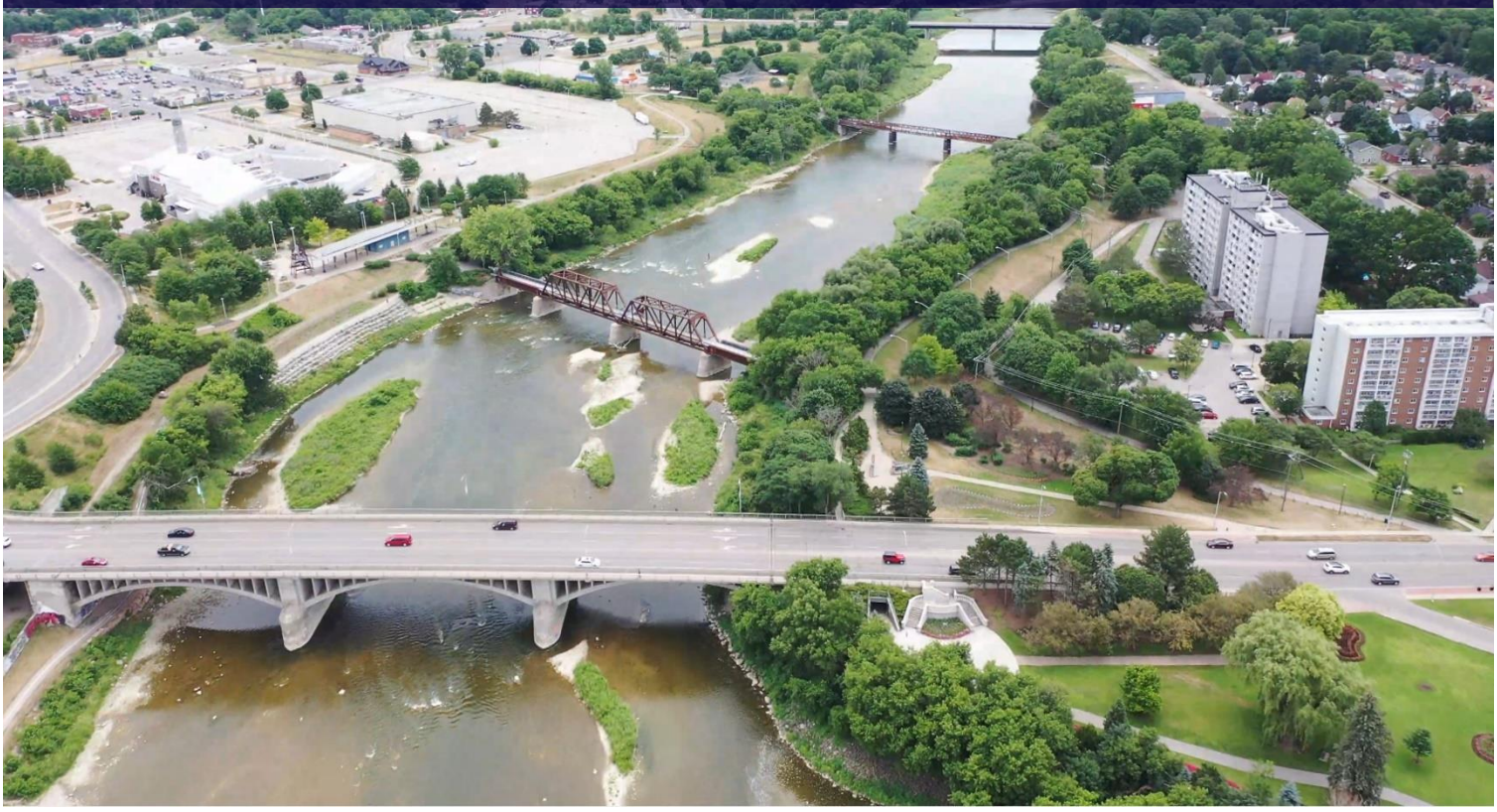
Appendix ‘D’ – Natural Environment Report



GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
650 WOODLAWN RD. W., BLOCK C, UNIT 2, GUELPH ON N1K 1B8 P: 519-824-8150 F: 519-824-8089 WWW.GMBLUEPLAN.CA

REPORT

Natural Environment Report for Three Grand River Bridge Crossings: Lorne Bridge, Brant Bridge and TH&B Crossing Bridge

City of Brantford

Submitted to:

Ms. Corri Marr, B.Sc. Hons, ENVSP, Infrastructure Planning
GM BluePlan Engineering Limited
235 North Centre Road, Suite 103
London, ON
N5X 4E7

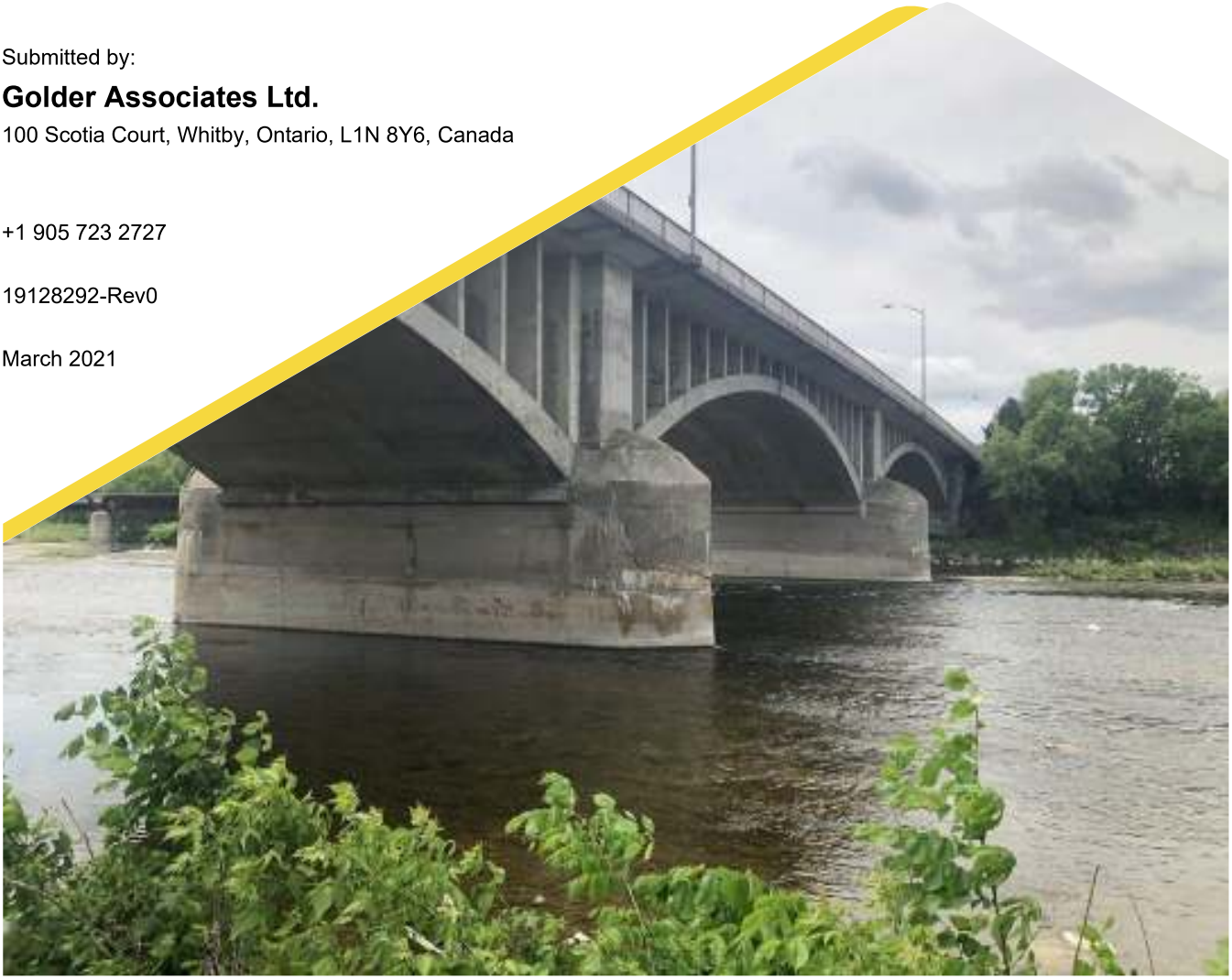
Submitted by:

Golder Associates Ltd.
100 Scotia Court, Whitby, Ontario, L1N 8Y6, Canada

+1 905 723 2727

19128292-Rev0

March 2021



Distribution List

1 e-copy GMBP

1 e-copy Golder Associates Ltd.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by GM Blue Plan Engineering Ltd. (GMBP) on behalf of the City of Brantford (the City) to provide a two-part Environmental Assessment (EA) Study for three crossings over the Grand River in Brantford, Ontario: 1) Lorne Bridge, 2) Brant's Crossing Bridge, and TH&B Crossing Bridge (the Project).

Based on the information provided, the proposed work will include either bridge rehabilitation of the structural members and bridge deck or complete bridge replacement. An overview of the existing natural environment conditions adjacent to each of the three bridges is provided in this report based on a field survey and a review of existing natural environment data. This report includes the natural environment recommendations to support the assessment of Project alternatives and provide input to the design team concerning the environmental sensitivities for the proposed Project.

1.1 Site and Study Area

Lorne Bridge (also known as Colborne Street West) is located between Brant Avenue/Icomm Drive and Ballantyne Drive/Fordview Drive and is classified as a minor arterial roadway in the Transportation Master Plan, 2014. Lorne Bridge is made up of three structures: Lorne Bridge Pedestrian Underpass, Lorne Bridge Arch, and Lorne Bridge Girder. The right-of-way (ROW) cross section consists of five lanes including turning lanes and sidewalks on the north and south side of the bridge. Currently there are no formal cycle lane pavement markings on the roadway and cyclists typically use the sidewalk to access the stairs leading into the trail system/parks.

Brant's Crossing Bridge is approximately 90 m south of Lorne Bridge and is currently closed. It was used prior to closure as a pedestrian crossing and east/west cycling trail connection and consists of four spans, including two that are steel truss construction and two that are half-through deck girder construction.

The TH&B Crossing Bridge is approximately 270 m south of Brant's Crossing Bridge. It was a former railway bridge that has been converted and is currently being used as a pedestrian and cycle crossing. The bridge may house a utility corridor and consists of four spans and concrete piers.

For the purposes of this assessment, each bridge is referred to as a 'site'. The terrestrial study area is defined as the area within 120 m of each bridge, and the aquatic study area is a 200 m reach of Grand River (i.e., 50 m upstream and 150 m downstream of each bridge). Because Lorne Bridge and Brant's Crossing Bridge are less than 120 m from each other, the terrestrial and aquatic study areas overlap. The terrestrial and aquatic study areas are collectively referred to as the natural environment study area (Figure 1). The majority of the natural environment study area consists of the Grand River, its riparian corridor and a municipal park. The northern portion of the natural environment study area is characterized by developed urban area.

LEGEND

- Flow Direction
- Fish and Fish Habitat Assessment Area
- Natural Enviromental Area
- Water

KEY MAP

0 25 50

1:3,000 METRES

NOTE(S)

REFERENCE(S)

CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO. HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
NATURAL ENVIRONMENT STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	JL
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	1

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25mm

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2.0 ENVIRONMENTAL POLICY

2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) was issued under Section 3 of the *Planning Act* (MMAH 2020a). The natural heritage policies of the PPS are intended to protect natural features and their ecological functions for the long term, and restoring or improving linkages between these natural features, surface water features and ground water features.

