC threatened species, 24 locally and provincially rare species, and four locally, provincially,

and nationally rare species. Also among these are 206 (24%) introduced species and 41 Carolinian species^{15, 21, 108, 177, 290, 346, 366, 392, 433, 440, 479, 501, 531, 996}. This area contains the second highest total of rare plant species along the Niagara Escarpment⁴⁴⁰.

Butterflies

Inadequate coverage in 2001 and 2002. Nature Counts surveyors recorded only one species, the locally rare eastern pine-elfin (*Incisalia niphon*), in 2002¹⁰⁰¹. Three common species were observed in 2000⁴¹⁷. From 1988 to 1991, a total of 28 species were found including three locally uncommon species, two locally rare species, and one COSEWIC special concern species^{998, 1000}.

Fish

Cootes Paradise is the largest marsh in western Lake Ontario and identified as the principal fish nursery area for that part of the lake. It has both coastal and rivermouth marsh environments. Its water sources include three large tributaries, Chedoke, Spencer and Borer’s Creeks, as well as seven small spring-fed brooks and hundreds of small springs. As a result, a broad range of habitat conditions can be found around the marsh.

A total of 87 species have been documented in Cootes Paradise, with 65 species identified during the 1990s⁴⁸⁶. Only one of these species had not been recorded in previous surveys, the round goby (*Neogobius melanostomus*), which was first documented in the marsh in 1999. One species, the yellow bullhead (*Ameiurus natalis*), was recorded as common in the 1980s but not in the 1990s, suggesting that its identification may have been incorrect.

Currently, most species exist at very low population levels, with the exception of common carp (*Cyprinus carpio*), alewife (*Alosa pseudoharengus*), spottail shiner (*Luxilus chrysocephalus*), white sucker (*Catostomus commersoni*), brown bullhead, gizzard shad (*Dorosoma cepedianum*) and white perch (*Morone americana*). Alewife, gizzard shad and white perch are native to the Great Lakes - St. Lawrence watershed, but not native to Cootes Paradise. The expansion of their range into this area is a result of the loss of marsh vegetation, creating a more open, pelagic environment. Since 1997, large carp have been excluded from the marsh by the Cootes Paradise Fishway.

Of the 87 species recorded, one is extirpated from Ontario (Atlantic salmon [*Salmo salar*]), and two are of national special concern. Since 1990, four provincially significant species and 25 regionally significant species have been recorded.

Herpetofauna

Adequate coverage during the Hamilton Herpetofaunal Atlas. Because reptiles and amphibians are well-studied in this area, Nature Counts surveyors did not record herpetofauna. Recently, a locally rare and COSEWIC

threatened species, the Common Musk Turtle, (*Sternotherus odoratus*), was found here in 2001⁴⁶⁶; eight species were observed in 2000, of which two are locally uncommon⁴¹⁷. A total of 21 species were recorded from 1984 to 1999 including two locally rare species, three locally uncommon species, one locally rare and COSEWIC special concern species, one locally, provincially, and nationally rare species, and one COSEWIC special concern species^{108, 342, 370, 429, 999, 1000}.

Breeding Birds

Adequate coverage. Breeding birds have also been well-documented in this area; thus, Nature Counts surveyors did not spend much time in this area. One species, the locally, provincially, and nationally rare hooded warbler (*Wilsonia citrina*) was found in 2002¹⁰⁰¹. Prior to 2002, a total of 97 species were observed including 12 locally rare species, 29 locally uncommon species, one locally and provincially rare species, and two locally, provincially, and nationally rare species^{108, 115, 334, 342, 393, 403, 417, 428, 500, 997, 1000, 1001}. Twelve interior forest species have also been located within this area^{115, 393, 417, 500, 1000, 1001}.

Mammals

Adequate coverage for small mammals and bats. The Nature Counts project conducted small mammal trapping and bat mist netting in 2002 and a total of 13 species were recorded¹⁰⁰¹. From 1947 to 1991 a total of eight species were observed including one locally uncommon species and one locally rare species^{108, 259, 346, 375, 1000}.

SIGNIFICANT SPECIES

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants				
Purplefalse Oats, <i>Trisetum melicoides</i> (PRE 1969, 1993) ^{15, 440}			S3S4	rare
American Chestnut, <i>Castanea dentata</i> (PRE 1969) ¹⁵	THR		S3	uncommon
American Hazel, <i>Corylus americana</i> (PRE 1969) ¹⁵			S5	rare
Aquatic Sedge, <i>Carex aquatilis</i> (PRE 1969) ¹⁵			S5	rare
Arrow-leaved Violet, <i>Viola sagittata</i> (PRE 1969) ¹⁵			S4	rare
Awned Sedge, <i>Carex atherodes</i> (PRE 1969) ¹⁵			S4S5	rare
Barnyard Grass, <i>Echinochloa muricata</i> (1992) ¹⁷⁷			S2S3	rare
Bashful Bulrush, <i>Trichophorum planifolium</i> (1958, pre 1969, 1984, 1991, 1997,) ^{15, 433, 501}	END	END-R	S1	rare
Bearded Shorthusk, <i>Brachyelytrum erectum</i> (PRE 1969) ¹⁵			S4S5	rare
Black Huckleberry, <i>Gaylussacia baccata</i> (PRE 1969) ¹⁵			S4	rare
Brainerd’s Hawthorn, <i>Crataegus brainerdii</i> (PRE 1969) ¹⁵			S2	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Broad Beech Fern, <i>Phegopteris hexagonoptera</i> (1956, pre 1969) ^{15, 501}	SC		S3	rare
Broadleaf Panic Grass, <i>Panicum latifolium</i> (pre 1969, 1984) ^{15, 479}			S4	rare
Bur Cucumber, <i>Sicyos angulatus</i> (PRE 1969) ¹⁵			S5	rare
Bushy Naiad, <i>Najas flexilis</i> (PRE 1969) ¹⁵			S5	rare
Canada Brome, <i>Bromus pubescens</i> (PRE 1969, 2001) ^{15, 1001}			S4	rare
Canada Hawkweed, <i>Hieracium canadense</i> (PRE 1969) ¹⁵			SU	rare
Canada Milk-vetch, <i>Astragalus canadensis</i> (PRE 1969) ¹⁵			S4	rare
Canada Wild-rye, <i>Elymus canadensis</i> (PRE 1969, 2001) ^{15, 1001}			S4S5	rare
Clammy-weed, <i>Polanisia dodecandra</i> (1954, 2001) ^{479, 1001}			S4	rare
Climbing False Buckwheat, <i>Polygonum scandens</i> (PRE 1969) ¹⁵			S4S5	rare
Clinton's Club-rush, <i>Scirpus clintonii</i> (1954, pre 1969) ^{15, 501}			S2	rare
Coarse Cyperus, <i>Cyperus odoratus</i> (PRE 1969, 1993) ^{15, 440}			S5	rare
Cow-wheat, <i>Melampyrum lineare</i> (PRE 1969) ¹⁵			S4S5	rare
Deflexed Stickseed, <i>Hackelia deflexa</i> (1993) ⁴⁴⁰			S5	rare
Downy Fox Glove, <i>Aureolaria virginica</i> (1957) ⁵⁰¹			S1	rare
Drooping Sedge, <i>Carex prasina</i> (1959, PRE 1969) ^{15, 501}			S4	rare
Dwarf Cinquefoil, <i>Potentilla canadensis</i> (PRE 1969) ¹⁵			SU	rare
Dwarf Ginseng, <i>Panax trifolius</i> (1961) ⁴⁷⁹			S4	rare
Dwarf Scouring-rush, <i>Equisetum scirpoides</i> (1957) ⁴⁷⁹			S5	rare
Early Buttercup, <i>Ranunculus fascicularis</i> (PRE 1969) ¹⁵			S4	rare
False Foxglove, <i>Aureolaria pedicularia</i> (1956, pre 1969, 1979, 1993, 2001) ^{15, 440, 479, 501, 1001}			S3	rare
Flat-stemmed Pondweed, <i>Potamogeton zosteriformis</i> (PRE 1969) ¹⁵			S5	rare
Flat-topped White Aster, <i>Aster umbellatus</i> (PRE 1969) ¹⁵			S5	rare
Forked Panic Grass, <i>Panicum dichotomum</i> (1954) ^{15, 501}			S2	rare
Fragrant Cudweed, <i>Gnaphalium obtusifolium</i> (PRE 1969) ¹⁵			S5	rare
Fragrant Water-lily, <i>Nymphaea odorata</i> (1993) ⁴⁴⁰				