Development and site alteration are prohibited within significant wetlands and significant coastal wetlands. Development and site alteration is not permitted in fish habitat or habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.

Development may be permitted within or adjacent to several other types of natural features where it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions, including: significant wetlands (north of Ecoregions 5E, 6E and 7E), significant woodlands, significant valleylands, significant wildlife habitat, significant areas of natural and scientific interest (ANSI), and other coastal wetlands.

2.2 Fisheries Act

The purpose of the *Fisheries Act* (Canada 1985) is to maintain healthy, sustainable and productive Canadian fisheries through the prevention of pollution and the protection of fish and their habitat. All projects undertaking in-water or near-water work must comply with the provisions of the *Fisheries Act*.

All projects where work is being proposed that cannot avoid impacts to fish or fish habitat require a Fisheries and Oceans Canada (DFO) project review (DFO 2019). If it is determined through the DFO review process that the project will result in death of fish or harmful alteration, disruption or destruction (HADD) of fish habitat, an authorization is required under the *Fisheries Act*. This includes projects that have the potential to obstruct fish passage or affect flows.

Proponents of projects requiring a *Fisheries Act* Authorization are required to also submit a Habitat Offsetting Plan, which provides details of how the death of fish and/or HADD of fish habitat will be offset, and outlines associated costs and monitoring commitments. Proponents also have a duty to notify DFO of any unforeseen activities during the project that cause harm to fish or fish habitat, and outline the steps taken to address them.

2.3 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) (Canada 1994) prohibits the killing or capturing of migratory birds, as well as any damage, destruction, removal, or disturbance of active nests. It also allows the Canadian government to pass and enforce regulations to protect various species of migratory birds, as well as their habitats.
While Environment and Climate Change Canada (ECCC) can issue permits allowing the destruction of nests for scientific or agricultural purposes, or to prevent damage being caused by birds, it does not typically allow for permits in the case of industrial or construction activities.

2.4 Species at Risk

2.4.1 Species at Risk Act

At a federal level, species at risk (SAR) designations for species occurring in Canada are initially determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). If approved by the federal Minister of the Environment, species are added to the federal List of Wildlife Species at Risk (Canada 2002). Species that

are included on Schedule 1 of the *Species at Risk Act* (SARA) as endangered or threatened are afforded protection of critical habitat on federal lands under the Act. On private or provincially-owned lands, only migratory birds and aquatic species listed as endangered, threatened, or extirpated are protected under SARA, and critical habitat protection on non-federal lands is afforded only to aquatic species, unless ordered by the Governor in Council.

2.4.2 Endangered Species Act

SAR designations for species in Ontario are initially determined by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Minister of Environment and Conservation, species are added to the provincial *Endangered Species Act* (ESA) (Ontario 2007). The legislation prohibits the killing or harming of species identified as endangered or threatened in the various schedules to the Act. The ESA also provides habitat protection to all species listed as threatened or endangered. As of June 30, 2008, the Species at Risk in Ontario (SARO) List is contained in Ontario Regulation (O. Reg.) 230/08.

Subsection 9(1) of the ESA prohibits the killing, harming or harassing of species identified as ‘endangered’ or ‘threatened’ in the various schedules to the Act. Subsection 10(1) (a) of the ESA states that “*No person shall damage or destroy the habitat of a species that is listed on the SARO list as an endangered or threatened species*”.

General habitat protection is provided, by the ESA, to all threatened and endangered species. Species-specific habitat protection is only afforded to those species for which a habitat regulation has been prepared and passed into law as a regulation of the ESA. The ESA has a permitting and registration process where alterations to the habitat of protected species may be considered.

2.5 Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe was issued under *The Places to Grow Act* (MMAH 2020b). The Growth Plan is intended, in coordination with other provincial plans, to establish a unique land use planning framework for the Greater Golden Horseshoe that supports the achievement of complete communities, a thriving economy, clean and healthy environment and social equity. A natural heritage system for the Greater Golden Horseshoe was developed and mapped under the Growth Plan in February 2018, which will support planning for the protection of the region’s natural heritage and biodiversity.

The study area is within a Built-Up Area of the Growth Plan (MMAH 2020b).

2.6 Municipal Official Plans

2.6.1 County of Brant

The County of Brant OP defers to the City of Brantford OP mapping and policies (Brant 2012)

2.6.2 City of Brantford

There are no natural features, Environmental Protection Areas, or Environmental Control Policy Areas mapped within the study area according to Schedule 3-1 (Natural Heritage: Environmental Areas), Schedule 3-3 (Natural Heritage: Wetland Areas) of the City’s OP (Brantford 2020). However, the OP indicates that Environmental Protection Areas include the regulatory floodplain of the Grand River, and Schedule 4-1 (Community Health and Safety: Floodplain) has mapped the majority of the study area as being within the regulatory floodplain. Therefore, these floodplain areas within the study area may be considered to be an Environmental Protection Area.

2.7 Grand River Conservation Authority

The study area is located within the jurisdiction of the GRCA. According to available online mapping (GRCA 2020a), all three bridges and most of the study area are within the regulated limits under O. Reg. 150/06: *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* (Ontario 2006). Work within the regulated limits may require a permit from the GRCA.

3.0 METHODS

3.1 Desktop and Background Review

The investigation of existing conditions in the study area included a background information search and literature review to gather data about the local area and provide context for the evaluation of the natural features. The following resources were used:

- Natural Heritage Information Centre (NHIC) database, maintained by the Ministry of Natural Resources and Forestry (MNRF) (NHIC 2020)
- Land Information Ontario (LIO) geospatial data (MNRF 2020a)
- Species at Risk Public Registry (ECCC 2020)
- Species at Risk in Ontario (SARO) List (MNRF 2020b)
- Breeding Bird Atlas of Ontario (OBBA) (Cadman et al. 2007)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2020)
- Bat Conservation International (BCI) range maps (BCI 2020)
- Ontario Butterfly Atlas (Jones et al. 2020)
- eBird species maps (eBird 2020)
- Vascular Plants at Risk in Ontario range maps (Leslie 2018)
- iNaturalist species database (iNaturalist 2020)
- MNRF LIO Aquatic Resources Area Layer (MNRF 2020c)
- Fish On-Line Ontario (MNRF 2020d)
- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Maps (DFO 2020)
- Grand River Information Network (GRCA 2020a)
- County of Brant Official Plan (2012)
- City of Brantford Official Plan (2020)
- Aerial imagery

To develop an understanding of the drainage patterns, ecological communities and potential natural heritage features that may be affected by the proposed Project, MNRF LIO data were used to create base layer mapping for the study area. A geographic query of the NHIC database was conducted to identify element occurrences of any natural heritage features, including wetlands, ANSI, life science sites, rare vegetation communities, rare species (i.e., species ranked S1-S3 by NHIC), species designated under the ESA or SARA, and other natural heritage features within the study area.

At the onset of the Project, information requests were submitted to the Guelph District MNRF and the Ministry of Environment, Conservation and Parks (MECP) for background natural environment information on the following within the study area:

- Provincially significant wetlands (PSW) and/or ANSI
- Wildlife corridors or specialized habitats
- Fish species and community data, fish management objectives and sampling records into the vicinity of the study area
- Thermal regime and timing window for in-water works
- Presence of known or potential SAR and SAR habitats

A response was received from the MNRF on May 5, 2020, but no response was received from the MECP as of the date of this report on the presence of species at risk and/or their occupied or contributing habitats within the study area.

3.2 Species at Risk Screening

For the purpose of the SAR screening, SAR are those species listed under the ESA and/or SARA. An assessment was conducted to determine which SAR has potential habitat in the study area. A screening of all SAR that have the potential to be found in the vicinity of the study area was conducted first as a desktop exercise using the sources listed in Section 4.1. Species with ranges overlapping the study area, or recent occurrence records in the vicinity, were screened by comparing their habitat requirements to habitat conditions in the study area.

The potential for the species to occur was determined through a probability of occurrence. A ranking of low indicates no availability of suitable habitat for that species in the study area and no recorded occurrences. Moderate probability indicates more potential for the species to occur, as suitable habitat appeared to be present in the study area, but no occurrence of the species has been recorded. Alternatively, a moderate probability could indicate an observation of a species, but there is no suitable habitat on the site or in the study area. High potential indicates a known species record in the study area (including during field surveys or background data review) and good quality habitat is present.

Searches were conducted during field surveys for suitable habitats and signs of all SAR identified through the desktop screening. The screening was refined based on the results of the field surveys (i.e., habitat assessment). Any habitat identified during field surveys that has potential to provide suitable conditions for additional SAR not already identified through the desktop screening was also assessed and recorded.

3.3 Field Surveys

The habitats and ecological communities in the study area, where accessible, were characterized through field surveys conducted on June 3 and 4, 2020. The following sections outline the methods used for each of the field surveys.

3.3.1 Ecological Land Classification and Botanical Inventory

Plant community classification and botanical inventory were completed within accessible portions of the terrestrial study area. Plant communities in the terrestrial study area were first delineated at a desktop level using high-resolution aerial imagery, then verified in the field (where access was possible) using the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998). During the field surveys, information on plant community structure and composition was recorded to better define and refine the plant community polygons.

The botanical inventory included area searches in all naturally-occurring habitats in the terrestrial study area, where accessible. The searches were conducted by systematically walking through all habitats in the terrestrial study area, in a meandering fashion, generally paralleling the principal (long) axis of a natural area, where feasible, and ensuring that the full width of the area was examined. Lists of all plant species identified during the botanical surveys were compiled.

3.3.2 General Wildlife Surveys and Habitat Assessment

General wildlife and wildlife habitat surveys were conducted concurrent with the ELC and botanical inventory. Searches were conducted to document the presence or absence of suitable habitat for those species identified in the desktop SAR screening. General wildlife surveys included track and sign surveys, area searches, and incidental observations. The full range of habitats in the terrestrial study area were searched, where accessible, with special attention paid to edge habitats and other areas where mammals might be active. Areas of exposed substrate such as sand or mud were located and examined for any visible tracks. Any wildlife (including mammals, butterflies, and dragonflies) seen and identified were recorded. When encountered, tracks and other signs (e.g., tracks, scats, hair, tree scrapes, etc.) were identified to a species, if possible, and recorded.

Each bridge was also investigated for evidence of use for nesting by barn swallow (*Hirundo rustica*), designated threatened under the ESA.

A habitat assessment for bats, including both maternity and hibernaculum habitats, was also conducted within the terrestrial study area. Treed communities were surveyed for large diameter (i.e., diameter at breast height [DBH] >25 cm) snag or cavity trees with potential to function as maternity roosts. Any anthropogenic structures, such as sheds or barns, or bedrock ridges with potential to function as hibernacula were also documented.

3.3.3 Fish and Fish Habitat Assessment

Field surveys to document surface water features, fish and fish habitat and collect baseline aquatic data for the Project were undertaken in the aquatic study area. The timing of field activities took into consideration the seasonal opportunities (i.e., non-flood conditions). The field data collected included the following:

- Description of aquatic habitat (e.g., permanence, stage, confinement)
- Habitat mapping including key habitat features (e.g., riffles, pools, woody debris, undercut banks, boulder clusters), groundwater seepage areas, wetted and bankfull widths and depths, substrate types, bank stability and soil types, overhead and in-water cover

- In-situ water quality parameters including dissolved oxygen, temperature, pH, water colour and conductivity
- Description of riparian and/or aquatic vegetation
- Location of critical fish habitat areas (e.g., potential spawning areas, deep water holding habitat) and/or barriers to fish movement
- Description of existing infrastructure (i.e., bridges, municipal drains etc.)
- Potential pollution point sources
- Observations of fish and aquatic species

Georeferenced photographs and GPS locations were collected of survey locations and fish habitat features observed during the survey. A fish inventory was not conducted as part of the field survey because existing fish inventory data from the MNRF were deemed adequate for the purpose of this assessment. In-situ water quality parameters were compared to the Canadian Council Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) of the Protection of Aquatic Life (CCME 1999) and the Ontario Provincial Water Quality Objectives (PWQO; MECP 2020).