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Fringed Brome Grass, <i>Bromus ciliatus</i> (PRE 1969) ¹⁵			S5	rare
Fringed Gentian, <i>Gentianopsis crinita</i> (PRE 1969) ¹⁵				rare
Frostweed, <i>Helianthemum canadense</i> (PRE 1969) ¹⁵			S4	rare
Grass-of-Parnassus, <i>Parnassia glauca</i> (PRE 1969) ¹⁵			S5	rare
Green Violet, <i>Hybanthus concolor</i> (pre1990) ²¹			S2	uncommon
Green Water-milfoil, <i>Myriophyllum verticillatum</i> (PRE 1969) ¹⁵			S5	rare
Greenish Pyrola, <i>Pyrola chlorantha</i> (PRE 1969) ¹⁵			S4S5	rare
Hairy Buttercup, <i>Ranunculus hispidus</i> var. <i>hispidus</i> (1979) ⁴⁷⁹			S3	rare
Hairy Rock-cress, <i>Arabis hirsuta pycnocarpa</i> (PRE 1969) ¹⁵			S5	rare
Hairy Wild-rye, <i>Elymus villosus</i> (1992) ¹⁷⁷			S4	rare
Halberd-leaved Atriplex, <i>Atriplex prostrata</i> (PRE 1969) ¹⁵			S5	rare
Hawthorn, <i>Crataegus chrysocarpa</i> (PRE 1969) ¹⁵			S5	rare
Hawthorn, <i>Crataegus dissona</i> (PRE 1969) ¹⁵			S3	rare
Hawthorn, <i>Crataegus formosa</i> (1977) ⁵⁰¹			S2	rare
Hawthorn, <i>Crataegus fulleriana</i> (PRE 1969) ¹⁵			S2?	rare
Hawthorn, <i>Crataegus macracantha</i> (PRE 1969) ¹⁵				rare
Hawthorn, <i>Crataegus scabrada</i> (PRE 1969) ¹⁵			S3?	rare
Hawthorn, <i>Crataegus schuettei</i> (PRE 1969) ¹⁵			S4	rare
Hay-scented Fern, <i>Dennstaedtia punctilobula</i> (PRE 1969) ¹⁵			S5	rare
Head-like Sedge, <i>Carex cephaloidea</i> (PRE 1969) ¹⁵			S5	rare
Horned Pondweed, <i>Zannichellia palustris</i> (pre1990) ²¹			S4	rare
Impoverished Panic Grass, <i>Panicum depauperatum</i> (PRE 1969) ¹⁵			S4	rare
Indian Grass, <i>Sorghastrum nutans</i> (1985, 2001) ^{479, 1001}			S4	rare
Indian Physic, <i>Porteranthus trifoliatum</i> (1957, PRE 1969) ^{15, 501}			SX	rare
Inflated Sedge, <i>Carex vesicaria</i> (PRE 1969) ¹⁵			S5	rare
Intermediate Spike-rush, <i>Eleocharis intermedia</i> (PRE 1969) ¹⁵			S4	rare
James's Sedge, <i>Carex jamesii</i> (PRE 1990) ²¹			S3	rare
Knotty Pondweed, <i>Potamogeton nodosus</i> (PRE 1969) ¹⁵			S5	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Languid Poa, <i>Poa languida</i> (PRE 1969) ¹⁵			S3	rare
Leafy Pondweed, <i>Potamogeton foliosus</i> (PRE 1969) ¹⁵			S5	rare
Little Bluestem, <i>Schizachyrium scoparium</i> (pre 1969, 1985, 1993, 2001) ^{15, 440, 479, 1001}			S4	rare
Marsh Cinquefoil, <i>Potentilla palustris</i> (PRE 1969, 1993) ^{15, 440}			S5	rare
Marsh Pea, <i>Lathyrus palustris</i> (PRE 1969) ¹⁵			S5	rare
Marsh Rush, <i>Juncus canadensis</i> (PRE 1969) ¹⁵			S5	rare
Marsh-bellflower, <i>Campanula aparinoides</i> (PRE 1969) ¹⁵			S5	rare
Water-marigold, <i>Megalodonta beckii</i> (PRE 1969) ¹⁵			S5	rare
Moss-like Love Grass, <i>Eragrostis hypnoides</i> (PRE 1969) ¹⁵			S4	rare
Naked-flowered Tick-trefoil, <i>Desmodium nudiflorum</i> (PRE 1969) ¹⁵			S4	rare
Narrow-leaved Panic Grass, <i>Panicum linearifolium</i> (PRE 1969) ¹⁵			S4S5	rare
Nimble Will, <i>Muhlenbergia schreberi</i> (PRE 1969) ¹⁵			S4	rare
Nodding Chickweed, <i>Cerastium nutans</i> (PRE 1969) ¹⁵			S4	rare
Northern Beech Fern, <i>Phegopteris connectilis</i> (PRE 1969) ¹⁵			S5	rare
Northern Bog Violet, <i>Viola nephrophylla</i> (PRE 1969) ¹⁵			S4	rare
Northern Dewberry, <i>Rubus flagellaris</i> (PRE 1969) ¹⁵			S4	rare
Northern Manna Grass, <i>Glyceria borealis</i> (PRE 1969) ¹⁵			S5	rare
Northern Meadow Spikemoss, <i>Selaginella apoda</i> (PRE 1969) ¹⁵			SP	rare
Northern Wild-rice, <i>Zizania palustris</i> (PRE 1969) ¹⁵			S4	rare
Nuttall's Bur-reed, <i>Sparganium americanum</i> (PRE 1969) ¹⁵			S4?	rare
One-flowered Cancer-root, <i>Orobanche uniflora</i> (PRE 1969) ¹⁵			S4	rare
Panicled Hawkweed, <i>Hieracium paniculatum</i> (1956, pre 1969) ^{15, 501}			S2	rare
Panicled Tick-trefoil, <i>Desmodium paniculatum</i> (PRE 1969) ¹⁵			S4	rare
Pondweed, <i>Potamogeton perfoliatus</i> (PRE 1969) ¹⁵			S4	rare
Poor-man's Pepper-grass, <i>Lepidium virginicum</i> (PRE 1969) ¹⁵			S5	rare
Prickly Wild Rose, <i>Rosa acicularis sayi</i> (PRE 1969) ¹⁵			S5	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Raspberry, <i>Rubus pensilvanicus</i> (PRE 1969) ¹⁵			SU	rare
Rattlesnake Manna Grass, <i>Glyceria canadensis</i> (PRE 1969) ¹⁵			S4S5	rare
Red Mulberry, <i>Morus rubra</i> (pre 1969, 1977) ^{15, 501}	END		S2	rare
Red-sheathed Bulrush, <i>Scirpus microcarpus</i> (PRE 1969) ¹⁵			S5	rare
River Bank Wild-rye, <i>Elymus riparius</i> (pre 1969, 1993) ^{15, 479}			S4?	rare
River Bulrush, <i>Scirpus fluviatilis</i> (1993) ⁴⁴⁰				
Rough Hedge-nettle, <i>Stachys hispida</i> (PRE 1969) ¹⁵			S4S5	rare
<i>Rubus arundelanus</i> (PRE 1969) ¹⁵				rare
Rue-anemone, <i>Thalictrum thalictroides</i> (pre 1969, 1993, 1997) ^{15, 440, 433}			S3	rare
Sage-leaved Willow, <i>Salix candida</i> (PRE 1969) ¹⁵			S5	rare
Saskatoon-berry, <i>Amelanchier alnifolia</i> (PRE 1969) ¹⁵			S4?	rare
Schreber's Aster, <i>Aster schreberi</i> (PRE 1969) ¹⁵			S2	rare
Sharp-leaved Goldenrod, <i>Solidago arguta</i> var. <i>arguta</i> (1958, 1993) ^{479, 501}			S3	rare
Sharp-scaled Oak Sedge, <i>Carex albicans</i> var. <i>albicans</i> (1958, pre 1969, 1980, 1999) ^{15, 392, 479, 501}				rare
Short-awned Foxtail, <i>Alopecurus aequalis</i> (PRE 1969) ¹⁵			S4S5	rare
Sleepy Catchfly, <i>Silene antirrhina</i> (pre 1969, 2001) ^{15, 1001}			S5	rare
Slender Wheat Grass, <i>Elymus trachycaulus trachycaulus</i> (pre 1969, 1993) ^{15, 479}			SU	rare
Small Beggar-ticks, <i>Bidens discoides</i> (1992) ¹⁷⁷			S4	rare
Small Pondweed, <i>Potamogeton berchtoldii</i> (PRE 1969) ¹⁵			S4S5	rare
Small White Water-lily, <i>Nymphaea odorata</i> ssp. <i>odorata</i> (PRE 1969) ¹⁵			S5	rare
Small's Spike-rush, <i>Eleocharis smallii</i> (PRE 1969) ¹⁵			S5	rare
Smooth-sheathed Sedge, <i>Carex laevivaginata</i> (PRE 1969, 1993) ^{15, 440}			S4	rare
Northern Mountainash, <i>Sorbus decora</i> (PRE 1969) ¹⁵			S5	rare
Southern Blue Flag, <i>Iris virginica</i> (PRE 1969) ¹⁵			S5	rare
Spatterdock, <i>Nuphar advenum</i> (1952, pre 1969) ^{15, 501}				rare
Spotted Coral-root, <i>Corallorhiza maculata</i> (PRE 1969) ¹⁵			S5	rare
Stiff-leaved Goldenrod, <i>Solidago rigida rigida</i> (pre 1990, 1997, 2001) ^{21, 433, 1001}			S3	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Stout Goldenrod, <i>Solidago squarrosa</i> (PRE 1969) ¹⁵			S5	rare
Strange Cinquefoil, <i>Potentilla paradoxa</i> (1957) ⁵⁰¹			S3	rare
Striate Knotweed, <i>Polygonum achoreum</i> (1992) ¹⁷⁷			S5	rare
Sunflower, <i>Helianthus strumosus</i> (PRE 1969, 1993) ^{15, 440}			S5	rare
Swamp Black Currant, <i>Ribes lacustre</i> (PRE 1969) ¹⁵			S5	rare
Swamp Candles, <i>Lysimachia terrestris</i> (PRE 1969) ¹⁵			S5	rare
Sweet Pignut Hickory, <i>Carya glabra</i> (1957, pre 1969, 1997) ^{15, 433, 501}			SU	rare
Sycamore, <i>Platanus occidentalis</i> (pre1990, 1993) ^{21, 440}			S4	rare
Tall Brome Grass, <i>Bromus latiglumis</i> (1982, 1992, 1993) ^{177, 440, 479}			S4	rare
Thin-leaved Sunflower, <i>Helianthus decapetalus</i> (PRE 1969) ¹⁵			S5	rare
Tick-trefoil, <i>Desmodium cuspidatum</i> (PRE 1969) ¹⁵			S3	rare
Tufted Love Grass, <i>Eragrostis pectinacea</i> (1992) ¹⁷⁷			S4	rare
Two-rayed Poa, <i>Poa saltuensis</i> (PRE 1969) ¹⁵			S4	rare
Two-stamened Sedge, <i>Carex diandra</i> (PRE 1969) ¹⁵			S5	rare
Umbellate Sedge, <i>Carex umbellata</i> (1993, 1999) ^{392, 479}			S5	rare
Upland White Aster, <i>Solidago ptarmicoides</i> (1993) ⁴⁷⁹			S5	rare
Upland Willow, <i>Salix humilis</i> (pre 1969, 1993) ^{15, 479}			S5	rare
Violet, <i>Viola septentrionalis</i> (PRE 1969) ¹⁵			SU	rare
Water-meal, <i>Wolffia arrhiza</i> (PRE 1969) ¹⁵				rare
Water-meal, <i>Wolffia borealis</i> (PRE 1969) ¹⁵			S4S5	rare
Water-willow, <i>Decodon verticillatus</i> (PRE 1969, 1993) ^{15, 440}			S5	rare
Wedge Grass, <i>Sphenopholis nitida</i> (1957, pre 1969) ^{15, 501}			S1	rare
White Wood Aster, <i>Aster divaricatus</i> (1955) ⁵⁰¹	THR		S1	rare
Whorled Milkwort, <i>Polygala verticillata</i> (PRE 1969) ¹⁵			S4	rare
Wild Germander, <i>Teucrium canadense viscidum</i> (PRE 1969) ¹⁵			SU	rare
Winged Loosestrife, <i>Lythrum alatum</i> (pre1990) ²¹			S3	rare
Wood Millet, <i>Milium effusum</i> (Pre 1969, 1984) ^{15, 479}			S4S5	rare
Yellow False Foxglove, <i>Aureolaria flava</i> (PRE 1969) ¹⁵			S3	rare
Yellow Giant Hyssop, <i>Agastache nepetoides</i> (PRE 1969) ¹⁵			S4	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Vascular Plants (cont'd)				
Yellow Stargrass, <i>Hypoxis hirsuta</i> (PRE 1969) ¹⁵			S3	rare
Butterflies				
Eastern Pine-Elfin, <i>Incisalia niphon</i> (2002) ¹⁰⁰¹			S5	rare
Harvester, <i>Feniseca tarquinius</i> (1988, 1989, 1991) ⁹⁹⁸			S4	rare
Monarch, <i>Danaus plexippus</i> (1988, 1991) ⁹⁹⁸	SC	NIAC	S5	
Northern Cloudy-Wing, <i>Thorybes pylades</i> (1988) ⁹⁹⁸			S5	rare
Fish				
American Brook Lamprey, <i>Lampetra appendix</i> (1996-98) ⁴⁸⁶			S3	rare
Bigmouth Buffalo, <i>Ictiobus cyprinellus</i> (1999) ⁴⁸⁶	SC	NIAC	SU	rare
Black Bullhead, <i>Ameiurus melas</i> (1999) ⁴⁸⁶			S3	uncommon
Bowfin, <i>Amia calva</i> (1999) ⁴⁸⁶			S4	rare
Channel Catfish, <i>Ictalurus punctatus</i> (1999) ⁴⁸⁶			S4	rare
Lake Trout, <i>Salvelinus namaycush</i> (1999) ⁴⁸⁶			S5	rare
Longear Sunfish, <i>Lepomis megalotis</i> (1999) ⁴⁸⁶	NAR		S3	
Longnose Gar, <i>Lepisosteus osseus</i> (1996-98) ⁴⁸⁶			S4	rare
Mimic Shiner, <i>Notropis volucellus</i> (1999) ⁴⁸⁶			S5	rare
Quillback, <i>Carpodes cyprinus</i> (1994-96) ⁴⁸⁶			S4	rare
Rosyface Shiner, <i>Notropis rubellus</i> (1997-98) ⁴⁸⁶			S4	rare
Herpetofauna				
Blanding's Turtle, <i>Emydoidea blandingii</i> (1984, 1985, 1986, 1987, 1988, 1991, 1999) ^{370, 999}			S4	rare
Common Mudpuppy, <i>Necturus maculosus maculosus</i> (1989) ⁹⁹⁹	NAR	NIAC	S4	rare
Common Musk Turtle (Stinkpot), <i>Sternotherus odoratus</i> (2001) ⁴⁶⁶	THR		S4	rare
Eastern Milk Snake, <i>Lampropeltis triangulum triangulum</i> (1984, 1986, 1991) ⁹⁹⁹	SC		S4	
Eastern Spiny Softshell, <i>Apalone spinifera spinifera</i> (1984, 1999) ^{370, 999}	THR	THR	S3	rare
Northern Map Turtle, <i>Graptemys geographica</i> (1984, 1985, 1987, 1991) ⁹⁹⁹	SC		S4	rare
Breeding Birds				
American Bittern, <i>Botaurus lentiginosus</i> (1985) ¹¹⁵			S4	rare
American Coot, <i>Fulica americana</i> (1968) ⁵⁰⁰	NAR		S4	rare
Black Tern, <i>Chlidonias niger</i> (1965, 1967, 1968, 1969) ⁵⁰⁰	NAR	VUL	S3	extirpated
Black-crowned Night-Heron, <i>Nycticorax nycticorax</i> (1995) ³⁴²			S3S, SZN	rare

Species (Year Found)	COSEWIC	MNR	SRank	City of Hamilton
Breeding Birds (cont'd)				
Black-throated Green Warbler, <i>Dendroica virens</i> (1984-85, 1994) ^{115, 393}			S5	rare
Blue-winged Teal, <i>Anas discors</i> (1985) ¹¹⁵			S5	rare
Carolina Wren, <i>Thryothorus ludovicianus</i> (1989, 1990, 1993, 1994, 1996, 1997, 1998, 1999, 2000) ^{334, 393, 417, 500}			S4	rare
Cerulean Warbler, <i>Dendroica cerulea</i> (1989, 1990) ⁵⁰⁰	SC	VUL	S3B, SZN	rare
Common Moorhen, <i>Gallinula chloropus</i> (1984-85, 1989, 1993, 1997, 1998) ^{115, 334, 393, 997}			S4	rare
Gadwall, <i>Anas strepera</i> (1984-85) ¹¹⁵			S4	rare
Golden-winged Warbler, <i>Vermivora chrysoptera</i> (1984) ¹¹⁵			S4	rare
Hooded Warbler, <i>Wilsonia citrina</i> (2002) ¹⁰⁰¹	THR		S3B, SZN	rare
Least Bittern, <i>Ixobrychus exilis</i> (1984, 1995, 1986, 1987, 1988, 1989, 1990, 1992, 1995, 1997, 1998, 1999) ^{115, 334, 342, 393, 500}	THR	VUL	S3	rare
Osprey, <i>Pandion haliaetus</i> (1998, 1999) ³⁹³			S4	rare
Prothonotary Warbler, <i>Protonotaria citrea</i> (1954, 1987, 1988, 1990, 1994, 1997, 1998, 1999) ^{334, 393, 500}	END	END-R	S1S2	rare
Tufted Titmouse, <i>Baeolophus bicolor</i> (1984, 1985, 1989, 1991, 1994, 1998) ^{115, 393, 395, 500, 1000}			S2S3	rare
Whip-poor-will, <i>Caprimulgus vociferus</i> (1985) ¹¹⁵			S4	rare
Mammals				
Least Shrew, <i>Cryptotis parva</i> (1947) ³⁷⁵			SH	rare

LAND USE AND LINKAGES

Present Land Use

Historically, Cootes Paradise supported a flourishing marsh community. However, the extent and quality of the aquatic and wetland vegetation in this area has undergone a dramatic decline during this century. The reasons for this decline are complex and include excessive sedimentation, excessive turbidity, the spread of non-native species, and water level changes¹⁷⁵. Feeding and spawning activities by the large carp population in this water body are believed to have played a major role in the loss of wetland vegetation¹⁸⁰. The water quality and loss of wetland habitat problems in Cootes Paradise are being addressed in conjunction with the comprehensive Hamilton Harbour restoration program¹⁸⁰. Since 1998, large areas of submergent and emergent marsh vegetation have been added.

Linkages with Other Natural Areas

Cootes Paradise is both a core natural area and a significant link between the open waters of Hamilton

Harbour (HAMI-66), and the wooded Dundas Valley (DUND-14) study area. Furthermore, several streams draining the area above or along the Niagara Escarpment enter Cootes Paradise; these include: Spencer Creek, Borer's Creek, Chedoke Creek, and Boathouse Creek¹⁴³. These riparian corridors connect to the Borer's Falls – Rock Chapel (DUND-16) and Spencer Gorge (FLAM-41) study areas⁴⁵⁹.

RECOMMENDATIONS

1. The area should be protected from development or other impacts.
2. Existing linkages with other natural areas should be maintained and enhanced.
3. The integrity of the entire study area should be restored, including remediation of water quality and restoration of fish and wildlife habitat in the central marsh/pond area.
4. Future field work should include ELC and monitoring significant species and communities.

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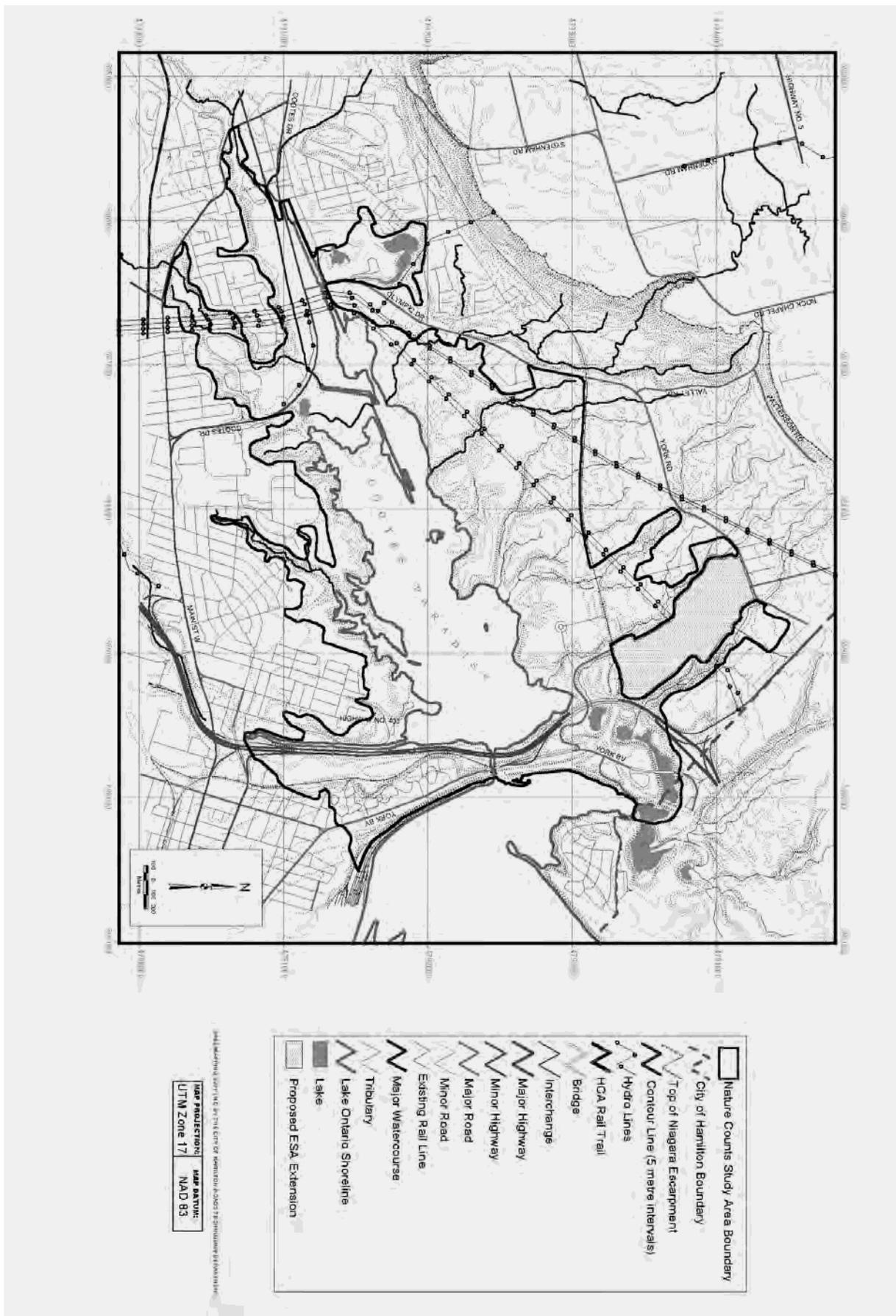
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SITE VISITS

Date	Duration	Purpose	Observers
12-Jun-1991	1.0 h	Flora	D. Bradley
17-Jun-1991	3.5 h	Birds	A. Wormington
09-Oct-1991		Flora	D. Bradley
01-Oct-2001		Flora	A. Goodban
15-Oct-2001		Flora	A. Goodban

Map 12. Cootes Paradise (DUND-15) mapping.



Identifiers

Area Type:	Wetland	Significant Level:	Provincial
Area ID:	7025	Reported Size (ha):	0
Alias(es):	COOTES PARADISE- WETLAND	Related to:	

Locational Information

UTM Centroid:	17,587512,4791722	Datum:	NAD83	Decimal Lat./Long.:	43.2732 / -79.9215
Ecodistrict(s):		County(ies):			
Topographic Map(s):		Tertiary Watershed(s):			
Imagery:					

Natural Heritage Values

Description:	A Provincially significant, Coastal wetland complex, made up of four individual wetlands, composed of two wetland types (81% swamp and 19% marsh) (Coulson et al., 1986).
Vegetation:	Vegetation Communities (Coulson et al., 1986):M1: submergents;M2: narrow-leaved emergents;M3: robust emergents;M4: free-floating plants; submergents; M5: floating plants; free-floating plants; submergents;S1: deciduous trees; ground cover; narrow-leaved emergents; tall shrubs;S2: tall shrubs; narrow-leaved emergents;
Landform:	Soils (Coulson et al., 1986): 100% clays, loams or silts;Site Type (Coulson et al., 1986): 100% lacustrine on enclosed bay;
Representation:	
Ecological Functions:	Nesting of colonial waterbirds- active feeding area for Great Blue Heron and Black-crowned Night Heron (both- RBG, L. Simser, pers. comm., referenced) (Coulson et al., 1986).Winter cover for wildlife- local significance for deer (MNR Cambridge, referenced) (Coulson et al., 1986).Waterfowl production- local significance (CWS, MNR, referenced) (Coulson et al., 1986).Significance for fish spawning and rearing- present- Northern Pike (MNR Cambridge, referenced) (Coulson et al., 1986).
Other Values:	Resource Products (Coulson et al., 1986):Bullfrogs (CWS, referenced), Snapping Turtles (RBG, L. Simser pers. comm., Royal Botanical Gardens, referenced), Furbearers- Muskrat, Raccoon, Beaver, Mink, Long-tail Weasel, Skunk, Coyote, Red Fox and Red Squirrel (all- RBG, L. Simser, pers. comm., Royal Botanical Gardens, referenced);
Current Land Use:	Recreational Activity (Coulson et al., 1986):Hunting- prohibited, Nature Appreciation or Study- high, Fishing- high, Canoeing/Boating- high;Landuses in Catchment Basin (Coulson et al., 1986):mainly agriculture and/or urban;
Historical Land Use:	
Floristic Quality:	

Management and Protection

Management Organisation:		IUCN Category:	
Management Comments:			
Protection:			
Ownership:			
Threats:	Impairment of natural quality intense in some areas or severe localized water pollution- water pollution from storm sewer and sewage treatment plant (Coulson et al., 1986).		
Exotic/Invasive Species:			
Off Site Uses:	Diversity of Surrounding Habitat (Coulson et al., 1986):row crops, abandoned agricultural land, deciduous forest, urban or cottage development, pits, quarries or mining waste disposal, open lake or deep river, terrain undulating or hilly with ravines, creeks;Hydrologically connected by surface water to other wetlands or open water within 1.5 km (Coulson et al., 1986).		
Rating Comments:			
Other Comments:			

Identifiers

Area Type:	Life Science ANSI	Significant Level:	Provincial
Area ID:	1148	Reported Size (ha):	0
Alias(es):	COOTES PARADISE DROWNED VALLEY	Related to:	

Locational Information

UTM Centroid: 17,588012,4792222 **Datum:** NAD83 **Decimal Lat./Long.:** 43.2776 / -79.9153

Ecodistrict(s):**County(ies):****Topographic Map(s):****Tertiary Watershed(s):****Imagery:****Natural Heritage Values****Description:****Vegetation:**

Most of the uplands and valley slopes are covered in dry-to-moist broadleaf forests of Red Oak, with White Oak, Black Oak and Red Maple as common secondary species and occasional co-dominant species on drier sites. Sugar Maple and Black Cherry are also frequent, with the occasional groves of White Pine. Moister lower valley slopes have Sugar Maple and Beech forests and, on cooler slopes, mixed stands of Hemlock and Sugar Maple and a stand of Hemlock - White Birch. The uplands and valleys also sustain a few successional stands of Black Walnut and Large-toothed Aspen, and thickets of Hawthorn and Staghorn Sumac. Crack Willow and Manitoba Maple forests cover a broad expanse of bottomlands on the western side of Cootes Paradise, with smaller bottomland stands in valleys south and north of Cootes. These valley bottomlands also contain seeps of Skunk Cabbage, Spotted Jewelweed and Spotted Joe-Pye-weed meadow marshes and swamps of White Elm, White Ash, Yellow Birch and Silver Maple. Two embayments on the southside of Cootes Paradise support thicket swamps of Speckled Alder - Red-osier Dogwood, marshes of Common Cattail and Water-willow, and open water covered in Common Duckweed. The wetlands on the western side of Cootes Paradise are dominated by Common Cattail in deeper waters and Long Manna Grass in more shallow waters. Open waters along the shore sustain floating and submerged aquatic communities of Fragrant Water-lily, Bullhead Lily and Sago Pondweed. [Varga and Jalava, 1995]

Landform:

Cootes Paradise is situated at the base of Dundas Valley, a large escarpment re-entrant valley almost completely buried by glacial and post-glacial sediments. Uplands deeply dissected by narrow valleys surround the shallow waters of Cootes Paradise, a waterbody 1 km wide and 2 km long. The valley around Cootes Paradise was flooded by glacial Lake Iroquois, a larger version of today's Lake Ontario. Following the retreat of this glacial lake, numerous small creeks cut valleys 15 m deep into the sandy loam lacustrine soils on the uplands around Cootes Paradise. Subsequently, Cootes Paradise was flooded over the past 6000 years or so by rising Lake Ontario water levels, creating a "drowned valley". The waterbody is separated from Hamilton Harbour by the Hamilton Bar, laid down originally as a baymouth gravel bar in glacial Lake Iroquois. [Varga and Jalava, 1995]

Representation:

Cootes Paradise is highly representative of Dundas Valley features on the Lake Iroquois Plain, with high representation of dry and moist broadleaf and mixed upland and valley forests, and moderate representation of meadow marshes, marshes and thicket swamps. The site has the largest open water lacustrine community in the Niagara Peninsula Section. It also sustains the largest Red Oak forests and the largest wetland complex in the Dundas Valley. Of note are the Speckled Alder and Water-willow wetland communities, with northern affinities; the latter community is not represented elsewhere in the biophysical section. Also of note are the most extensive seasonal mudflats on the Canadian side of Lake Ontario. [Varga and Jalava, 1995]

Ecological Functions:

The 423 ha of Cootes Paradise include about 23 ha of forest interior, providing habitat for 13 forest- interior bird species. It is connected along Ancaster Creek and Sulphur Creek to other forested lands in Dundas Valley, part of a regional woodland complex of 1600 ha. Cootes Paradise is also connected to a highly significant escarpment corridor stretching from Spencer Gorge to Mount Nemo, a distance of 23 km. Cootes Paradise supports the largest protected bay on the Niagara Peninsula, with more than 12 km of shoreline and 200 ha of open water. These waters support significant wetlands and serve as an important staging area for migrating shorebirds and waterfowl. [Varga and Jalava, 1995]

Other Values:**Current Land Use:****Historical Land Use:****Floristic Quality:****Management and Protection****Management****ICUN Category:****Organisation:****Management****Comments:****Protection:****Ownership:****Threats:**