4.0 EXISTING CONDITIONS RESULTS

4.1 Vegetation

4.1.1 Regional Setting

The study area is located in the Deciduous Forest Region and the Niagara subregion (Rowe 1972). This region is dominated by deciduous forest cover, with the most common association consisting of sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*) together with basswood (*Tilia americana*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white oak (*Quercus alba*), and bur oak (*Quercus macrocarpa)*. Other common species include butternut, bitternut hickory (*Carya cordiformis*), rock elm (*Ulmus thomasii*), silver maple (*Acer saccharinum*) and blue-beech (*Carpinus caroliniana*). There is poor representation of coniferous species, which occur as scattered individuals, and may include eastern white pine (*Pinus strobus*) and eastern white cedar (*Thuja occidentalis*) (Rowe 1972).

This subregion also contains the main distribution of Carolinian species in Canada, including black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), swamp white oak (*Quercus bicolor*) and shagbark hickory (*Carya ovata*), as well as scattered representations of tulip tree (*Liriodendron tulipifera*), black cherry (*Prunus serotina*), chinquapin oak (*Quercus muehlenbergii*), pin oak (*Quercus palustris*), blue ash (*Fraxinus quadrangulata*), cucumber tree (*Magnolia acuminata*), red mulberry, and sassafras (*Sassafras albidum*) (Rowe 1972).

4.1.2 Plant Communities

Natural riparian vegetation on the northern bank of the Grand River adjacent to Lorne Bridge was narrow and generally restricted to the area between the river and the recreational trail (Figure 2). Northwest of Lorne Bridge the area was characterized as a Cultural Meadow / Cultural Thicket (CUM/CUT) mosaic dominated by saplings of white ash and American elm, riverbank grape, and reed canary grass. Northeast of Lorne Bridge the cultural meadow / cultural thicket transitioned to a small area of Lowland Deciduous Forest (FOD7) dominated by

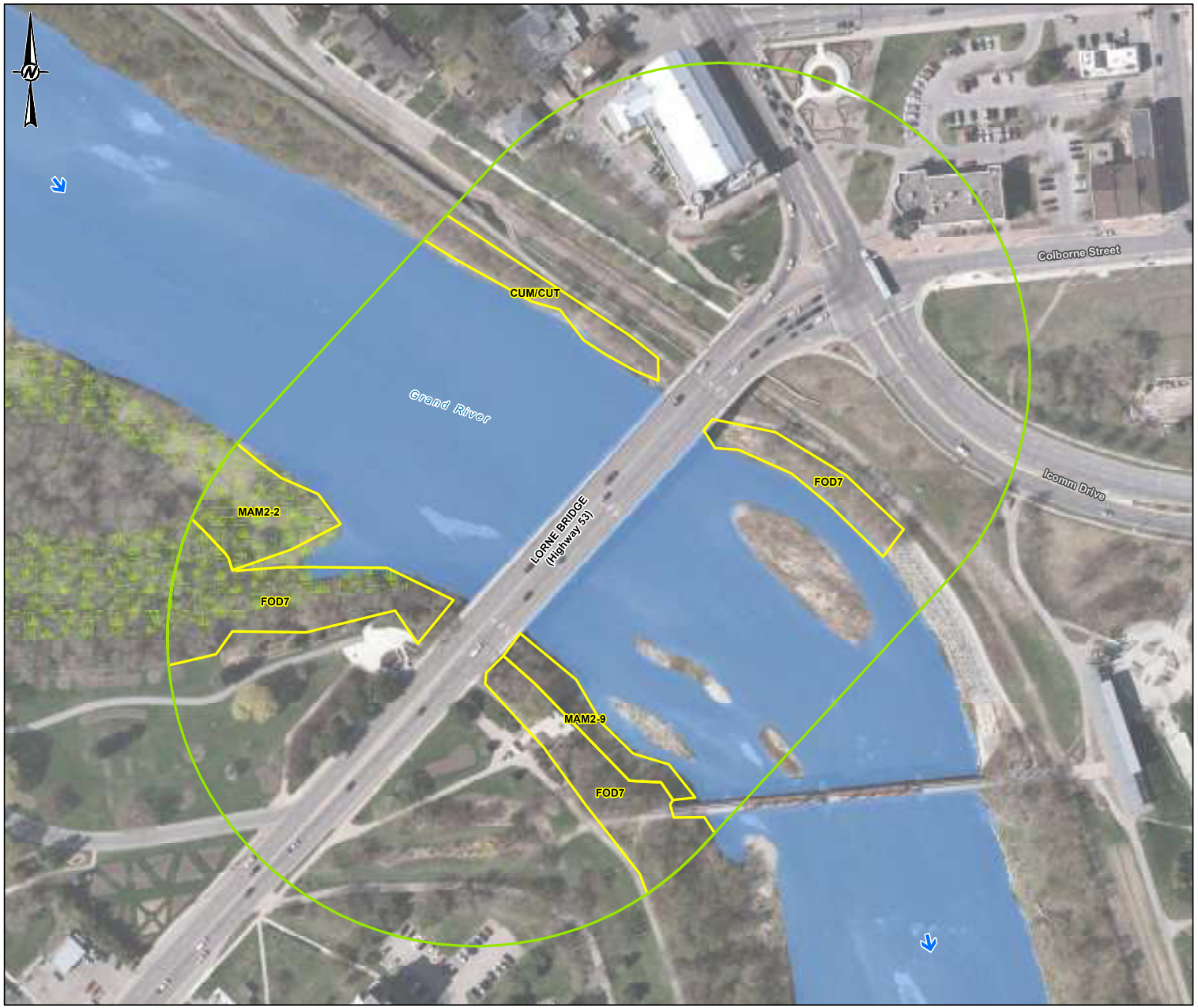
Manitoba maple, American elm and reed canary grass (Figure 2). An area of armoured stone separated the Lowland Deciduous Forest from Brant's Crossing Bridge to the south.

Northwest of Lorne Bridge, there was a small floodplain Reed Canary Mineral Meadow Marsh (MAM2-2) dominated by reed canary grass with scattered willow shrubs (Figure 2).

Semi-mature Lowland Deciduous Forest (FOD7) characterized the upper portion of the riparian zone along the southern and northern banks of the Grand River through the majority of the terrestrial study area (Figures 2, 3 and 4). The forest was dominated by Manitoba maple and Norway maple in association with American elm, cottonwood, willow, riverbank grape and Virginia creeper. The understory was generally sparse with a dense groundcover layer. The groundcover layer was also highly disturbed with over 50% representation of exotic or invasive species. On average the trees measured around 30 cm DBH with some larger trees observed to the south of TH&B Crossing Bridge (Figure 4).

The lower portion of the riparian zone on the southern bank of the Grand River between Lorne Bridge and TH&B Crossing Bridge was characterized by an area of floodplain Jewelweed Mineral Meadow Marsh (MAM2-9) (Figure 2, 3 and 4) dominated by jewelweed in association with reed canary grass, hemp nettle, and great ragweed.

There were also areas of cultural woodland (CUW) that are part of the municipal park to the west of the TH&B Crossing Bridge (Figure 4).



LEGEND

- Water
- Study Area
- ELC
- Flow Direction

ELC Code	*Description*
MAM2-2	Reed Canary Mineral Meadow Marsh
MAM2-9	Jewelweed Mineral Meadow Marsh
FOD7	Lowland Deciduous Forest
CUM/CUT	Cultural Meadow / Cultural Thicket

KEY MAP

0 25 50
1:1,500 METRES

NOTE(S)

REFERENCE(S)

CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO. HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
ECOLOGICAL LAND CLASSIFICATION AT LORNE BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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LEGEND

- Snag Tree
- Study Area
- ELC
- Water
- Flow Direction

ELC Code	*Description*
MAM2-2	Reed Canary Mineral Meadow Marsh
MAM2-9	Jewelweed Mineral Meadow Marsh
FOD7	Lowland Deciduous Forest
CUW	Cultural Woodland (Deciduous)

KEY MAP

0 25 50
1:1,500 METRES

NOTE(S)

REFERENCE(S)
CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO.
HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
ECOLOGICAL LAND CLASSIFICATION AT TH&B RAILWAY CROSSING BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	3

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25mm
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LEGEND

- Study Area
- ELC
- Water
- Flow Direction

ELC Code	Description
MAM2-9	Jewelweed Mineral Meadow Marsh
FOD7	Lowland Deciduous Forest

KEY MAP

0 25 50
1:1,500 METRES

NOTE(S)

REFERENCE(S)

CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO. HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
ECOLOGICAL LAND CLASSIFICATION AT BRANT'S CROSSING BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

4.1.3 Vascular Plants

A total of 47 vascular plant species were identified during the botanical surveys completed in the terrestrial study area (Appendix A). Of these, 45% are native species, and 45% are exotic species. The remaining 10% (five plants) were unable to be identified to the species level due to plant condition (i.e., browsed) or seasonal timing (i.e., not flowering). The high incidence of exotic species is likely due to the heavy disturbance from recreational use of the riparian corridor and adjacent urban environment.

Significant and Sensitive Species

All of the plant species identified through the botanical, or other, surveys are secure and common, widespread and abundant in Ontario and globally (S4 or S5; G5) or are unranked alien species (SNA; GNR). No butternut, or other plant SAR identified to have potential to occur in the study area (Appendix B), were observed during the field surveys.

4.2 Wildlife and Wildlife Habitat

A total of 21 species of birds, two mammals and one amphibian were observed in the terrestrial study area during the field surveys (Appendix C). A wide variety of bird species were observed, including waterfowl such as mallard (*Anas platyrhynchos*), birds common to riparian habitats such as cedar waxwing (*Bombycilla cedrorum*) or yellow warbler (*Setophaga petechia*), and birds common to urban landscapes such as American robin (*Turdus migratorius*) and northern cardinal (*Cardinalis cardinalis*). The Grand River riparian corridor is likely a significant foraging area used by many bird species in the local landscape and therefore contributes to the high species richness of the study area.

No barn swallow nests were observed on any of the three bridges, nor were any individuals observed in the terrestrial study area during field surveys. However, the Grand River is likely to provide foraging habitat for individuals nesting in the local landscape, and barn swallow has been recorded along the Grand River in the vicinity of the study area (eBird 2020).

Several active cliff swallow (*Petrochelidon pyrrhonota*) nests were observed on Lorne Bridge and adults were observed bringing food to the nests. Nests were observed under the bridge between the northern abutment wall and the north-central pier.

Although the Lowland Deciduous Forest (FOD7) within the study area is semi-mature, few snag or cavity trees were observed. Two large snag trees were identified along the edge of the forest southeast of TH&B Crossing Bridge (Figure 3). Both snag trees were dead and measured 60-70 cm DBH. Although no visible cavities were observed, the upper branches of both trees may be hollow and may provide suitable maternity roosting habitat for bats or habitat for other wildlife. Overall, the Lowland Deciduous Forest was assessed to have low potential to support bat maternity roost habitat for species which use cavities or hollows, such as little brown myotis (*Myotis lucifugus*), a SAR bat.