Most of the uplands are covered in mature forests of Sugar Maple, Red Oak, White Oak and Black Oak, with trees in excess of 100 years old. Some of the drier oak forests were probably dependent on periodic ground fires for oak regeneration and for maintenance of the semi-open canopies (generally under 60% cover) that encourage a rich savannah flora. The elimination of fires in Cootes Paradise maybe responsible for the decline in numbers and the presumed extirpation

of some of the site's savannah flora. For example, savannah species such as Downy Foxglove, Early Buttercup, Large-bracted Tick-trefoil, Canada Frostweed, Yellow Stargrass, Forked Panic Grass, Clinton's Bulrush and Canada Milk-vetch have not been reported in recent years. The wetland portion of Cootes Paradise has suffered declines in the quality, diversity and size of aquatic vegetation over the past 50 years. This decline is the result of a complex series of factors including water-level fluctuations (a series of high lake levels in the mid-1950s and early 1970s, with natural fluctuations now reduced), and excessive sediment- and nutrient-loading within the watershed and drainshed. The introduced carp have a significant impact through causing and exacerbating turbidity problems by grazing aquatic plants and destabilizing bottom sediments. An introduced grass, Long Manna Grass, has taken over the shallow emergent marshes, supplanting native sedges and grasses such as the Canada Blue-joint. The introduced shrub, Glossy Buckthorn, and the introduced herb, Purple Loosestrife, are invading the highly significant Speckled Alder thicket swamps and Water-willow marshes. Common Cattail marshes, now restricted to the shoreline and the back portions of Cootes Paradise, once covered most of its waters. The submergent aquatic community has been decimated, with its number of pondweed species declining from a diverse 8 species to less than 4 species. Many rare wetland plants such as Claspingleaved Pondweed, Small Pondweed, Leafy Pondweed, Short-awned Foxtail, Northern Wild-rice, Aquatic Sedge, Awned Sedge, Beaked Sedge, Inflated Sedge, Red-rooted Cyperus, Canada Rush, Spatterdock, Yellow Water Buttercup, Water Milfoil, Swamp Candle and Marsh-marigold have not been seen since the 1950s or 1960s, and are presumed to be extirpated. [Varga and Jalava, 1995]

Exotic/Invasive

Species:

Off Site Uses:

Rating

Comments:

Other

Comments:

Appendix C

Photo Record

Red Hill Creek Valley Looking North East – Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4) and Open Aquatic stormwater pond.



Red Hill Creek Valley Looking to North West - small remnant of Fresh Moist Manitoba Maple Cultural Woodlot (CUW1-3)



Red Hill Creek Valley Looking to South West - large block of Fresh-Moist Sugar Maple Hardwood Deciduous Forest (FOD 6-5) to west. Restoration and small patches of Staghorn Sumac Cultural Thicket (CUT1-1) can be seen in the foreground.



Red Hill Creek Valley Looking to South East - small Fresh-Moist Willow Lowland Deciduous Forest (FOD 7-3) follows a small drainage running parallel to Queenston Road into the valley



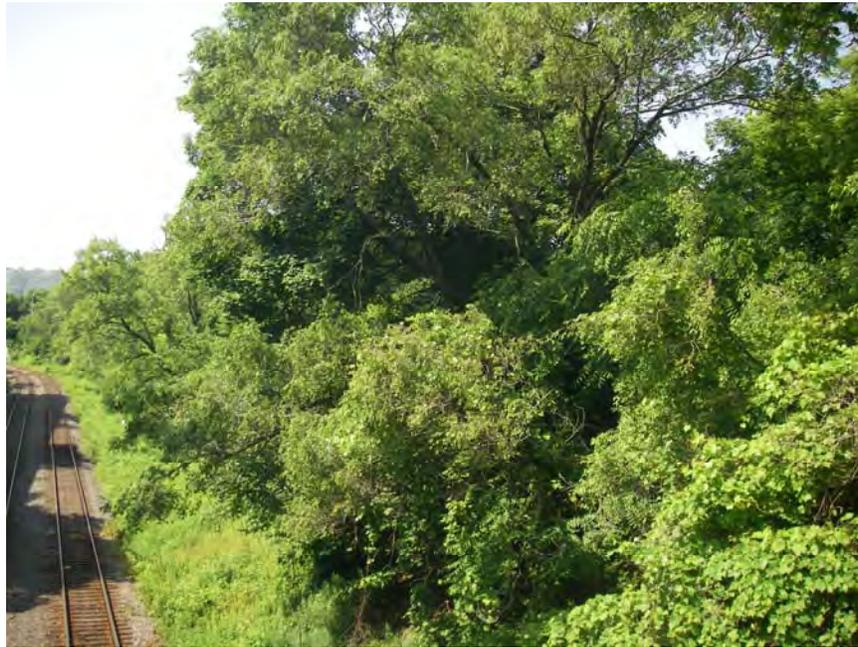
Gage Park Looking South - Dry Fresh Norway Maple Plantation (CUP1-11)



Gage Park Looking South East - Dry Fresh Mixed Cultural Plantation (CUP2-2)



Chedoke Creek Looking South - Remnant Dry Fresh Silver Maple Deciduous Forest (FOD5-11) found lining the rail line to the east to Cathedral Park.



Chedoke Creek Looking West - Dry Fresh Manitoba Maple Mineral Cultural Woodlot (CUW1-3) lining the northern edge of Cathedral Park. Small wet pocket in foreground.



Chedoke Creek Looking North East - Dry Fresh Manitoba Maple Mineral Cultural Woodlot (CUW1-3) lining the western edge of Cathedral Park, and the west and east sides of the Highway 403 to Main Street West ramp. Small wet pocket of Reed Canary Grass Meadow Marsh (MAM2-2) seen to the left.



Chedoke Creek Looking West - Area of manicured lawn and trees associated with properties to the west of Highway 403 and north of Main Street West.



Appendix D

NHIC Species Occurrence Data

Red Hill Creek NHIC Plant Species Occurrence Data (2010)

OBJECTID	SQUARE1KM	EO_ID	ELEMENT_SU	SCI_NAME	COMMNAME	S_RANK	COSEWIC	MNR_STATUS	LAST_OBS	EXTIRPATED
729669	17NH98_87	23188.000000000000	145022.000000000000	Asclepias variegata	White Milkweed	SX			1870	Y
729843	17NH98_97	23188.000000000000	145022.000000000000	Asclepias variegata	White Milkweed	SX			1870	Y
729663	17NH98_87	2404.000000000000	63000.000000000000	Nuphar advena	Large Yellow Pond-lily	S3			1952-07-27	N
729837	17NH98_97	2404.000000000000	63000.000000000000	Nuphar advena	Large Yellow Pond-lily	S3			1952-07-27	N
729673	17NH98_87	60410.000000000000	168520.000000000000	Hieracium paniculatum	Panicled Hawkweed	S2?			1956-08-08	N
729847	17NH98_97	60410.000000000000	168520.000000000000	Hieracium paniculatum	Panicled Hawkweed	S2?			1956-08-08	N
729672	17NH98_87	2681.000000000000	153026.000000000000	Aureolaria virginica	Downy Yellow False Foxglove	S1			1957-07-26	Y
729846	17NH98_97	2681.000000000000	153026.000000000000	Aureolaria virginica	Downy Yellow False Foxglove	S1			1957-07-26	Y
729674	17NH98_87	67820.000000000000	179060.000000000000	Bacidia trachona	A Lichen	S1S2			1978-06-26	N
729848	17NH98_97	67820.000000000000	179060.000000000000	Bacidia trachona	A Lichen	S1S2			1978-06-26	N
729675	17NH98_87	67817.000000000000	179494.000000000000	Diplotomma epipolium	A Lichen	S1S2			1978-06-28	N
729849	17NH98_97	67817.000000000000	179494.000000000000	Diplotomma epipolium	A Lichen	S1S2			1978-06-28	N
729665	17NH98_87	2549.000000000000	82062.000000000000	Crataegus dissona	Northern Hawthorn	S3			1981-09-05	N
729839	17NH98_97	2549.000000000000	82062.000000000000	Crataegus dissona	Northern Hawthorn	S3			1981-09-05	N
729664	17NH98_87	2534.000000000000	82042.000000000000	Crataegus brainerdii	Brainerd's Hawthorn	S2			1981-09-07	N
729838	17NH98_97	2534.000000000000	82042.000000000000	Crataegus brainerdii	Brainerd's Hawthorn	S2			1981-09-07	N
729667	17NH98_87	5507.000000000000	133500.000000000000	Chimaphila maculata	Spotted Wintergreen	S1	END	END	1886-07-01	Y
729841	17NH98_97	5507.000000000000	133500.000000000000	Chimaphila maculata	Spotted Wintergreen	S1	END	END	1886-07-01	Y
729671	17NH98_87	60293.000000000000	153024.000000000000	Aureolaria pedicularia	Fern-leaved Yellow False Foxglove	S2?			1888-09-19	N
729845	17NH98_97	60293.000000000000	153024.000000000000	Aureolaria pedicularia	Fern-leaved Yellow False Foxglove	S2?			1888-09-19	N
729661	17NH98_87	3254.000000000000	39002.000000000000	Aplectrum hyemale	Puttyroot	S2			1889-04-19	Y
729835	17NH98_97	3254.000000000000	39002.000000000000	Aplectrum hyemale	Puttyroot	S2			1889-04-19	Y
729662	17NH98_87	2482.000000000000	54038.000000000000	Polygonum erectum	Erect Knotweed	SH			1897-10	Y
729836	17NH98_97	2482.000000000000	54038.000000000000	Polygonum erectum	Erect Knotweed	SH			1897-10	Y
729660	17NH98_87	59465.000000000000	32050.000000000000	Hypoxis hirsuta	Yellow Stargrass	S3			1898-06-10	Y
729834	17NH98_97	59465.000000000000	32050.000000000000	Hypoxis hirsuta	Yellow Stargrass	S3			1898-06-10	Y
729666	17NH98_87	59792.000000000000	82202.000000000000	Porteranthus trifoliatus	Bowman's-root	SX				N
729840	17NH98_97	59792.000000000000	82202.000000000000	Porteranthus trifoliatus	Bowman's-root	SX				N
729670	17NH98_87	60240.000000000000	149062.000000000000	Onosmodium molle ssp. hispidissimum	Soft-hairy False Gromwell	S2				N
729844	17NH98_97	60240.000000000000	149062.000000000000	Onosmodium molle ssp. hispidissimum	Soft-hairy False Gromwell	S2				N
729668	17NH98_87	60162.000000000000	143056.000000000000	Sabatia angularis	Square-stemmed Rose Pink	SX				N
729842	17NH98_97	60162.000000000000	143056.000000000000	Sabatia angularis	Square-stemmed Rose Pink	SX				N

Gage Park NHIC Plant Species Occurrence Data (2010)

OBJECTID	SQUARE1KM	EO_ID	ELEMENT_SU	SCI_NAME	COMMNAME	S_RANK	COSEWIC	MNR_STATUS	LAST_OBS	EXTIRPATED
729106	17NH98_58	23188.000000000000	145022.000000000000	<i>Asclepias variegata</i>	White Milkweed	SX			1870	Y
729114	17NH98_58	21077.000000000000	180148.000000000000	<i>Colinus virginianus</i>	Northern Bobwhite	S1	END	END	1904	Y
729113	17NH98_58	23028.000000000000	180071.000000000000	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron	S3B,S3N			1936	N
729115	17NH98_58	17355.000000000000	180784.000000000000	<i>Crotalus horridus</i>	Timber Rattlesnake	SX	EXP	EXP	1950	Y
37949	17NH98_58	3493.000000000000	0.000000000000	Sensitive Species	Sensitive Species				1988	N
729112	17NH98_58	5195.000000000000	168712.000000000000	<i>Solidago arguta</i>	Sharp-leaved Goldenrod	S4			1989	N
37948	17NH98_58	16423.000000000000	0.000000000000	Sensitive Species	Sensitive Species				1937-07-05	Y
729108	17NH98_58	60268.000000000000	151086.000000000000	<i>Monarda didyma</i>	Scarlet Beebalm	S3			1950-07	N
729100	17NH98_58	2404.000000000000	63000.000000000000	<i>Nuphar advena</i>	Large Yellow Pond-lily	S3			1952-07-27	N
729093	17NH98_58	3068.000000000000	23648.000000000000	<i>Trichophorum clintonii</i>	Clinton's Clubrush	S2S3			1954-05-24	N
729090	17NH98_58	3380.000000000000	22208.000000000000	<i>Dichanthelium dichotomum</i>	Forked Panic Grass	S2			1954-07-03	N
729111	17NH98_58	60410.000000000000	168520.000000000000	<i>Hieracium paniculatum</i>	Panicled Hawkweed	S2?			1956-08-08	N
729091	17NH98_58	3489.000000000000	22596.000000000000	<i>Sphenopholis nitida</i>	Shiny Wedge Grass	S1			1957-06-17	N
729110	17NH98_58	2681.000000000000	153026.000000000000	<i>Aureolaria virginica</i>	Downy Yellow False Foxglove	S1			1957-07-26	Y
729097	17NH98_58	2222.000000000000	44002.000000000000	<i>Carya glabra</i>	Pignut Hickory	S3			1957-09-19	N
729092	17NH98_58	59241.000000000000	23016.000000000000	<i>Carex albicans</i> var. <i>albicans</i>	White-tinged Sedge	S3			1980-05-17	N
729102	17NH98_58	2549.000000000000	82062.000000000000	<i>Crataegus dissona</i>	Northern Hawthorn	S3			1981-09-05	N
729101	17NH98_58	2534.000000000000	82042.000000000000	<i>Crataegus brainerdii</i>	Brainerd's Hawthorn	S2			1981-09-07	N
729098	17NH98_58	21253.000000000000	46000.000000000000	<i>Castanea dentata</i>	American Chestnut	S2	END	END	1993-08-09	N
729095	17NH98_58	3241.000000000000	32112.000000000000	<i>Uvularia perfoliata</i>	Perfoliate Bellwort	S1			2001-05-11	N
729104	17NH98_58	5507.000000000000	133500.000000000000	<i>Chimaphila maculata</i>	Spotted Wintergreen	S1	END	END	1886-07-01	Y
729109	17NH98_58	60293.000000000000	153024.000000000000	<i>Aureolaria pedicularia</i>	Fern-leaved Yellow False Foxglove	S2?			1888-09-19	N
729096	17NH98_58	3254.000000000000	39002.000000000000	<i>Aplectrum hyemale</i>	Puttyroot	S2			1889-04-19	Y
729099	17NH98_58	2482.000000000000	54038.000000000000	<i>Polygonum erectum</i>	Erect Knotweed	SH			1897-10	Y
729094	17NH98_58	59465.000000000000	32050.000000000000	<i>Hypoxis hirsuta</i>	Yellow Stargrass	S3			1898-06-10	Y
729103	17NH98_58	59792.000000000000	82202.000000000000	<i>Porteranthus trifoliatu</i> s	Bowman's-root	SX				N
729107	17NH98_58	60240.000000000000	149062.000000000000	<i>Onosmodium molle</i> ssp. <i>hispidissimum</i>	Soft-hairy False Gromwell	S2				N
729105	17NH98_58	60162.000000000000	143056.000000000000	<i>Sabatia angularis</i>	Square-stemmed Rose Pink	SX				N