Significant and Sensitive Species

The majority of the bird species identified through the field surveys are secure and common, widespread and abundant in Ontario and globally (S4 or S5; G5), or SNA (not applicable – species is not a target for conservation). One bird species observed during the field surveys is designated threatened under the ESA: chimney swift (*Chaetura pelagica*).

Chimney swift breeding habitat is varied but they are most commonly associated with towns and cities with large concentrations of chimneys. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007). Chimney swift were observed flying over the terrestrial study area at a high altitude. According to background records (eBird 2020), chimney swift is commonly observed along the Grand River throughout Brantford and likely uses the area for foraging. Buildings within the terrestrial study area may contain chimney structures suitable for nesting or roosting.

4.3 Surface Water Features

The Grand River watershed drains an area of 6,800 km^2 and flows over 300 km to Lake Erie. The study area is located within the Lower Grand Watershed (GRCA 2014). The Grand River within the aquatic study area is a permanent winding river, crossed by each of the three bridges, and eventually draining to Lake Erie approximately 70 km downstream of the study area. The Grand River is navigable, though the broad channel with moderate staging and riffled turbulence was observed. The section of the Grand River between Paris and Brantford, including the reach crossed by each of the three bridges, was designated as *Exceptional Waters* by the GRCA (2005) due to the productive, functional and aesthetic nature of the Grand River as it provides migratory routes for various species, SAR habitats present, has complex floodplains and valley lands, high groundwater discharges, healthy channel morphology and high community interest and use (GRCA 2005). Various dams within the Grand River, control spring flood conditions and help retain waters during periods of low flow, offering protection from fluctuating temperature increases previously observed (GRCA 2005).

4.4 Fish and Fish Habitat

4.4.1 Fish Community

The Grand River fish community is diverse and abundant, representing approximately 83 species of sport, forage and bait fish species confirmed within its waters, as well as a number of unconfirmed, historically extirpated species and occasionally migrant species (GRCA 2001). A summary of fish species in the vicinity of the aquatic study area, as determined during the background review, is provided in Appendix D. The background information obtained through MNRF correspondence (Buck 2020 pers. comm.) confirmed the following fish species were previously captured within the vicinity of the aquatic study area: black redhorse (*Moxostoma duquesnei*), blackside darter (*Percina maculate*), bluntnose minnow (*Pimephales notatus*), common carp (*Cyprinus carpio*), golden redhorse (*Moxostoma erythrurum*), greater redhorse (*Moxostoma valenciennesi*), greenside darter (*Etheostoma blennioides*), Johnny darter (*Etheostoma nigrum*), Johnny darter x tesselated darter (*Etheostoma olmstedi*), logperch (*Percina caprodes*), mimic shiner (*Notropis volucellus*), mooneye (*Hiodon tergisus*), *Moxostoma* sp., northern hog sucker (*Hypentelium nigricans*), perches (*Percidae* sp.), rainbow darter (*Etheostoma caeruleum*), rock bass (*Ambloplites rupestris*), round goby (*Neogobius melanostomus*), shorthead redhorse (*Moxostoma macrolepidotum*), smallmouth bass (*Micropterus dolomieu*), spotfin shiner (*Cyprinella spiloptera*), and white sucker (*Catostomus commersonii*).

Rainbow trout were introduced through stocking of Lake Erie and the Grand River after the removal of the Lorne Dam. They use the river to access spawning areas and tributaries upstream (GRCA 2005). Some competition exists between rainbow trout and brown trout populations within the Grand River as a result of the historical stocking activities, but the populations of brown trout were not yet self-sustaining as of 2005 (GRCA 2005). Aquatic invasive species within the Grand River include round goby and rusty crayfish (*Orconectes rusticus*) (EDD 2020).

Significant and Sensitive Species

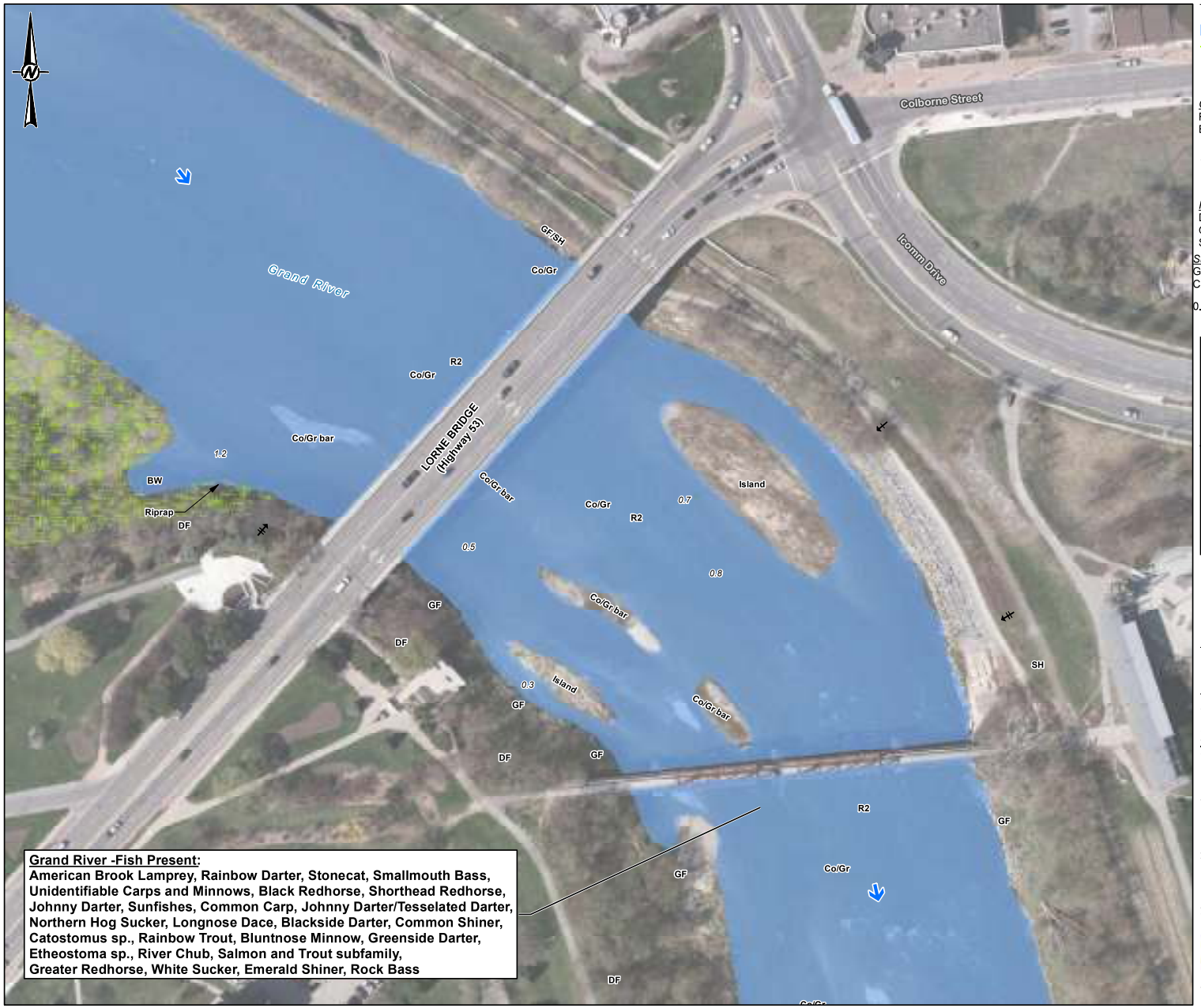
Aquatic SAR that have the potential to occur in the aquatic study area include: black redhorse (*Moxostoma duquesnei*), eastern sand darter (*Ammocrypta pellucida*), wavy-rayed lampmussel (*Lampsilis fasciola*) and rainbow mussel (*Villosa iris*) (Appendix B). There is mapped critical habitat for silver shiner (*Notropis photogenis*) in the aquatic study area (DFO 2020). At the time of writing this report, no response was received from the MECP in regard to the information request submitted for presence of SAR and definition on occupied or contributing habitats within the study area.

4.4.2 Fish Habitat

Background information obtained through the MNRF correspondence noted that walleye (*Sander vitreus*) spawning habitat has been observed just outside of the aquatic study area and may be present within the aquatic study area (Buck 2020 pers. comm.). Long term changes in land use practices and fisheries management planning has led to productive spawning and rearing grounds for bass, walleye and pike as well as sucker species (including SAR) and carp. The surveyed reach of the Grand River within the study area provides warm water fish habitat in the assessed section (Buck 2020 pers. comm.) but provides a combination of warm-cool water habitats throughout the regional area. The results of the fish habitat assessment for each bridge is provided in the following sections.

4.4.2.1 Lorne Bridge

A summary of fish habitat features in the aquatic study area for Lorne Bridge is provided in Table 1 and a photographic log is provided in Appendix E1. Fish habitat mapping for the surveyed reach is presented on Figure 5.



LEGEND

- Cool Water
- Wetland
- Flow Direction

Channel Unit/Habitat Type:
R2 - Moderate quality run habitat 0.75 m - 1.0 m
BW - Backwater

Bank Slope:
- Intermediate slope (6 to 30%)
- Steep slope (31 to 70%)

Riparian Vegetation Type:
DF - Deciduous forest
GF - Grass/Forbs
SH - Shrubs

Substrate Particle Size:
Gr - Gravel (2 - 64 mm)
Co - Cobble (64 - 256 mm)

0.7 - Depth in metres

KEY MAP

0 25 50
1:1,200 METRES

NOTE(S)

REFERENCE(S)
CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO.
HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
FISH AND FISH HABITAT AT LORNE BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	JL
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

The Grand River in the surveyed reach (i.e., 50 m upstream and 150 m downstream of Lorne Bridge) was fairly uniform throughout, flowing through a mixture of anthropogenically modified and naturalized banks. The watercourse is crossed by Colborne Street West and Lorne Park to the west and Johnsons trail running parallel to the River on the east. The bridge is supported by two in-water piers. Banks along and under the bridge have been reinforced with rip rap armouring to provide stability. The habitat consisted of a moderate quality run with sufficient depth (i.e., >0.5 m) and slow flows. Wetted and bankfull widths were wide and generally ranged from >100 m to 125 m. There are a series of larger islands approximately 130 m upstream of the Lorne Bridge. The named islands include: Grand Island and Kerby Islands outside the aquatic study area. No visible signs of iron staining, groundwater upwellings or inflowing tributaries were noted during the survey. No barriers to fish movements were recorded within the assessed reach and ample migratory opportunities exist to reach upstream and downstream habitats. An absence of pool habitat and measured water depths (i.e., 0.65 m to 0.8 m) throughout the assessed reach may limit the overwintering habitats available to larger bodied fish species such as Salmonidae (i.e., trout), Catostomidae (i.e., suckers) and northern pike but may provide sufficient depths for bait and smaller bodied forage fish species.

Table 1: Fish Habitat at Lorne Bridge, Brant's Crossing, and TH&B Crossing Bridge, Grand River, June 2020

Survey Location	Channel Morphology	Bankfull Width (m)	Bankfull Depth (m)	Wetted Width (m)	Wetted Depth (m)	Cover Type (%)	Substrate Type	Temp (°C)	DO (mg/L)	pH	Conductivity (µS/cm)
Lorne Bridge											
Upstream (50m)	Run (100%)	122	3.65	107	0.65	WD/SMV	Co/Gr/Bo/Sa	21.99	7.95	8.03	801
Lorne Bridge	Run (100%)	116	2.65	108	0.65	SMV	Co/Gr/Bo/Sa	21.86	8.22	8.13	799
Downstream (150m)	Run (100%)	125	5.8	98	0.8	SMV	Co/Gr/Bo/Sa	21.86	8.22	8.13	799
Brant's Crossing Bridge											
Upstream (50m)	Run (100%)	125	5.8	98	0.8	SMV	Co/Gr/Bo/Sa	21.86	8.22	8.13	799
Brant's Crossing Bridge	Run (100%)	125	5.8	102	0.8	SMV	Sa/Co/Gr/Bo/	21.16	6.69	8.25	775
Downstream (150m)	Run (100%)	125	2.7	100	0.7	SMV	Co/Gr/Bo/Sa	21.76	8.32	8.32	808
TH&B Crossing Bridge											
Upstream (50m)	Run (100%)	75	2.8	68	0.65	SMV	Co/Gr/Bo/Sa	21.89	7.55	8.31	779
TH&B Crossing Bridge	Run (100%)	78	4.0	70	0.65	SMV	Co/Gr/Sa/Bo	21.46	6.46	8.29	765
Downstream (150m)	Run (100%)	75	2.5	65	0.8	SMV	Co/Gr/Sa/Bo	22.20	7.23	8.32	765

Notes: Temp = temperature; DO = dissolved oxygen; mg/L = milligrams per Litre; µS/cm = microSiemens per centimetre; WD = woody debris; SMV = Submerged vegetation; Co = Cobble; Gr= gravel; Bo=Boulders; Sa=Sand.

Upstream Fish Habitats

Upstream of the Lorne Bridge, in the aquatic study area, habitat features included a small island to the west side of the channel and sandy banks. Banks were moderately to high stability, with no signs of slumping. Banks were higher on the eastern portion of the channel with moderate to high slopes on both sides. The left downstream bank, on the west side of the Grand River, consisted of cobble, sand and gravel soils. Riparian vegetation was primarily grasses and shrubs, overhead cover was negligible. The right downstream bank, on the eastern side of the river was higher (9.5 m with a moderately steep slope. Bank soils were a combination of boulders and cobble and were reinforced with rip-rap armouring. Riparian vegetation was primarily grasses with a few shrubs and deciduous trees flanking the river, providing marginal overhead cover. Water was turbid and minimal (<5%) instream cover was provided by submerged vegetation and woody debris. Substrates consisted of large expanses of gravel with minor amounts of gravel, sand and boulders. These gravel bars and substrates within the upstream reach would support substratum spawning and nest building for walleye, Salmonidae species, Percidae as well as a variety of Cyprinidae.

A small side channel to the east of a small unnamed island (at UTM 17T 559291.75 m E, 4776324.65 m N) provided backwater habitat with reverse flow direction and lower flows than the main channel. The substrates within the backwater generally consisted of a higher proportion of fines. This area supports nursery and rearing processes for a variety of fish species as well as staging habitats for migratory fish species.

Downstream Fish Habitats

Bank heights immediately adjacent to the bridge have been altered to lowered heights to accommodate the bridge structure and were approximately 2 m high. Limited cover and vegetation were present in the immediate vicinity of the bridge on the western downstream side of the Grand River whereas grasses and forbs were plentiful (90%) on the eastern side of the river. There is a municipal storm water drain in the downstream reach of the aquatic study area.

The habitat features downstream in the aquatic study area included two moderately sized islands adjacent to both the east and west banks as well as four exposed gravel/cobble bars. At the downstream survey extent (i.e., 150 m), the bankfull width is comparable to the upstream reach and wetted width in slightly less (i.e., 98 m) as the banks encroach further into the open water area. Water depth was 0.8 m mid channel. Bank heights and slopes were similar both sides of the river (Table 1). Banks were moderately vegetated with grasses and forbs. No overhead cover was provided by the vegetation on either bank and in-water cover was limited to submerged vegetation. Substrates were consistent with the upstream reaches and consisted of cobble, gravel, sand and boulders. Numerous areas with substratum spawning conditions to support Salmonids, Walleye and Sucker species were observed throughout the downstream reach of the aquatic study area. Moderate amounts of spawning areas with suitable conditions for forage fish were observed, whereas the limited instream vegetation constrained opportunities for predatory species such as Pike spawning and nursery/rearing habitats.

Water Quality

In-situ water quality was similar throughout the Lorne Bridge aquatic study area and water temperatures were typical for the period assessed (i.e., 21°C) and supportive of the warmwater thermal regime designation (Table 1). Dissolved oxygen and pH were within CWQG and PWQO for the protection of aquatic life and suitable to support a variety of life stages and species present within the river. Conductivity values in the Lorne Bridge aquatic study area were typical for the Grand River (i.e., approximately 800 µS/cm) (GRCA 2020b).

4.4.2.2 Brant's Crossing Bridge

A summary of fish habitat features is provided in Table 1 and a photographic log is provided in Appendix E2. Fish habitat mapping for the surveyed reach is presented on Figure 6.

Grand River -Fish Present:
American Brook Lamprey, Rainbow Darter, Stonecat, Smallmouth Bass, Unidentifiable Carps and Minnows, Black Redhorse, Shorthead Redhorse, Johnny Darter, Sunfishes, Common Carp, Johnny Darter/Tesselated Darter, Northern Hog Sucker, Longnose Dace, Blackside Darter, Common Shiner, Catostomus sp., Rainbow Trout, Bluntnose Minnow, Greenside Darter, Etheostoma sp., River Chub, Salmon and Trout subfamily, Greater Redhorse, White Sucker, Emerald Shiner, Rock Bass

LEGEND

Cool Water

Flow Direction

Channel Unit/Habitat Type:
R2 - Moderate quality run habitat 0.75 m - 1.0 m
BW - Backwater

Bank Slope:
Shallow slope (0 to 5%)
Intermediate slope (6 to 30%)
Steep slope (31 to 70%)

Riparian Vegetation Type:
DF - Deciduous forest
GF - Grass/Forbs
SH - Shrubs

Substrate Particle Size:
Gr - Gravel (2 - 64 mm)
Co - Cobble (64 - 256 mm)

0.7 - Depth in metres

KEY MAP

0 25 50
1:1,000 METRES

NOTE(S)

REFERENCE(S)
CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO.
HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
FISH AND FISH HABITAT AT BRANT'S CROSSING BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	JL
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	A	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

Upstream Fish Habitats

Upstream of the Brant's Crossing Bridge is the same as the downstream reach of the Lorne Bridge. Bank heights immediately adjacent to the bridge have been altered to lowered heights to accommodate the bridge structure and were approximately 2 m high. Limited cover and vegetation were present in the immediate vicinity of the bridge on the western downstream side of the river whereas grasses and forbs were plentiful (90%) on the eastern side of the river. There is a municipal storm water drain within the upstream reach of the Brant's Crossing Bridge aquatic study area.

The upstream habitat features included two moderately sized islands adjacent to both the east and west banks as well as four exposed gravel/cobble bars. At the upstream survey extent (i.e., 50 m), the bankfull and wetted widths are comparable to the downstream reach. Water depth was 0.8 m mid channel. Bank heights and slopes were similar both sides of the river (Table 1). Banks were moderately vegetated with grasses and forbs. No overhead cover was provided by the vegetation on either bank and in-water cover was limited to submerged vegetation (algae). Substrates were consistent with the downstream reach and consisted of cobble, gravel, sand and boulders. Numerous areas of substratum spawning conditions to support Salmonids, Walleye and Sucker species were observed throughout the upstream reach of the aquatic study area. Moderate amounts of spawning areas with suitable conditions for forage fish were observed, whereas the limited instream vegetation constrained opportunities for predatory species such as Pike spawning and nursery/rearing habitats.

Downstream Fish Habitats

Bank heights decreased in height in comparison to the upstream reach and were 2 m high. Grasses and forbs were plentiful (80-90%) in the immediate vicinity of the bridge on both banks. A municipal storm water drain is present within the downstream reach.

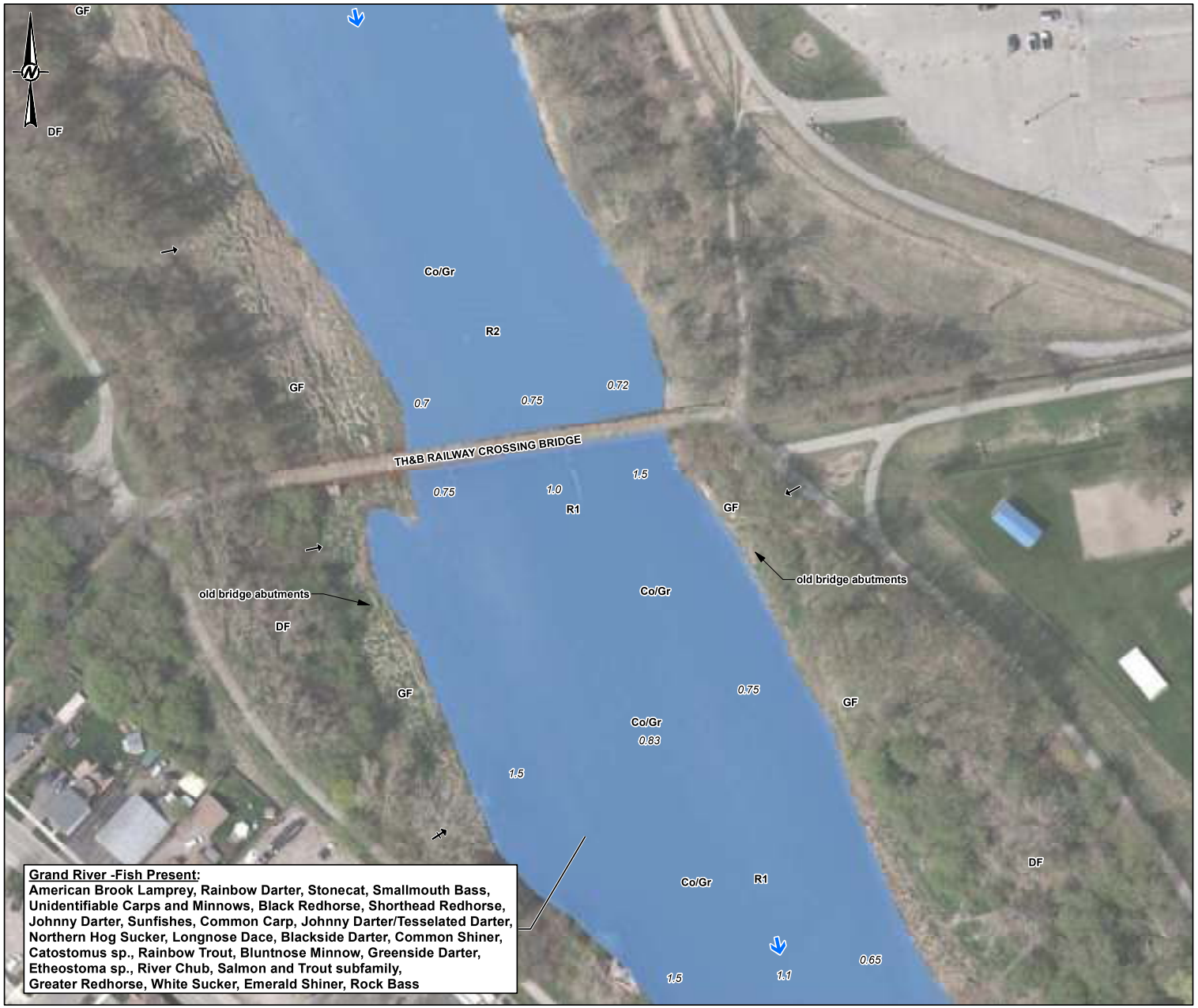
The downstream habitat features included once exposed gravel/cobble bar. At the downstream extent of the aquatic study area (i.e., at 150 m), the bankfull width and wetted widths are comparable to the upstream reach. Water depth was 0.7 m mid channel. Bank heights and slopes were similar on both sides of the river (Table 1). Banks were moderately vegetated with grasses and forbs. No overhead cover was provided by the vegetation on either bank and in-water cover was limited to submerged vegetation (algae). Substrates were consistent with the upstream reaches and consisted of cobble, gravel, sand and boulders. Numerous areas of substratum spawning conditions to support Salmonids, Walleye and Sucker species were observed throughout the downstream reach of the aquatic study area. Moderate amounts of spawning areas with suitable conditions for forage fish were determined, whereas the limited instream vegetation constrained opportunities for predatory species such as Pike spawning and nursery/rearing habitats.