Avian Species List

Hamilton Rapid Transit B-Line Terrestrial and Wetland Wildlife Report

Prepared for:
SNC Lavalin

Project No. 1173

Date: Nov 15 2010



NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Hamilton Rapid Transit B-Line Terrestrial and Wetland Wildlife Report

Project Team:

Staff	Role
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Report submitted on November 23, 2010

Brett Woodman, Project Manager

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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by SNC-Lavalin to undertake a review of the terrestrial and avian ecology conditions along the Main/King B-Line corridor between University Plaza and the Centennial Parkway in the city of Hamilton. The B-Line corridor is a proposed route for the Rapid Transit system associated with the City of Hamilton's Rapid Transit Initiative. This report provides a summary of background information on the natural heritage features, as well as results of original field surveys and background review of breeding birds, mammals, and herpetofauna for the project area. This information is summarized in order to identify any environmental constraints present and to guide the development of the proposed LRT system.

1.1 Project Area

For the purposes of this report, the term 'project area' refers to the urban area of downtown Hamilton Ontario along Main Street and King Street between University Plaza in the west, and the Centennial Parkway in the east (Figure 1). The term 'study area' refers to the project area plus the surrounding area (approximately 1km). Detailed biological surveys were undertaken by NRSI within the project area and background information on the biological communities and features in the study area were collected and reviewed.

2.0 Study Methods

2.1 Collection and Review of Background Information

Background information on the natural environmental features within the study area was gathered from the Natural Heritage Information Centre (NHIC) Biodiversity Explorer database (OMNR 2010).

Initial species lists were compiled to provide information on species known from the local vicinity using various atlases, including the Ontario Mammal Atlas (Dobbyn 1994), Ontario Breeding Bird Atlas (OBBA) (Cadman et al. 2007), and the Ontario Herpetofaunal Summary Atlas (Oldham and Weller 2000). The NHIC Biodiversity Explorer database (OMNR 2010) was searched for provincially rare species. All wildlife species identified as nationally significant (COSEWIC 2009) or provincially significant (OMNR 2009) were cross-referenced with species known to occur within the vicinity of the study area.

Data on breeding birds in the study area was extracted from the OBBA. Since the OBBA provides data based on 10x10 km survey squares, information on breeding birds from the squares that overlapped with the study area were compiled (squares 17NH88, 17NH89, 17NH98, 17NH99, 17PH08). Birds identified as nationally rare (COSEWIC 2009) or provincially rare (OMNR 2009; OMNR 2010) were cross-referenced with birds that were observed in the study area.

2.2 Field Work

Terrestrial biologists from Natural Resource Solutions Inc. conducted a total of five field visits to the study area in the spring and summer of 2010. A variety of field surveys were undertaken which are described below in more detail.

2.2.1 Birds

The breeding bird season in southern Ontario is between May 1st and July 31st, with standard survey times being between May 24th and July 8th as per the Ontario Breeding Bird Atlas protocols. Two breeding bird surveys were conducted by NRSI on June 25th and July 7th, 2010, using the OBBA methodology, which involved area searches

throughout the entire property. In addition to breeding bird surveys, all birds observed within the study area during all field visits were documented.

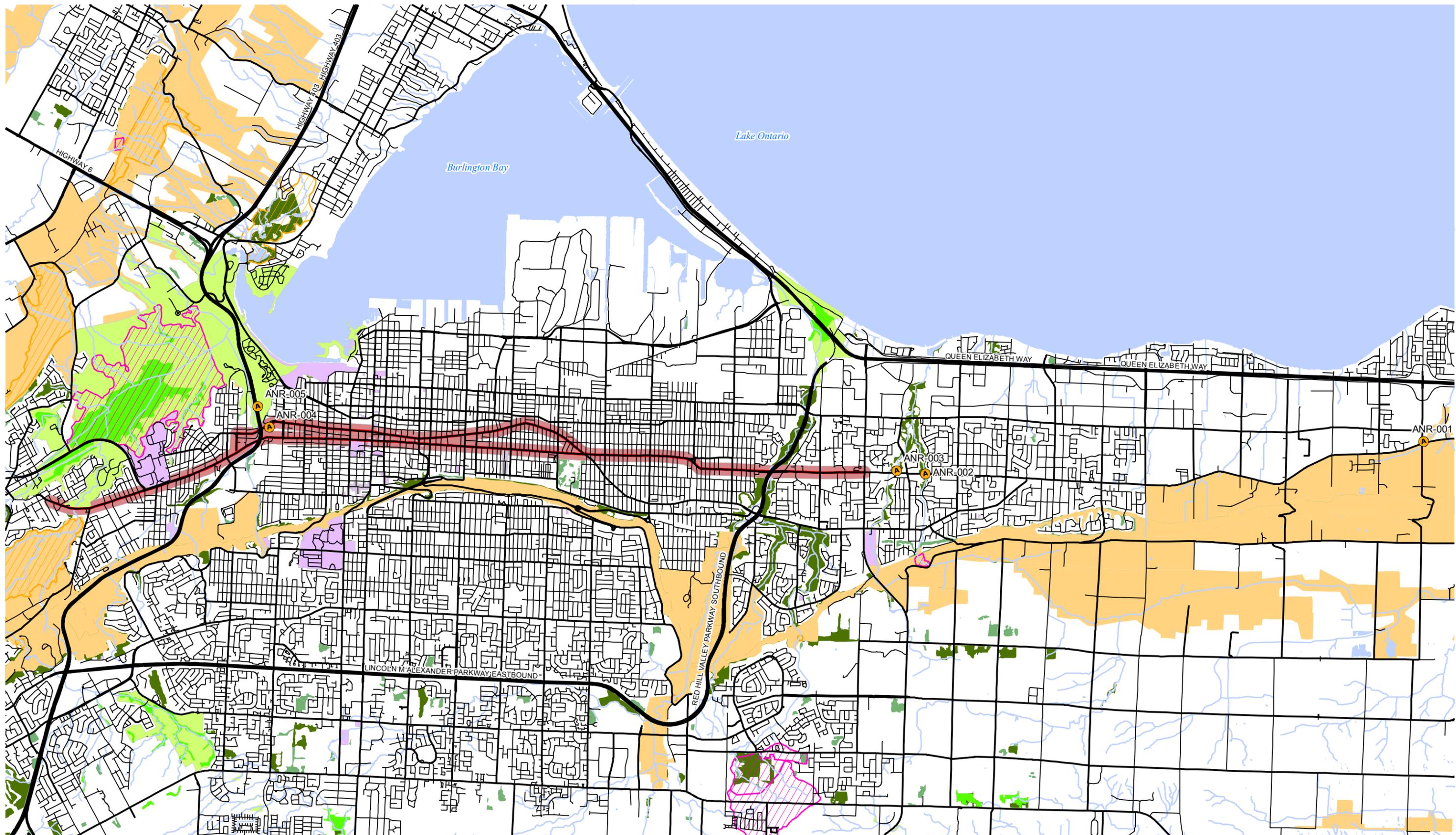
2.2.2 Herpetofauna

Standard evening anuran (frogs and toads) call surveys were completed after sunset once monthly from April to June in accordance with the Marsh Monitoring Program (Bird Studies Canada 1994). Five anuran survey stations (ANR-001 to -005) were established within the study area, as shown on Figure 1. These visits occurred approximately half an hour after sunset on April 28th, May 20th, and June 21st, 2010. All frog and toad species heard calling within 100m of the station were recorded, along with the intensity of their call, the approximate number of individuals, and the weather conditions. Suitable habitat for anurans is very limited in the project area; as a result some of the survey point locations are outside of the project area within better habitat. This was done to determine what species could be found in the project area.

Habitat for reptiles is very limited within the subject lands therefore no specific surveys for these species were completed.

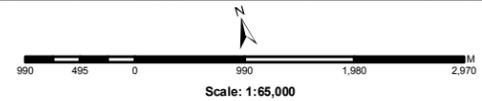
2.2.3 Additional Wildlife

All observations of mammals (as well as evidence such as tracks, scats, dens, etc.) were documented on all field visits.



Legend

- | | | | | |
|---------------------------------|----------------------------------|--|---|--|
| Anuran Monitoring Station (ANR) | Proposed Rapid Transit Route | Area of Natural and Scientific Interest | Environmentally Significant Area | Proposed Rapid Transit Route (120m Buffer) |
| Highway | Watercourse | Provincial | Locally Significant Area | Waterbody |
| Primary Road | Locally Significant Wetland | Regional | Provincially Significant Area | Significant Woodlot |
| Secondary Road | Provincially Significant Wetland | Designated Heritage Site | Natural Heritage System Area | Woodlot |



Hamilton Rapid Transit Initiative-Proposed B-Line Route Project Area & Natural Features

Date: November 22, 2010	File Number: 1173B	Sub Code:
Figure: 1		Rev. 0

File: X:\1173B_HamiltonRapidTransitInitiative\NRSI_1173B_ProjectAreaNaturalFeatures_1009_2010_11_22_SMM.mxd

3.0 Existing Conditions

3.1 Soils and Terrain

The following is a summary of the information provided in the soil maps of Wentworth county (Presant et al. 1965):

The majority of the subject property is located on the Queenston formation, which is of Ordovician age. It is the oldest formation in the County, and occupies the area from the base of the escarpment to the Lake Ontario shoreline. This formation also forms the surface bedrock of much of the Dundas Valley, although part of the Valley is reported to be carved in older Ordovician rocks which lie under the Queenston formation. The Queenston rocks consist of red mudstone with occasional greenish siltstone bands. It weathers rapidly into a cohesive, reddish soil on exposure to the atmosphere.

The gently sloping area which extends from Lake Ontario to an elevation of about 350ft, has been called the Iroquois Plain, because it was once covered by glacial Lake Iroquois. It consists of weathered red shale overlain by lenses of clay till and lacustrine sand. Drainage is slow where the sand is absent or very shallow. The ravines in this area have only a few, short tributaries, and their main contribution to the local drainage is to provide outlets for tile drains.

3.2 Designated Natural Areas

The following is a summary of the information provided in the natural areas described in the Dillon Consulting Ltd. (2009) report on the Rapid Transit Initiative:

1. Chedoke Creek

Both the King and Main Street segment of the LRT B-Line cross Chedoke Creek at the intersection with Highway 403, located between Macklin Street North and Dundurn Street. Chedoke Creek at this location is conveyed via a large culvert, which flows northward and empties into Cootes Paradise. Based on communication with Hamilton Conservation Authority, the Chedoke sub-

watershed has several rare and significant species but is generally highly impacted and degraded by human activity. The proposed B-Line Route crosses Chedoke Creek within the Lower Chedoke Creek sub-watershed. Within this sub-watershed warm water fisheries have been identified north of King Street (HCA 2008a). King Street, which is the most northerly crossing in this area, comes to within 50 meters of the Cootes Paradise Environmentally Significant Area (ESA). Cootes Paradise is the largest remaining Great Lakes Shoreline Marsh at the western end of Lake Ontario and contains many significant species, including a high diversity of native plant species, and also contains interior forest habitat.

Cootes Paradise is also an important staging ground for waterfowl and provides connectivity between the significant terrestrial habitats in the Dundas Valley and significant aquatic habitats in Hamilton Harbour (Hamilton Naturalists Club 1995a). The larger Cootes Paradise area also contains a Provincially Significant Wetland and Life Science Area of Natural and Scientific Interest (ANSI) as classified by the MNR. However, the boundaries for the ANSI and Provincially Significant Wetland (PSW) designated areas are situated further north and are not relevant to the proposed undertaking.