Water Quality

In-situ water quality was similar throughout the Brant's Crossing Bridge aquatic study area and water temperatures were typical for the period assessed (i.e., 21°C) and supportive of the warmwater thermal regime designation. Dissolved oxygen and pH were within CWQG and PWQO for the protection of aquatic life and suitable to support a variety of life stages and species present within the river. Conductivity values were typical for the Grand River (i.e., approximately 800 µS/cm) (GRCA 2020).

4.4.2.3 TH&B Crossing Bridge

A summary of fish habitat features is provided in Table 1 and a photographic log is provided in Appendix E3. Fish habitat mapping for the surveyed reach is presented on Figure 7.



LEGEND

Cool Water

Flow Direction

Channel Unit/Habitat Type:
R1 - Highest quality run habitat >1.0 m
R2 - Moderate quality run habitat 0.75 m - 1.0 m

Bank Slope:
Shallow slope (0 to 5%)
Steep slope (31 to 70%)

Riparian Vegetation Type:
DF - Deciduous forest
GF - Grass/Forbs
SH - Shrubs

Substrate Particle Size:
Gr - Gravel (2 - 64 mm)
Co - Cobble (64 - 256 mm)

0.7 - Depth in metres

KEY MAP

0 25 50
1:1,000 METRES

NOTE(S)

REFERENCE(S)
CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE – ONTARIO. HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
GM BLUEPLAN ENGINEERING LIMITED

PROJECT
MINISTRY OF TRANSPORTATION BRIDGE REHABILITATION

TITLE
FISH AND FISH HABITAT AT TH&B CROSSING BRIDGE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-02-05
DESIGNED	RRD
PREPARED	RRD
REVIEWED	JL
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
19128292	0006	0	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
25mm

Upstream Fish Habitats

Banks upstream of the TH&B Crossing Bridge in the aquatic study area were moderately stable, with no signs of slumping. Banks were 2 m high on both sides of the channel with moderate slopes. Bank material consisted of sand, cobble and gravel soils. Riparian vegetation was primarily grasses and forbs and overhead cover was negligible. Minimal (<5%) instream cover was provided by submerged vegetation (algae). Substrates consisted of a mix of cobble and gravel with minor amounts of sand and boulders. These gravel bars and substrates within the upstream reach would support substratum spawning and nest building for Walleye, Salmonid species, Percidae as well as a variety of Cyprinids.

Downstream Fish Habitats

Bank heights in immediate proximity of the bridge were approximately 2 m high. Grasses and forbs were plentiful (100%) on both banks. There is a municipal storm water drain within the downstream reach of the TH&B Crossing Bridge aquatic study area.

Depths increased slightly downstream to a maximum depth of approximately 1.5 m, and current velocity slowed. At the downstream extent of the aquatic study area (i.e., 150 m), the bankfull and wetted widths were comparable to the upstream reach. The left downstream bank, on the west side of the river, consisted of cobble, gravel and sand soils. Riparian vegetation was primarily grasses and forbs, overhead cover was negligible. The right downstream bank, on the eastern side of the river was higher (5 m with a steep slope). Bank material consisted of sand, boulder, cobble and gravel (Table 1). No overhead cover was provided by the vegetation on either bank and in-water cover was limited to submerged vegetation (algae). Substrates were consistent with the upstream reaches and consisted of cobble, gravel, sand and boulders. Numerous areas of substratum spawning conditions to support Salmonids, Walleye and Sucker species were observed throughout the downstream reach of the TH&B Crossing Bridge aquatic study area. Moderate amounts of spawning areas with suitable conditions for forage fish were observed, whereas the limited instream vegetation constrained opportunities for predatory species such as Pike spawning and nursery/rearing habitats. Suitability for overwintering increased in the downstream reach due to increased maximum depth.

Water Quality

In-situ water quality was similar throughout the TB&H Rail Bridge aquatic study area and water temperatures were typical for the period assessed (i.e., 21-22°C) and supportive of the warmwater thermal regime designation. Water temperatures in the downstream reach were measured at greater than 22°C. Dissolved oxygen and pH were within CWQG and PWQO for the protection of aquatic life and suitable to support a variety of life stages and species present within the river. Conductivity values were typical for the Grand River (i.e., approximately 775 µS/cm) (GRCA 2020).

4.5 Designated or Significant Natural Heritage Areas

There are no PSWs, ANSIs, significant woodlands or life science sites were identified within the study area.

4.5.1 Habitat for Endangered or Threatened Species

As discussed in Section 4.2, one species designated threatened under the ESA was observed during field surveys within the terrestrial study area: chimney swift. Six additional species were assessed to have moderate potential to occur within the study area based on the availability of potential suitable habitat (Appendix B): barn swallow, bank swallow (*Riparia riparia*), eastern small-footed myotis (*Myotis leibii*), little brown myotis (*Myotis*

lucifugus), tri-colored bat (*Perimyotis subflavus*) and queensnake (*Regina septemvittata*). Threatened and endangered species receive individual and habitat protection under the Act.

Barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 2019). Although no nests were observed on any of the three bridges, individuals nesting in the local landscape may forage over the Grand River. individuals have been observed along the Grand River in the vicinity of the study area (eBird 2020).

Bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and riverbanks, sand and gravel pits, and roadcuts. Breeding sites are typically located near open foraging sites such as waterbodies, grasslands, wetlands and riparian woods (Garrison 1999). Although no suitable nesting habitat was identified within the study area, individuals nesting in the local landscape may forage over the Grand River. Individuals have been observed along the Grand River in the vicinity of the study area (eBird 2020).

Little brown myotis will roost in both natural and man-made structures (e.g., attics, barns). Natural roosting colonies require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas (ECCC 2018). Tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests and typically roost in close proximity to large waterbodies (ECCC 2018). The Lowland Deciduous Forest (FOD7) may provide suitable maternity roost habitat for tri-colored bat. Although the forest is semi-mature, few snag or cavity trees were observed within the study area to provide roosting habitat for other SAR bats. Buildings within the study area may provide suitable anthropogenic maternity roost habitat for tittle brown myotis. The Grand River may also provide suitable foraging habitat or drinking water.

Eastern small-footed myotis generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles, but it occasionally inhabits buildings (Humphrey 2017). The armoured banks of the Grand River may provide suitable maternity roost habitat for eastern small-footed myotis.

Queensnake requires permanent aquatic habitat with large flat rocks, either submerged or on the bank/shoreline. Individuals rarely leave the shoreline of permanent bodies of water with abundant shoreline cover and a healthy population of crayfish (Gillingwater 2011). The Grand River and riparian corridor, particularly the large rocks along the armoured banks, may provide suitable habitat for queensnake. There are also occurrence records of queensnake in the vicinity of the study area (iNaturalist 2020).

4.5.2 Other Wetlands

An unevaluated wetland is mapped along the southern edge of the Grand River to the southwest of Lorne Bridge (Figure 1) according to both LIO (MNRF 2020a) and GRCA mapping (GRCA 2020). Based on the field surveys, a portion of this mapped unevaluated wetland within the study area was confirmed to be wetland and classified as Reed Canary Meadow Marsh (MAM2-2) and the remainder was classified as Lowland Deciduous Forest (FOD7) (Figure 2). Other wetland communities were identified within the study area during the field surveys and classified as Jewelweed Mineral Meadow Marsh (MAM2-9).

According to the City's OP (Brantford 2020), an impact assessment is required to be completed for development proposed within 120 m of a wetland 2 ha or greater in size. The area of mapped unevaluated wetland southwest of Lorne Bridge is approximately 3 ha in size. All of the other wetland communities identified within the study area are smaller than 2 ha. The impact assessment must evaluate the ecological function of adjacent lands, identify a vegetative buffer and demonstrate there will be no adverse impacts on the wetland or its ecological function

(Brantford 2020). Further, the MNRF recommended that this unevaluated wetland be considered for addition to the existing Brantford Northwest PSW, located 3.6 km northwest of the study area (Buck, pers. comm. 2020).

According to the Ontario Wetland Evaluation System (OWES), other wetland units in close proximity (i.e., within 750 m) to an existing PSW can be combined as part of the overall PSW through a process known as complexing. Wetland complexes typically have similar or complementary biological, social and/or hydrological functions (MNR 2014). The unevaluated wetland southwest of Lorne Bridge is not located within 750 m of the Brantford Northwest PSW and therefore does not meet the distance criterion to be considered for complexing.

4.5.3 Significant Valleylands

The Grand River valleyland is considered to be significant according to the NHRM (MNR 2010) based on surface water functions, landform prominence, distinctive geomorphic functions, and degree of naturalness. Development and site alteration is permitted within significant valleylands where it is demonstrated there will be no adverse impacts to the features or its ecological function (MMAH 2020a).

4.5.4 Significant Wildlife Habitat

Habitat for Species of Conservation Concern

Four species of conservation concern (SOCC) were assessed to have moderate potential to occur within the study area based on the availability of potential suitable habitat (Appendix B): monarch (*Danaus plexippus*), common nighthawk (*Chordeiles minor*), eastern wood-pewee (*Contopus virens*) and snapping turtle (*Chelydra serpentina*).

Species of conservation concern (SOCC) includes habitat for three groups of species:

- Species that are rare, those whose populations are significantly declining, or have a high percentage of their global population in Ontario
- Species listed as special concern under the ESA
- Species listed as threatened or endangered under SARA

Monarch, designated special concern under both the ESA and SARA, is found wherever there is milkweed (*Asclepias* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies, and roadsides, but also in city gardens and parks (COSEWIC 2010). Although milkweed plants were observed within the study area during field surveys, the plants were scattered and unlikely to support a large concentration of monarch individuals. Other flowering plants in the meadow marsh (MAM2-2; MAM2-9) and meadow (CUM) habitats within the study area may provide suitable foraging habitat or monarch.

Eastern wood-pewee, designated special concern under both the ESA and SARA, inhabits a wide variety of wooded upland and lowland habitats, including deciduous, coniferous, or mixed forests. It occurs most frequently in forests with some degree of openness (COSEWIC 2012). The Lowland Deciduous Forest (FOD7) within the study area may provide suitable nesting habitat for eastern wood-pewee. The Grand River may also provide suitable foraging habitat.

Common nighthawk, designated special concern under the ESA and threatened under the SARA, require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bogs, fens, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007). The open meadow marsh (MAM2-2;

MAM2-9) habitats within the study area may provide suitable nesting habitat for common nighthawk. The Grand River may also provide suitable foraging habitat. There are also occurrence records of common nighthawk in the vicinity of the study area (eBird 2020).

Snapping turtle, designated special concern under both the ESA and SARA, uses a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation (COSEWIC 2008). The Grand River within the study area may provide suitable aquatic habitat for snapping turtle, particularly in marshy bays, such as the area southwest of Lorne Bridge (Figure 2).

Migration Corridors

The Grand River valleyland also functions as a wildlife movement corridor that is likely to be considered regionally significant based on the overall size (length and width) of the feature. The valleyland facilitates movement through the urban center of the City and connects to rural communities north and south of the study area. This feature may be considered a type of significant wildlife habitat (SWH), as defined in the Significant Wildlife Habitat Technical Guide (SWHTG) (MNR 2000) and Ecoregion 7E Criterion Schedule (MNRF 2015).

Other Habitats

The MNRF also indicated that the Grand River within the study area may function as a Waterfowl Winter Concentration Area (Buck, pers. comm. 2020). During the winter (approximately Jan 1 to Mar 31) waterfowl may congregate in large watercourses where fast water flow prevents freezing and provides foraging opportunities. Although not defined as SWH according to the SWHTG (MNR 2000) or Ecoregion 7E Criterion Schedule (MNRF 2015), Waterfowl Winter Concentration Areas may be considered a regionally significant natural heritage feature.

SWH is considered a type of Environmental Control Policy Area by the City (Brantford 2020). Development and site alteration are permitted within these areas where it is demonstrated no adverse impacts to these features or their ecological functions will occur, and/or where appropriate compensation is approved by the relevant agencies (Brantford 2020).

City of Brantford Natural Features

Although there are no Environmental Protection Areas mapped within the study area, the portion of the Grand River regulatory floodplain within the study area should be considered as an Environmental Protection Area, as described above (Section 2.6.2). Development for approved uses within Environmental Protection Areas must include supporting documentation which characterizes the natural features and describes appropriate mitigation measures (Brantford 2020).

Similarly, there are no Environmental Control Policy Areas mapped within the study area. However, natural linkages, wetlands, steep slopes, streams and fish habitat are all considered to be Environmental Control Policy Areas. Because the Grand River valleyland functions as a natural linkage (as described above), it may be considered an Environmental Control Policy Area. Development and site alteration are permitted within these areas where it is demonstrated no adverse impacts to these features or their ecological functions will occur, and/or where appropriate compensation is approved by the relevant agencies (Brantford 2020).

5.0 NATURAL ENVIRONMENT CONSTRAINTS ASSESSMENT

5.1 Vegetation, Wetlands, and Significant Valleyland

5.1.1 Lorne Bridge

The Lorne Bridge terrestrial study area is characterized by riparian lowland deciduous forest (FOD7), meadow marsh (MAM2-2; MAM2-9) and cultural meadow/thicket (CUM/CUT). The reed canary meadow marsh (MAM2-2) was also mapped as an unevaluated wetland and is regulated under Regulation 150/06 by the GRCA and provided protection by the City (Brantford 2020). No vascular plant SAR or provincially rare plant species (i.e., S1-S3) were identified within the Lorne Bridge terrestrial study area.

A significant valleyland was also identified within the study area. Although not mapped as such, the Grand River valleyland and regulatory floodplain may also be considered as an Environmental Protection Area and Environmental Control Policy Area, as defined by the City (Brantford 2020).

Rehabilitation of the Lorne Bridge Pedestrian Underpass, Lorne Bridge Arch, and Lorne Bridge Girder has potential to result in impacts to vegetation, unevaluated wetlands and significant valleyland. The most likely period for effects to occur are during construction. Impacts as a result of the Project may include:

- Vegetation removal or alteration of plant communities:
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation. The removal of vegetation and disturbance of soils can lead to bank instability and create the potential for sediment laden runoff to enter the wetlands (MAM2-2; MAM2-9) and the Grand River unless properly managed.
- Introduction of invasive plant species
  - Use and staging of equipment such as heavy machinery and storing of materials may create disturbed conditions suitable for establishment of invasive plant species. Seeds of invasive plant species may also be transported to the site via equipment and materials.
- Landform alteration
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation, which may alter the existing landform characteristics (e.g., valley slope).

5.1.2 Brant's Crossing Bridge

The Brant's Crossing Bridge terrestrial study area is characterized by riparian Lowland Deciduous Forest (FOD7) and Jewelweed Mineral Meadow Marsh (MAM2-9). No vascular plant SAR or provincially rare plant species (i.e., S1-S3) were identified within the Brant's Crossing Bridge terrestrial study area.

A significant valleyland was also identified within the study area. Although not mapped as such, the Grand River valleyland and regulatory floodplain may also be considered as an Environmental Protection Area and Environmental Control Policy Area, as defined by and meeting the City (Brantford 2020) criteria.

Rehabilitation of the Brant's Crossing Bridge has potential to result in impacts to vegetation and significant valleyland. The most likely period for effects to occur are during construction. Impacts as a result of the project may include:

- Vegetation removal or alteration of plant communities:
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation. The removal of vegetation and disturbance of soils can lead to bank instability and create the potential for sediment laden runoff to enter the Jewelweed Mineral Meadow Marsh (MAM2-9) and Grand River unless properly managed.
- Introduction of invasive plant species
  - Use and staging of equipment such as heavy machinery and storing of materials may create disturbed conditions suitable for establishment of invasive plant species. Seeds of invasive plant species may also be transported to the site via equipment and materials.
- Landform alteration
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation, which may alter the existing landform characteristics (e.g., valley slope).

5.1.3 TH&B Crossing Bridge

The TH&B Crossing Bridge terrestrial study area is characterized by riparian Lowland Deciduous Forest (FOD7), Jewelweed Mineral Meadow Marsh (MAM2-9) and Cultural Woodland (CUW). No vascular plant SAR or provincially rare plant species (i.e., S1-S3) were identified within the TH&B Crossing Bridge terrestrial study area.

A significant valleyland was also identified within the study area. Although not mapped as such, the Grand River valleyland and regulatory floodplain may also be considered as an Environmental Protection Area and Environmental Control Policy Area, as defined by and meeting the City (Brantford 2020) criteria.

Rehabilitation of the TH&B Crossing Bridge has potential to result in impacts to vegetation and significant valleyland. The most likely period for effects to occur are during construction. Impacts as a result of the Project may include:

- Vegetation removal or alteration of plant communities:
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation. The removal of vegetation and disturbance of soils can lead to bank instability and create the potential for sediment laden runoff to enter the Jewelweed Mineral Meadow Marsh (MAM2-9) and Grand River unless properly managed.
- Introduction of invasive plant species
  - Use and staging of equipment such as heavy machinery and storing of materials may create disturbed conditions suitable for establishment of invasive plant species. Seeds of invasive plant species may also be transported to the site via equipment and materials.
- Landform alteration
  - The Project may involve the clearing of vegetation, grading and excavations around the bridge during rehabilitation, which may alter the existing landform characteristics (e.g., valley slope).

Most impacts to vegetation or significant natural heritage features can be managed through the appropriate planning and application of avoidance and mitigation measures as detailed in Section 6.1.

Opportunities for Restoration or Enhancement

Rehabilitation of Lorne Bridge, Brant's Crossing Bridge and TH&B Crossing Bridge has potential to incorporate restoration and enhancement opportunities during planning and construction. Some recommended opportunities are detailed below:

- Restore or enhance disturbed areas to align with the GRCA's goal to maintain landscapes and views as natural areas with quality of vegetation and aesthetics as part of the objectives for Land/Water Use and Management in the Grand River (GRCA 2006)
- Restore disturbed areas using native species and incorporate measures to control or remove invasive species growth

5.2 Wildlife and Wildlife Habitats

The study area is characterized by a fairly rich bird community, and likely also supports several species of mammals and herpetofauna. The Grand River valleyland was also identified as wildlife movement corridor SWH.

5.2.1 Lorne Bridge

Several active cliff swallow nests were observed on Lorne Bridge during the field surveys between the northern abutment wall and the north-central pier.

The Lowland Deciduous Forest (FOD7) may provide suitable habitat for one SAR (tri-colored bat) and SWH for one SOCC (eastern wood-pewee). Open marsh (MAM2-2; MAM2-9) and meadow (CUM) habitats may provide suitable SWH for two SOCC (monarch, common nighthawk). The Grand River and its shoreline, including the armoured banks, may provide habitat for two SAR (eastern small-footed myotis, queensnake), SWH for one SOCC (snapping turtle), as well as regionally significant habitat for Waterfowl Winter Concentration Area.

Structures in the terrestrial study area may provide suitable habitat for two SAR (chimney swift, little brown myotis), and the Grand River may provide suitable foraging habitat for five SAR (barn swallow, bank swallow, chimney swift, little brown myotis, tri-colored bat).

Rehabilitation of the Lorne Bridge Pedestrian Underpass, Lorne Bridge Arch, and Lorne Bridge Girder has potential to result in impacts to cliff swallow, habitat for SAR (tri-colored bat, eastern small-footed myotis, queensnake), SWH (migration corridor and habitat for monarch, common nighthawk, eastern wood-pewee, snapping turtle) and regionally significant habitat for Waterfowl Winter Concentration Area. Use of the Grand River as foraging habitat and potential nesting/roosting habitat in structures are not expected to be impacted as a result of the project. The most likely period for effects to occur are during construction. Effects to wildlife and wildlife habitats as a result of the Project may include:

- Displacement, disturbance or harm of wildlife
  - Vegetation clearing, use of equipment (especially heavy machinery) and rehabilitation works on the bridge structure itself may cause temporary displacement of wildlife. Vegetation clearing and work on the bridge structure may also have potential to cause harm to wildlife (e.g., destruction of nests, mortality from equipment strikes).
- Changes in form and function of wildlife habitats

  - Vegetation clearing, grading and excavations around the bridge during rehabilitation may remove wildlife habitat and/or alter use of wildlife habitats (e.g., in-water work within the marshy bay may remove aquatic vegetation and reduce suitability for snapping turtle).
- Changes in wildlife passage
  - Vegetation clearing and/or staging of equipment and materials may create temporary barriers to wildlife movement through the riparian corridor.

5.2.2 Brant's Crossing Bridge

The Lowland Deciduous Forest (FOD7) may provide suitable habitat for one SAR (tri-colored bat) and SWH for one SOCC (eastern wood-pewee). Open marsh (MAM2-9) and meadow (CUM) habitats may provide suitable SWH for two SOCC (monarch, common nighthawk). The Grand River and its shoreline, including the armoured banks, may provide habitat for two SAR (eastern small-footed myotis, queensnake), SWH for one SOCC (snapping turtle), as well as regionally significant habitat for Waterfowl Winter Concentration Area.

The Grand River may also provide suitable foraging habitat for five SAR (barn swallow, bank swallow, chimney swift, little brown myotis, tri-colored bat).

Rehabilitation of the Brant's Crossing Bridge has potential to result in impacts to habitat for SAR (tri-colored bat, eastern small-footed myotis, queensnake), SWH (migration corridor and habitat for monarch, common nighthawk, eastern wood-pewee, snapping turtle) and regionally significant habitat for Waterfowl Winter Concentration Area. Use of the Grand River as foraging habitat is not expected to be impacted as a result of the project. The most likely period for effects to occur are during construction. Effects to wildlife and wildlife habitats as a result of the Project may include:

- Displacement, disturbance or harm of wildlife
  - Vegetation clearing, use of equipment (especially heavy machinery) and rehabilitation works on the bridge structure itself may cause temporary displacement of wildlife. Vegetation clearing and work on the bridge structure may also have potential to cause harm to wildlife (e.g., destruction of nests, mortality from equipment strikes).
- Changes in form and function of wildlife habitats
  - Vegetation clearing, grading and excavations around the bridge during rehabilitation may remove wildlife habitat and/or alter use of wildlife habitats (e.g., in-water work may remove aquatic vegetation and reduce suitability for snapping turtle).
- Changes in wildlife passage
  - Vegetation clearing and/or staging of equipment and materials may create temporary barriers to wildlife movement through the riparian corridor.