2. Gage Park

Gage Park, located along the south side of Main Street between Gage Avenue and King Street, is a public park that is classified as Urban Area in the Niagara Escarpment Plan. This park consists of recreational structures, manicured lawns, with areas of planted trees, shrubs and gardens.

3. Red Hill Creek Escarpment Valley

The LRT B-Line crosses over the Red Hill Creek Escarpment Valley between Parkdale Avenue and Centennial Parkway. This Valley feature is designated as a Life Science Site by the MNR and an ESA according to Map 4 of the Hamilton-Wentworth Official Plan (Official Plan). Only the Official Plan ESA boundary is indicated, as the MNR does not maintain mapping for this feature. The Red Hill Creek Valley is part of a branching urban greenspace that includes floodplains and both passive and active recreational lands. The natural area is bounded by

a mix of urban, suburban and industrial development in both Hamilton and Stoney Creek. The Red Hill Creek Valley is crossed by roadways, railways, hydro corridors and sewage mains and the Red Hill Valley Parkway currently runs along much of the creek valley. The valley is a part of the continuous corridor of natural vegetation along the Niagara Escarpment. Despite human impacts, this site still contains a high biological diversity due to varied topography, substrates and microclimates. Several rare and uncommon species inhabit the Red Hill Creek Escarpment Valley (Hamilton Naturalists Club 1995b).

4. Coldwater Creek

The proposed LRT B-Line route crosses Coldwater Creek, also known as Ancaster Creek, along Osler Drive (part of the Highway 8/Main Street Corridor) on the east side of University Plaza. Coldwater Creek is a part of the Ancaster Creek sub-watershed and at this location is conveyed under Osler Drive via a large culvert, flowing northward towards Cootes Paradise (HCA 2008b). This creek and associated valley contains several designated natural heritage features adjacent to the proposed B-Line route. Cootes Paradise, designated as an ESA under the Official Plan and described above, is found along the north side of Osler Drive with the boundary at the road right of way.

The Dundas Valley, designated as an ESA under the Official Plan, is found along the south side of Osler Drive and has boundaries approaching to within approximately 150 meters of the road right of way. This large area is a re-entrant valley in the Niagara Escarpment, which is characterized by several forest types and a wide variety of topographies and microclimates. Significant wildlife populations and high biodiversity are found within the Dundas Valley including many found only in the Carolinian zone of Canada.

The Ancaster Creek Valley, designated as a Life Science ANSI by the MNR, is also found to the south of Osler Drive approximately 150 meters from the proposed B-Line route. Several forest communities are found in the valley, and bottomland meadow marshes and marshes are supported by the presence of seeps. The mature hemlock kame valley slope forests found in the valley are considered the best example of this forest type in the Niagara Peninsula area;

there is also a high representation of thickets, and a moderate representation of moist broadleaf forests, mixed valley forests and broadleaf bottomland forest.

3.3 Wildlife

3.3.1 Birds

A comprehensive bird species list, including field observations from NRSI and background information from the Ontario Breeding Bird Atlas (Cadman et al. 2007) can be found in Appendix I. A total of 154 bird species are known from the 10x10 km squares (17NH88, 17NH89, 17NH98, 17NH99, 17PH08) that overlap with the study area according to the OBBA. Most of these species lack suitable breeding habitat within the study area.

Background information from the OBBA indicates that 21 significant bird species are known from the vicinity (approximately 10 km) of the subject property. These species, their habitat, and the likelihood of finding them in the study area are described in Table 1 below. Preferred breeding habitat for most of the significant species listed is not found within the study area, with the exception of peregrine falcon (*Falco peregrinus anatum/tundrius*), chimney swift (*Chaetura pelagica*), common nighthawk (*Chordeiles minor*), Louisiana waterthrush (*Seiurus motacilla*), and red-headed woodpecker (*Melanerpes erythrocephalus*).

Twenty-six species were observed by NRSI biologists during the area search surveys. Nine of these species showed probable breeding evidence; another ten species showed possible breeding evidence. Only one species showed confirmed breeding evidence because of fledged young, the European starling (*Sturnus vulgaris*). Six additional species were observed without any level of breeding evidence: common grackle (*Quiscalus quiscula*), barn swallow (*Hirundo rustica*), American crow (*Corvus brachyrhynchos*), chimney swift (*Chaetura pelagica*), ring-billed gull (*Larus delawarensis*), and herring gull (*Larus argentatus*). A complete list of all species observed is available in Appendix I. All of these species, with the exception of chimney swifts, are common or very common breeders in Ontario (OMNR 2010).

Chimney swifts were observed flying overhead on both breeding bird surveys on June 25th and July 7th, 2010. Because they nest in chimneys in urban areas, they could be found breeding in the study area; however, because the B-Line will not impact their nesting structures, they should not be impacted by the development (Dillon Consulting Ltd. 2009).

Peregrine falcons can nest on tall buildings in urban areas, and a pair has nested on the Hamilton Sheraton Hotel, located at the King and Bay intersection on the proposed B-Line route, since 1995 (Dillon Consulting Ltd. 2009). They were not observed by NRSI biologists during field surveys, but it is reasonable to assume that the nesting pair could return to this nest site or a nearby spot in the study area. According to the Dillon Consulting Ltd. report, these falcons “are accustomed to street level disturbance during the breeding season and should not be impacted by the development.

Common nighthawks can nest on flat, gravel roofs. Because the B-Line will not impact these structures, they should not be impacted by the development. This species was not observed by NRSI biologists during field surveys.

Louisiana waterthrush and red-headed woodpecker could potentially breed in the forested creek valleys found within the study area. These species were not observed by NRSI biologists during field surveys. However, as B-Line construction will not impact outside of the existing infrastructures footprint (Dillon Consulting Ltd. 2009) these species should not be impacted.

Table 1. Significant bird species in the vicinity of the study area

Common Name	Scientific Name	S-Rank ¹	COSEWIC status ²	SARO status ³	Preferred Habitat ⁴	Habitat within subject property?
Redhead	<i>Aythya americana</i>	S2B, S4N			shallow cattail/bulrush marshes, lakes and ponds and fens; preferred nesting usually close to shallow water (most within 2 m), but can be found as far as 266 m from water's edge	No
Red-necked Grebe	<i>Podiceps grisegena</i>	S3B, S4N	NAR	NAR	permanent freshwater lakes with a fringe of aquatic emergent vegetation; marshes, impoundments or sewage lagoons with > 4 ha of open water; protected marshy areas or bays in larger lakes;	No
Least Bittern	<i>Ixobrychus exilis</i>	S4B	THR	THR	deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails	No
Black-Crowned Night Heron	<i>Nycticorax nycticorax</i>	S3B,S3N			deciduous woodland swamps, cattail marshes, islands, wooded river and lake banks, coastal wetlands	No
Bald Eagle	<i>Haliaeetus leucocephalus</i>	S2N, S4B	NAR	SC	require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching	No
Peregrine Falcon	<i>Falco peregrinus anatum/tundrius</i>	S3B	SC	THR	rock cliffs, crags, especially situated near water; tall buildings in urban centres;	Yes
Great Black-backed Gull	<i>Larus marinus</i>	S2B			flat rocky coastal islands, moorlands, rocky beaches, cliffs; nest is solitary or in small (rarely large) colonies	No
Forster's Tern	<i>Sterna forsteri</i>	S2B	DD	DD	large open and fresh or saltwater marshes, deep cattail marshes; must be near open water; marsh nesting restricts breeding distribution	No
Caspian Tern	<i>Hydroprogne caspia</i>	S3B	NAR	NAR	open habitat near large lakes or rivers, beaches, shorelines, rocky or sandy beaches,	No

					offshore islands; negatively affected by elevated water levels during nesting season	
Barn Owl	<i>Tyto alba</i>	S1	E	END	open areas such as fields, agricultural lands with scattered woodlots, buildings and/or orchards; grasslands, sedge meadows, marshes; nests in hollow trees and live trees >46 cm dbh; also nests in barns, abandoned buildings	No
Short-eared Owl	<i>Asio flammeus</i>	S2N, S4B	SC	SC	grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; both diurnal and nocturnal habits; ground nester	No
Common Nighthawk	<i>Chordeiles minor</i>	S4B	T	SC	open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs	Yes
Whip-poor-will	<i>Caprimulgus vociferus</i>	S4B	T	THR	dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaf litter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests	No
Chimney Swift	<i>Chaetura pelagica</i>	S4B, S4N	T	THR	commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys	Yes
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	S4B	T	SC	open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees	Possible in forested creek valleys
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	S4B	T	SC	early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubby clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha of habitat	No
Prothonotary Warbler	<i>Protonotaria citrea</i>	S1B	E	END	area sensitive species preferring 100 ha of flooded or swampy woodlands with standing or flowing water and more than 25% canopy cover with numerous stumps and snags;	No

					stream borders or flooded bottomlands; soft, dead trees with dbh >10 cm; Carolinian species	
Louisiana Waterthrush	<i>Seiurus motacilla</i>	S3B	SC	SC	prefers wooded ravines with running streams; also woodlands swamps; large tracts of mature deciduous or mixed forests; canopy cover is essential; has strong affinity to nest sites; nests on ground	Possible in forested creek valleys
Hooded Warbler	<i>Wilsonia citrina</i>	S3B	T	SC	favours mature, deciduous forest (Carolinian), particularly along stream bottoms, ravine edges and where saplings and shrubbery grow; nests above ground in small shrubs; feeds on or near ground	No
Canada Warbler	<i>Wilsonia canadensis</i>	S4B	T	SC	an interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha	No
Yellow-breasted Chat	<i>Icteria virens</i>	S2B	SC (ssp. <i>virens</i>)	SC	thickets, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc.	No
Bobolink	<i>Dolichonyx oryzivorus</i>	S4B	THR		large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha	No

¹OMNR 2010; ²COSEWIC 2009; ³OMNR 2009; ⁴OMNR 2000.

3.3.2 Herpetofauna

Twenty-six species of herpetofauna (reptiles and amphibians) are known to occur within the vicinity of the study area according to the Ontario Herpetofaunal Atlas (Oldham and Weller 2000). See Table 2 below for the eight significant species known from the study area, their preferred habitat, and the likelihood of finding them in the study area.

Preferred habitat for any of the significant species listed is not found within the study area.

NRSI observed one amphibian species within the subject lands: the green frog (*Rana clamitans melanota*). A complete list of herpetofauna known from the study area, including their current status rankings, is shown in Appendix II.

Table 2. Significant reptile and amphibian species known from the vicinity of the study area

Common Name	Scientific Name	S-Rank ¹	COSEWIC status ²	SARO status ³	Preferred Habitat ⁴	Habitat within subject property?
Eastern Spiny Softshell	<i>Apalone spinifera spinifera</i>	S3	THR	THR	large river systems, shallow lakes and ponds with muddy bottoms and aquatic vegetation; basks on sandbars, mud flats, grassy beaches, logs or rocks; eggs are laid near water on sandy beaches or gravel banks in areas with sun	No
Common Snapping Turtle	<i>Chelydra serpentina serpentina</i>	S5	SC	SC	permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites	No
Blanding's Turtle (Great Lakes/St Lawrence population)	<i>Emydoidea blandingii</i>	S3	THR	THR	shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation	No
Northern Map Turtle	<i>Graptemys geographica</i>	S3	SC	SC	large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water	No
Eastern Musk Turtle (Stinkpot)	<i>Sternotherus odoratus</i>	S3	THR	THR	aquatic, except when laying eggs; shallow slow moving water of lakes, streams, marshes and ponds; hibernate in underwater mud, in banks or in muskrat lodges	No
Eastern Milksnake	<i>Lampropeltis t. triangulum</i>	S3	SC	SC	farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods	No
Jefferson Salamander and	<i>Ambystoma jeffersonianum</i>	S2	THR	THR	damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding	No
Jefferson/Blue-spotted Salamander Polyploids	<i>Ambystoma jeffersonianum-laterale polyploids</i>	S2			damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding	No

¹OMNR 2010; ²COSEWIC 2009; ³OMNR 2009; ⁴OMNR 2000.

3.3.3 Mammals

Thirty mammal species are known from the vicinity of the study area based on information from the *Mammal Atlas of Ontario* (Dobbyn 1994), all of which are common species in Ontario. NRSI biologists observed two of these species within the subject lands including direct observations of gray squirrel (*Sciurus carolinensis*) and raccoon (*Procyon lotor*).

No species of mammal known to the area are considered Species at Risk (COSEWIC 2009; OMNR 2009). A complete list of mammal species known from the study area and their current status can be seen in Appendix III.

4.0 Significance and Sensitivity of Natural Features

The majority of the study area is urban within the City of Hamilton, with a few small forested creek valleys.

A number of significant species are known from the vicinity of the study area including many species of birds and herpetofauna. Suitable habitat for some of the significant bird species is present within the subject lands. In particular, peregrine falcons, chimney swifts, common nighthawks, Louisiana waterthrushes, and red-headed woodpeckers all have the potential to breed in the study area. The only significant bird species observed during field surveys was chimney swifts. However, as discussed in Section 3.0, none of these species should be impacted by the proposed development.

There is no suitable habitat for any significant herpetofauna species, and no significant herpetofauna species were observed by NRSI biologists during field surveys.

5.0 Summary

Natural Resource Solutions Inc. was retained by SNC Lavalin and the City of Hamilton to prepare a Natural Environment Characterization report for the proposed Rapid Transit B-line. This report identifies constraints posed by natural features with the subject lands and is intended to address the potential impacts of the new development.

Although there is suitable habitat for some significant bird species, the proposed development is not expected to have impacts on these species. If any wildlife species particularly snakes, turtles, or nesting birds, are encountered during construction, NRSI should be contacted immediately to ensure that the appropriate agencies are notified and arrangements are made for these species to be relocated.

6.0 References

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APPENDIX I

Bird Species Observed and Known from the Surrounding Area

1173B Hamilton Light Rail - Line B
Avian Species List

Scientific Name	Common Name	NRSI Biologist Observations - Highest Breeding Evidence		OBBA 2nd Atlas Highest Breeding Evidence					GRANK	SRANK	COSEWIC	SARO	Hamilton Significant Breeding Birds	
		25-Jun-10	7-Jul-10	17NH08	17NH09	17NH08	17NH09	17PH08						
Ducks, Geese & Swans														
<i>Branta canadensis</i>	Canada Goose			FY	FY	AE	AE	G5	S5					
<i>Cygnus olor</i>	Mute Swan			FY	FY	FY	FY	G5	SNA					
<i>Cygnus buccinator</i>	Trumpeter Swan					AE	NE	G4	S4	NAR	NAR			
<i>Aix sponsa</i>	Wood Duck			P	FY	AE	FY	G5	S5					
<i>Anas strepera</i>	Gadwall						FY	G5	S4				√	
<i>Anas rubripes</i>	American Black Duck					FY	H	G5	S4					
<i>Anas platyrhynchos</i>	Mallard			FY	FY	NE	FY	G5	S5					
<i>Anas discors</i>	Blue-winged Teal						P	G5	S4					
<i>Anas clypeata</i>	Northern Shoveler						X	G5	S4				√	
<i>Anas acuta</i>	Northern Pintail						FY	G5	S5					
<i>Anas crecca</i>	Green-winged Teal						P	FY	G5	S4				
<i>Aythya americana</i>	Redhead							FY	G5	S2B, S4N			√	
<i>Oxyura jamaicensis</i>	Ruddy Duck							X	G5	S4B, S4N				
Partridges, Grouse & Turkeys														
<i>Phasianus colchicus</i>	Ring-necked Pheasant			T	T		T	G5	SNA				√* (I)	
<i>Bonasa umbellus</i>	Ruffed Grouse				NE			G5	S4B, S4N				√*	
<i>Meleagris gallopavo</i>	Wild Turkey					H	NE	G5	S5				√* (RI)	
GREBES														
<i>Podilymbus podiceps</i>	Pied-billed Grebe						FY	G5	S4B, S4N				√	
<i>Podiceps grisegena</i>	Red-necked Grebe							NE	G5	S3B, S4N	NAR	NAR		
CORMORANTS														
<i>Phalacrocorax auritus</i>	Double-crested Cormorant						NY	NY	G5	S5B	NAR	NAR		
HERONS & BITTERNS														
<i>Ixobrychus exilis</i>	Least Bittern					T	S	G5	S4B	THR	THR		√	
<i>Ardea herodias</i>	Great Blue Heron					V	V	G5	S4B				√*	
<i>Ardea alba</i>	Great Egret					X		G5	S2B					
<i>Butorides virescens</i>	Green Heron			T	A	H	NY	G5	S4B					
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron					X	NY	X	G5	S3B, S3N				
VULTURES														
<i>Cathartes aura</i>	Turkey Vulture			FY	P		P	P	G5	S5B				
HAWKS, KITES & EAGLES														
<i>Pandion haliaetus</i>	Osprey					H			G5	S5B			√	
<i>Haliaeetus leucocephalus</i>	Bald Eagle						X		G4	S2N, S4B	NAR	SC		
<i>Circus cyaneus</i>	Northern Harrier					V		P	G5	S4B	NAR	NAR	√	
<i>Accipiter striatus</i>	Sharp-shinned Hawk			CF			H		G5	S5		NAR	√	
<i>Accipiter cooperii</i>	Cooper's Hawk			CF	D		FY	CF	G5	S4	NAR	NAR	√	
<i>Buteo platypterus</i>	Broad-winged Hawk					NY			G5	S5B			√	
<i>Buteo jamaicensis</i>	Red-tailed Hawk			FY	FY		A	NY	G5	S5	NAR	NAR		
CARACARAS & FALCONS														
<i>Falco sparverius</i>	American Kestrel							FY	NY	G5	S4		√*	
<i>Falco peregrinus anatum/tundrius</i>	Peregrine Falcon							NY	G4T4	S3B	SC	THR	√	
RAILS, GALLINULES & COOTS														
<i>Rallus limicola</i>	Virginia Rail			T	T		T	P	G5	S5B			√*	
<i>Porzana carolina</i>	Sora			S	FY		S	T	G5	S4B				
<i>Gallinula chloropus</i>	Common Moorhen						S	H	G5	S4B			√	
<i>Fulica americana</i>	American Coot						P		G5	S4B	NAR	NAR	EX	
CRANES														
<i>Grus canadensis</i>	Sandhill Crane							X	G5	S5B				
PLOVERS														
<i>Charadrius vociferus</i>	Killdeer			A	FY		FY	NE	G5	S5B, S5N				
SANDPIPERS & PHALAROPES														
<i>Actitis macularia</i>	Spotted Sandpiper			P	NE		FY	FY	G5	S5				
<i>Bartramia longicauda</i>	Upland Sandpiper			T	T		FY		G5	S4B				
<i>Scolopax minor</i>	American Woodcock					D	T	FY	AE	G5	S4B			
GULLS, TERNS & SKIMMERS														
<i>Larus delawarensis</i>	Ring-billed Gull	X	X			NE	NY	AE	G5	S5B, S4N				
<i>Larus argentatus</i>	Herring Gull	X	X			NE	NY		G5	S5B, S5N			√*	
<i>Larus marinus</i>	Great Black-backed Gull						X		G5	S2B			√	
<i>Hydroprogne caspia</i>	Caspian Tern					X	NY		G5	S3B	NAR	NAR	√*	
<i>Sterna hirundo</i>	Common Tern					X	NE	X	G5	S4B	NAR	NAR	√*	
<i>Sterna forsteri</i>	Forster's Tern					X			G5	S2B	DD	DD		
PIGEONS & DOVES														
<i>Columba livia</i>	Rock Pigeon	H	H			AE	P	NE	NU	G5	SNA			
<i>Zenaidura macroura</i>	Mourning Dove	S	T			AE	AE	FY	FY	G5	S5			
CUCKOOS & ANIS														
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo					T	NB		P	G5	S4B		√	
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo					T	S	H	H	G5	S5B		√*	
BARN OWLS														
<i>Tyto alba</i>	Barn Owl								T	G5	S1	E	END	EX

Scientific Name	Common Name	NRSI Biologist Observations - Highest Breeding Evidence		OBBA 2nd Atlas Highest Breeding Evidence					GRANK	SRANK	COSEWIC	SARO	Hamilton Significant Breeding Birds
		25-Jun-10	7-Jul-10	17NH08	17NH09	17NH09	17NH09	17PH08					
<i>Otus asio</i>	TYPICAL OWLS Eastern Screech-Owl			S	S	FY	S		G5	S4	NAR	NAR	√*
<i>Bubo virginianus</i>	Great Horned Owl			S	AE	H	NY		G5	S4			√*
<i>Asio flammeus</i>	Short-eared Owl						A		G5	S2N, S4B	SC	SC	√
<i>Chordeiles minor</i>	GOATSUCKERS Common Nighthawk					X	X		G5	S4B	T	SC	√
<i>Chaetura pelagica</i>	SWIFTS Chimney Swift	X	X	V	P	AE	P		G5	S4B, S4N	T	THR	√*
<i>Archilochus colubris</i>	HUMMINGBIRDS Ruby-throated Hummingbird			FY	P	T	D		G5	S5B			√*
<i>Ceryle alcyon</i>	KINGFISHERS Belted Kingfisher			CF	P	AE	S		G5	S4B			√*
<i>Melanerpes erythrocephalus</i>	WOODPECKERS Red-headed Woodpecker				AE	H	FY		G5	S4B	T	SC	√
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker			T	T	T	FY		G5	S4			√*
<i>Picoides pubescens</i>	Downy Woodpecker	H	H	NY	NY	NY	CF		G5	S5			√*
<i>Picoides villosus</i>	Hairy Woodpecker			NY	NY	NY	T		G5	S5			√*
<i>Colaptes auratus</i>	Northern Flicker			FY	AE	NY	AE		G5	S4B			√*
<i>Dryocopus pileatus</i>	Pileated Woodpecker			N	FY	T			G5	S5			√*
<i>Contopus virens</i>	TYRANT FLYCATCHERS Eastern Wood-Pewee			A	CF	T	T		G5	S4B			√*
<i>Empidonax alnorum</i>	Alder Flycatcher			T	S	S	T		G5	S5B			√*
<i>Empidonax traillii</i>	Willow Flycatcher			NY	T	T	CF		G5	S5B			√*
<i>Empidonax minimus</i>	Least Flycatcher			T	P		H		G5	S4B			√*
<i>Sayornis phoebe</i>	Eastern Phoebe			NY	NE	T	NY		G5	S5B			√*
<i>Myiarchus crinitus</i>	Great Crested Flycatcher			T	CF	NY	FY		G5	S4B			√*
<i>Tyrannus tyrannus</i>	Eastern Kingbird			FY	CF	NY	FY		G5	S4B			√*
<i>Vireo flavifrons</i>	VIREOS Yellow-throated Vireo			S	T		S		G5	S4B			√*
<i>Vireo gilvus</i>	Warbling Vireo			T	CF	FY	A		G5	S5B			√*
<i>Vireo olivaceus</i>	Red-eyed Vireo		S	CF	A	NE	CF		G5	S5B			√*
<i>Cyanocitta cristata</i>	CROWS & JAYS Blue Jay	H	H	AE	FY	FY	CF		G5	S5			√*
<i>Corvus brachyrhynchos</i>	American Crow	X	X	FY	FY	FY	FY		G5	S5B			√*
<i>Eremophila alpestris</i>	LARKS Horned Lark			P	P	CF	FY		G5	S5B			√*
<i>Progne subis</i>	SWALLOWS Purple Martin				H	S	AE		G5	S4B			√*
<i>Tachycineta bicolor</i>	Tree Swallow			AE	AE	FY	AE		G5	S4B			√*
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow			FY	V	FY	CF		G5	S4B			√*
<i>Riparia riparia</i>	Bank Swallow			AE	T		H		G5	S4B			√*
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				AE				G5	S4B			√*
<i>Hirundo rustica</i>	Barn Swallow	X	X	AE	FY	NY	AE		G5	S4B			√*
<i>Poecile atricapillus</i>	CHICKADEES & TITMICE Black-capped Chickadee	S	T	AE	AE	CF	AE		G5	S5			√*
<i>Baeolophus bicolor</i>	Tufted Titmouse			FY	FY		S		G5	S4			√
<i>Sitta canadensis</i>	NUTHATCHES Red-breasted Nuthatch			CF	S		CF		G5	S5			√*
<i>Sitta carolinensis</i>	White-breasted Nuthatch	S	T	CF	CF	T	T		G5	S5			√*
<i>Certhia americana</i>	CREEPERS Brown Creeper			FY	NY	S			G5	S5B			√*
<i>Thryothorus ludovicianus</i>	WRENS Carolina Wren			FY	FY	A	T		G5	S4			√
<i>Troglodytes aedon</i>	House Wren			NY	NY	FY	CF		G5	S5B			√*
<i>Troglodytes troglodytes</i>	Winter Wren			T	S	S	S		G5	S5B			√*
<i>Cistothorus platensis</i>	Sedge Wren			T	N		S		G5	S4B	NAR	NAR	√*
<i>Cistothorus palustris</i>	Marsh Wren			N	AE	T	S		G5	S4B			√
<i>Polioptila caerulea</i>	GNATCATCHERS Blue-gray Gnatcatcher			CF	FY	S	P		G5	S4B			√*
<i>Sialia sialis</i>	THRUSHES Eastern Bluebird			AE	V		NE		G5	S5B	NAR	NAR	√*
<i>Catharus fuscescens</i>	Veery			CF	T		T		G5	S4B			√*
<i>Hylocichla mustelina</i>	Wood Thrush			AE	CF	T	T		G5	S4B			√*
<i>Turdus migratorius</i>	American Robin	S	T	CF	FY	CF	CF		G5	S5B			√*
<i>Dumetella carolinensis</i>	MOCKINGBIRDS & THRASHERS Gray Catbird		S	NE	FS	CF	NE		G5	S4B			√*
<i>Mimus polyglottos</i>	Northern Mockingbird			NE	NY	NY	NY		G5	S4			√*
<i>Toxostoma rufum</i>	Brown Thrasher			NB	P	T	CF		G5	S4B			√*
<i>Sturnus vulgaris</i>	STARLINGS European Starling	FY	FY	NY	FY	NY	FY		G5	SNA			√*
<i>Bombycilla cedrorum</i>	WAXWINGS Cedar Waxwing	X	P	CF	NY	FY	NB		G5	S5B			√*

Scientific Name	Common Name	NRSI Biologist Observations - Highest Breeding Evidence		OBBA 2nd Atlas Highest Breeding Evidence					GRANK	SRANK	COSEWIC	SARO	Hamilton Significant Breeding Birds
		25-Jun-10	7-Jul-10	17NH88	17NH89	17NH98	17NH99	17PH08					
WOOD-WARBLEDERS													
<i>Vermivora pinus</i>	Blue-winged Warbler			CF	T		S		G5	S4B			√*
<i>Vermivora chrysoptera</i>	Golden-winged Warbler			T	S		S		G4	S4B	T	SC	√
<i>Vermivora chrysoptera x pinus</i>	Lawrence's Warbler			A	H								
<i>Vermivora chrysoptera x pinus</i>	Brewster's Warbler			A	H		S						
<i>Dendroica petechia</i>	Yellow Warbler			NE	CF		NE	AE	G5	S5B			
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler			CF	A		S	H	G5	S5B			√*
<i>Dendroica magnolia</i>	Magnolia Warbler			S					G5	S5B			√
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler			S					G5	S5B			√
<i>Dendroica virens</i>	Black-throated Green Warbler			NB					G5	S5B			√
<i>Dendroica pinus</i>	Pine Warbler			T	FY		T		G5	S5B			√*
<i>Mniotilta varia</i>	Black-and-white Warbler			S					G5	S5B			√*
<i>Setophaga ruticilla</i>	American Redstart			CF	FY		S	S	G5	S5B			√*
<i>Protonotaria citrea</i>	Prothonotary Warbler				FY			H	G5	S1B	E	END	√
<i>Seiurus aurocapillus</i>	Ovenbird			A	T		T	S	G5	S4B			√
<i>Seiurus noveboracensis</i>	Northern Waterthrush				T				G5	S5B			√
<i>Seiurus motacilla</i>	Louisiana Waterthrush			A	S		S		G5	S3B	SC	SC	√
<i>Oporornis philadelphia</i>	Mourning Warbler			T	S		S		G5	S4B			√*
<i>Geothlypis trichas</i>	Common Yellowthroat			CF	DD		A	T	G5	S5B			√*
<i>Wilsonia citrina</i>	Hooded Warbler			A	FY				G5	S3B	T	SC	√
<i>Wilsonia canadensis</i>	Canada Warbler							S	G5	S4B	T	SC	√*
<i>Icteria virens</i>	Yellow-breasted Chat			S					G5	S2B	SC (ssp. virens)	SC	√
TANAGERS													
<i>Piranga olivacea</i>	Scarlet Tanager			D	A		T	S	G5	S4B			√*
SPARROWS													
<i>Pipilo erythrophthalmus</i>	Eastern Towhee			T	S		T	S	G5	S4B			√*
<i>Spizella passerina</i>	Chipping Sparrow	S	T	AE	FY		CF	FY	G5	S5B			√
<i>Spizella pallida</i>	Clay-colored Sparrow			T	S		S		G5	S4B			√
<i>Spizella pusilla</i>	Field Sparrow			A	FY		NE	CF	G5	S4B			√
<i>Poocetes gramineus</i>	Vesper Sparrow			D			S	T	G5	S4B			√*
<i>Passerculus sandwichensis</i>	Savannah Sparrow			CF	NY		T	CF	G5	S4B			√*
<i>Ammodramus saviannarum</i>	Grasshopper Sparrow			T	CF			S	G5	S4B			√*
<i>Melospiza melodia</i>	Song Sparrow	H		NE	NY		NY	CF	G5	S5B			√
<i>Melospiza georgiana</i>	Swamp Sparrow			CF	T		A	T	G5	S5B			√
<i>Zonotrichia albicollis</i>	White-throated Sparrow			H					G5	S5B			√*
CARDINALS & ALLIES													
<i>Cardinalis cardinalis</i>	Northern Cardinal	S	T	CF	AE		FY	CF	G5	S5			√
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak			AE	FY		CF	CF	G5	S4B			√
<i>Passerina cyanea</i>	Indigo Bunting			CF	FS		A	AE	G5	S4B			√
BLACKBIRDS													
<i>Dolichonyx oryzivorus</i>	Bobolink			D	P		S	CF	G5	S4B	THR		√
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	S	T	NY	CF		NE	NY	G5	S4			√
<i>Sturnella magna</i>	Eastern Meadowlark			T	AE		FY	CF	G5	S4B			√
<i>Sturnella neglecta</i>	Western Meadowlark				T				G5	S3B			√
<i>Quiscalus quiscula</i>	Common Grackle	X		CF	FY		FY	CF	G5	S5B			√
<i>Molothrus ater</i>	Brown-headed Cowbird	P		FY	NE		FY	FY	G5	S4B			√
<i>Icterus spurius</i>	Orchard Oriole			NB	FS		CF	P	G5	S4B			√*
<i>Icterus galbula</i>	Baltimore Oriole	S		NY	CF		FY	NY	G5	S4B			√
FINCHES													
<i>Carpodacus purpureus</i>	Purple Finch	S			H				G5	S4B			√
<i>Carpodacus mexicanus</i>	House Finch			FY	D		FY	FY	G5	SNA			√
<i>Carduelis tristis</i>	American Goldfinch	S	T	NE	AE		NB	NE	G5	S5B			√
OLD WORLD SPARROWS													
<i>Passer domesticus</i>	House Sparrow	H	H	CF	CF		FY	CF	G5	SNA			√
<i>Coccyzus species</i>	Cuckoo sp.			S			S	S					√
	Blue or Golden-Winged Warbler			S			S						√

BREEDING EVIDENCE CODES

Observed

X Species observed in its breeding season with no evidence of breeding

Possible

H Species observed in its breeding season in suitable nesting habitat

S Singing male present of breeding calls heard in breeding season in suitable nesting habitat

Probable

P Pair observed in their breeding season in suitable nesting habitat

T Permanent territory presumed through registration of territorial song on at least 2 days, one week or more apart at the same place

D Courtship or display between a male and female or 2 males including courtship feeding and copulation

V Visiting probable nest site

A Agitated behaviour or anxiety calls of an adult

B Brood patch on adult female or cloacal protuberance on adult male

N Nest building or excavation of nest site

Confirmed

DD Distraction display or injury feigning

NU Used nest or egg shell found (occupied/laid this season)

FY Recently fledged young or downy young

AE Adults leaving or entering nest site in circumstances indicating occupied nest

FS Adult carrying faecal sac

CF Adult carrying food for young

NE Nest containing eggs

NY Nest with young seen or heard

STATUS LISTINGS

G-Rank (Global Rank) (Source: NatureServe <http://www.natureserve.org/explorer/granks.htm>)

G1- Critically Imperiled	At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2- Imperiled √	At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3- Vulnerable √	At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4- Apparently Secure	Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5- Secure √	Common; widespread and abundant.

S-Rank (Provincial Rank) (Source: NHIC 2009- See individual species listing for date of last status update)

SX- Presumed Extirpated	Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH- Possible Extirpated	Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered.
S1- Critically Imperiled	Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2- Imperiled	Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3- Vulnerable	Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4- Apparently Secure	Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5- Secure	Common, widespread, and abundant in the nation or state/province.
SU- Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA- Not Applicable	A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

COSEWIC (National Rank) (Source: COSEWIC as of December 2008 http://www.cosewic.gc.ca/eng/sc10/rpt/rpt_csar_e.pdf)

E- Endangered	A wildlife species facing imminent extirpation or extinction.
T- Threatened	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
SC- Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
NAR- Not at Risk	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
DD- Data Deficient	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
XT- Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

OMNR (Provincial Status) (Source: OMNR as of February 2009 <http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/246809.html>)

EXP- Extirpated	A species that no longer exists in the wild in Ontario but still occurs elsewhere.
END- Endangered	A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR- Threatened	A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC- Special Concern	A species with characteristics that make it sensitive to human activities or natural events.

NOTE: Under the new ESA all species classified as END or THR automatically receive habitat protection under the Act

REGIONAL SIGNIFICANCE

Hamilton (Source: The Breeding Birds of Hamilton Ontario. 2003. In: Nature Counts Project Hamilton Natural Areas Inventory 2003. Species Checklists)

√ Rare

∨ Uncommon

EX- Extirpated

I- Introduced

RI- Reintroduced

APPENDIX II

Herpetofauna Species Observed and Known from the Surrounding Area

1173B Hamilton Light Rail - Line B
Herpetofauna Species List

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	COSEWIC	SARO	Ontario Herp Atlas	Observed by NRSI
Turtles							
<i>Apalone spinifera spinifera</i>	Eastern Spiny Softshell	G5T5	S3	THR	THR	X	
<i>Chelydra serpentina serpentina</i>	Common Snapping Turtle	G5T5	S5	SC	SC	X	
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	G5T5	S5			X	
<i>Emydoidea blandingii</i>	Blanding's Turtle (<i>Great Lakes/St Lawrence population</i>)	G4	S3	THR	THR	X	
<i>Graptemys geographica</i>	Northern Map Turtle	G5	S3	SC	SC	X	
<i>Sternotherus odoratus</i>	Eastern Musk Turtle (Stinkpot)	G5	S3	THR	THR	X	
Snakes							
<i>Diadophis punctatus edwardsi</i>	Northern Ringneck Snake	G5T5	S4			X	
<i>Lampropeltis t. triangulum</i>	Eastern Milksnake	G5T5	S3	SC	SC	X	
<i>Storeria dekayi dekayi</i>	Northern Brownsnake	G5T?	S5	NAR	NAR	X	
Salamanders							
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	G4	S2	THR	THR	X	
<i>Ambystoma jeffersonianum-laterale polypliods</i>	Jefferson/Blue-spotted Salamander Polypliods	hybrid	S2			X	
<i>Ambystoma laterale</i>	Blue-spotted Salamander	G5	S4			X	
<i>Ambystoma maculatum</i>	Spotted Salamander	G5	S4			X	
<i>Necturus maculosus</i>	Mudpuppy	G5	S4	NAR	NAR	X	
<i>Notophthalmus viridescens viridescens</i>	Red-spotted Newt	G5T5	S5			X	
<i>Plethodon cinereus</i>	Eastern (Northern) Redback Salamander	G5	S5			X	
Toads and Frogs							
<i>Bufo americanus</i>	American Toad	G5	S5			X	
<i>Hyla versicolor</i>	Tetraploid Gray Treefrog	G5	S5			X	
<i>Pseudacris triseriata (Carolinian Pop'n)</i>	Western Chorus Frog	G5	S4	NAR	NAR	X	
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	G5	S5			X	
<i>Rana catesbeiana</i>	Bullfrog	G5	S4			X	
<i>Rana clamitans melanota</i>	Green Frog	G5	S5			X	X
<i>Rana palustris</i>	Pickereel Frog	G5	S4	NAR	NAR	X	
<i>Rana pipiens</i>	Northern Leopard Frog	G5	S5	NAR	NAR	X	
<i>Rana sylvatica</i>	Wood Frog	G5	S5			X	

APPENDIX III
Mammal Species Observed and Known from the Surrounding Area

1173B Hamilton Light Rail - Line B

Mammal Species List

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	COSEWIC	OMNR	Ontario Mammal Atlas	Observed by NRSI
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	G5	S5			X	
<i>Canis latrans</i>	Coyote	G5	S5			X	
<i>Castor canadensis</i>	Beaver	G5	S5			X	
<i>Condylura cristata</i>	Star-nosed Mole	G5	S5			X	
<i>Didelphis virginiana</i>	Virginia Opossum	G5	S4			X	
<i>Eptesicus fuscus</i>	Big Brown Bat	G5	S5			X	
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	G5	S4			X	
<i>Lasiurus borealis</i>	Red Bat	G5	S4			X	
<i>Lasiurus cinereus</i>	Hoary Bat	G5	S4			X	
<i>Lepus europaeus</i>	European Hare	G5	SE			X	
<i>Marmota monax</i>	Woodchuck	G5	S5			X	
<i>Mephitis mephitis</i>	Striped Skunk	G5	S5			X	
<i>Microtus pennsylvanicus</i>	Meadow Vole	G5	S5			X	
<i>Mustela frenata</i>	Long-tailed Weasel	G5	S4			X	
<i>Mustela vison</i>	Mink	G5	S5			X	
<i>Myotis lucifuga</i>	Little Brown Bat	G5	S5			X	
<i>Odocoileus virginianus</i>	White-tailed Deer	G5	S5			X	
<i>Ondatra zibethicus</i>	Muskrat	G5	S5			X	
<i>Peromyscus leucopus</i>	White-footed Mouse	G5	S5			X	
<i>Pipistrellus subflavus</i>	Eastern Pipistrelle	G5	S3?			X	
<i>Procyon lotor</i>	Raccoon	G5	S5			X	X
<i>Rattus norvegicus</i>	Norway Rat	G5	SE			X	
<i>Sciurus carolinensis</i>	Gray Squirrel Black Morph	G5	S5			X	X
<i>Sciurus carolinensis</i>	Gray Squirrel Gray Morph	G5	S5			X	X
<i>Sorex cinereus</i>	Masked (Common) Shrew	G5	S5			X	
<i>Sorex fumeus</i>	Smokey Shrew	G5	S5			X	
<i>Sylvilagus floridanus</i>	Eastern Cottontail	G5	S5			X	
<i>Tamias striatus</i>	Eastern Chipmunk	G5	S5			X	
<i>Vulpes vulpes</i>	Red Fox	G5	S5			X	
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	G5	S5			X	