5.2.3 TH&B Crossing Bridge

The Lowland Deciduous Forest (FOD7) may provide suitable habitat for one SAR (tri-colored bat) and SWH for one SOCC (eastern wood-pewee). There are also two snag trees southeast of the bridge that may provide roosting habitat for bats or other wildlife. Open marsh (MAM2-9) and meadow (CUM) habitats may provide suitable SWH for two SOCC (monarch, common nighthawk). The Grand River and its shoreline, including the

armoured banks, may provide habitat for two SAR (eastern small-footed myotis, queensnake), SWH for one SOCC (snapping turtle), as well as regionally significant habitat for Waterfowl Winter Concentration Area.

Structures within the terrestrial study area may provide suitable habitat for two SAR (chimney swift, little brown myotis), and the Grand River may provide suitable foraging habitat for five SAR (barn swallow, bank swallow, chimney swift, little brown myotis, tri-colored bat).

Rehabilitation of the TH&B Crossing Bridge has potential to result in impacts to snag trees, habitat for SAR (tri-colored bat, eastern small-footed myotis, queensnake), SWH (migration corridor and habitat for monarch, common nighthawk, eastern wood-pewee, snapping turtle), and regionally significant habitat for Waterfowl Winter Concentration Area. Use of the Grand River as foraging habitat and potential nesting/roosting habitat in structures are not expected to be impacted as a result of the project. The most likely period for effects to occur are during construction. Effects to wildlife and wildlife habitats as a result of the Project may include:

- Displacement, disturbance or harm of wildlife
  - Vegetation clearing, use of equipment (especially heavy machinery) and rehabilitation works on the bridge structure itself may cause temporary displacement of wildlife. Vegetation clearing and work on the bridge structure may also have potential to cause harm to wildlife (e.g., destruction of nests, mortality from equipment strikes).
- Changes in form and function of wildlife habitats
  - Vegetation clearing, grading and excavations around the bridge during rehabilitation may remove wildlife habitat and/or alter use of wildlife habitats (e.g., in-water work may remove aquatic vegetation and reduce suitability for snapping turtle).
- Changes in wildlife passage
  - Vegetation clearing and/or staging of equipment and materials may create temporary barriers to wildlife movement through the riparian corridor.

Most impacts to wildlife and wildlife habitat can be managed through the appropriate planning and application of avoidance and mitigation measures as detailed in Section 6.2.

Opportunities for Restoration or Enhancement

Rehabilitation of each bridge has potential to incorporate restoration and enhancement opportunities, during planning and construction. Some recommended opportunities are detailed below:

- Protection/avoidance of the backwater area upstream of the Lorne Bridge

5.3 Fish and Fish Habitats

5.3.1 Lorne Bridge, Brant's Crossing Bridge and TH&B Crossing Bridge

The fish and fish habitat in the Grand River are afforded protection under the *Fisheries Act*. Alterations to the watercourse and the associated floodplain are regulated under Regulation 150/06 under the *Conservation Authorities Act* administered by the GRCA.

Construction works such as the rehabilitation/replacement of the Lorne Bridge (including the Pedestrian Underpass, Lorne Bridge Arch, and Lorne Bridge Girder) as well as consideration for the

rehabilitation/replacement and/or removal/permanent closure of the TH&B Crossing Bridge and Brant's Crossing Bridges has potential to result in impacts to the surface water features, fish and fish habitats. The most likely period for effects to occur are during planning and construction. Effects to surface water features, fish and fish habitats as a result of temporary or permanent near or in-water works may include:

- Change to form and function of the Grand River, fish and fish habitats
- Changes to water quality, contaminant concentrations or food supply
- Changes to flow and fish passage
- Potential or direct mortality of fish, eggs or larva due use of heavy equipment, water extraction, introduction of deleterious substances
- Displacement of SAR or significant aquatic species

Construction activities such as the use of industrial equipment, grading, excavations, blasting activities, changes to riparian and/or aquatic vegetation, placement or removal of structures in-water and water extraction have the potential to cause changes in the form and function of aquatic and fish habitat features as well as flow and fish passage. Care should be taken to avoid changes to the extent possible to sensitive features such as the gravel/cobble bars and islands throughout the assessed reach, particularly around bridge piers, as well as the backwater in the upstream habitat, as these provide habitats that support critical life stages.

Construction activities associated with bridge replacement/rehabilitation/removal have the potential to alter water quality, introduce deleterious substances and alter food supply through the exposure of on-site materials and changes to water quality through sedimentation, dredging activities, introduced chemicals during the use of industrial equipment, spills and erosion/sedimentation. Construction activities have the potential to cause indirect or direct mortality of fish, eggs or larva and/or displacement of SAR or significant aquatic species due use of heavy equipment, water extraction, introduction of deleterious substances.

Most impacts to aquatic features, fish and fish habitats can be managed through the appropriate planning and application of avoidance and mitigation measures as detailed in Section 6.3.

Opportunities for Restoration or Enhancement

Rehabilitation of the Lorne Bridge has potential to incorporate restoration and enhancement opportunities, during planning and construction. Some recommended opportunities are detailed below:

- Protection/avoidance of the backwater area upstream of the Lorne Bridge and cobble bars at bridge pier footings.
- Removal or replacement of in-water piers, substrates or where access is required below the high-water mark would cause significant disturbance to fish and fish habitats in comparison to replacements or rehabilitations required above the high-water mark
- Addition of large woody-debris jams against outside meanders of the mainstream may enhance channel complexity (GRCA 2001)
- Fish management objectives for this reach of the Grand River includes water retention to prevent low flows and enable temperature regulation, establish Pike and Walleye spawning habitat (GRCA 2006). Potential enhancements to establish Pike and Walleye spawning habitat would include aquatic vegetation plantings in

slow water areas to support Pike spawning and create riffle habitats with gravel/cobble bars for Walleye spawning. Placement of keystone rubble (i.e., similar in size to cobble with more angular edges) areas along bank and shoreline areas to facilitate spawning beds.

- From the GRCA Fish management Plans (GRCA 2001):
  - Rehabilitate degraded habitat
  - Improve overwintering habitats
  - Integrate fish habitat restoration/rehabilitation into wildlife habitat management projects (shoreline works to improve habitat for waterfowl [i.e., consider aquatic vegetation plantings to encourage feeding areas, naturalize the shorelines with taller hydrophilic plants that may support nest materials and cover [i.e., cattails], provide stepped embankments to facilitate movement between the River and the shoreline habitat)
  - Restore riparian vegetation to naturalized condition

6.0 PRELIMINARY DESIGN AND PERMITTING CONSIDERATIONS

During design and construction of the final bridge rehabilitation/replacement, the Project has the potential to impact sensitive natural systems. While the study area is largely urban in nature, the Grand River and its valleyland are valuable features that promote natural heritage values. Consequently, all phases of the project, including the planning, design, construction, clean-up, and remediation phases, shall avoid or minimize the potential for impacts to the natural features identified. The following operational constraints, mitigation measures and protection recommendations shall be considered during the various phases of the Project to protect vegetation and wildlife, including fish and fish habitat.

Input is also provided on the preferred option from the natural environment perspective for the proposed alternative solutions for each bridge, as provided by GMBP on February 19, 2021.

6.1 Vegetation, Wetlands and Significant Valleylands

The following operational constraints, mitigation measures and protection recommendations shall be considered during Project activities to protect plant communities, wetlands and significant valleylands.

6.1.1 All Bridges

- Vegetated and wetland areas are to be maintained to the extent possible. The development area should be clearly marked.
- If it is deemed necessary to carry out project works with industrial equipment in wetland areas or to ford industrial equipment across wetland areas, swamp mats/pads should be used to protect the wetland ecosystem and prevent rutting
- If drilling or digging occurs in wetland areas the organic layer should be stockpiled and reinstated upon construction completion to salvage seed source

- Tree/shrub planting should be considered for planning purposes and limited to native species that exist currently within the site and region, and that are suitable for the microhabitat conditions (e.g., floodplain, slopes)
- All machinery should be cleaned prior to arrival in the study area to mitigate for the transfer of non-native and/or invasive species
- All disturbed areas should be restored to their original contour and gradient, re-stabilized with appropriate erosion and sediment control measures, and revegetated with native seed mix and/or planted with native species

6.1.2 Lorne Bridge

- If possible, a minimum setback of 30 m should be implemented from the unevaluated wetland mapped to the northwest of the bridge
- A permit will be submitted to GRCA for work within the regulated area associated with the unevaluated wetland, or for work within the wetland itself, in accordance with Ontario Regulation 150/06

6.1.3 Input on Alternative Solutions

In considering the potential for adverse impacts, the option to Rehabilitate Lorne Bridge results in the least amount of disturbance to vegetation, wetlands and the valleyland slope, and is therefore the preferable solution. The Replacement option is expected to result in significant temporary disturbance of the embankments for staging and equipment access, and the permanent footprint of the bridge would be expanded resulting in permanent loss of vegetation. However, the footprint is expected to expand to the south which would minimize disturbance and permanent adverse impacts to the wetland on the north side of Lorne Bridge.

All options for Brant's Crossing Bridge are not expected to have any permanent adverse impacts on vegetation or the significant valleyland as there is no increase in permanent footprint. Because the structure, or portions of the structure, would remain under all options, potential positive impacts to the valleyland (e.g., increased slope stabilization with removal of structures and rehabilitation of the slopes) are not expected. The options to Close and Retain, Rehabilitate, and Rehabilitate and Raise appear to have the least amount of temporary disturbance to vegetation. Close and Remove would require clearing for temporary crane access and it is anticipated that the Replace option would also require a certain amount of temporary disturbance for staging and access.

Similar to Brant's Crossing Bridge, all options for the TH&B Crossing Bridge are not expected to have any permanent adverse impacts on vegetation or the significant valleyland as there is no increase in permanent footprint. Because the structure, or portions of the structure, would remain under all options, potential positive impacts to the valleyland are not expected. The options to Close and Retain, Rehabilitate, and Rehabilitate and Raise appear to have the least amount of temporary disturbance to vegetation. Close and Remove would require clearing for temporary crane access and it is anticipated that the Replace option would also require a certain amount of temporary disturbance for staging and access.

Construction of a new pedestrian crossing has the highest likelihood for permanent and temporary impacts on vegetation and the significant valleyland as it will create a new footprint in previously undisturbed areas.

6.2 Wildlife and Wildlife Habitats

The following operational constraints, mitigation measures and protection recommendations shall be considered during project activities to protect wildlife and their habitats.

6.2.1 All Bridges

- All vegetation clearing should occur outside of the breeding bird season (April 15 – August 15). If this is not possible, a nesting survey will be completed by a qualified biologist in all areas to be cleared prior to clearing activities. If any active nests are found during the nesting survey, a buffer will be installed around the nest to protect against disturbance. Vegetation within the protection buffer cannot be removed until the young have fledged the nest.
- Avoid in-water work in the Grand River, particularly in the middle sections, during the winter waterfowl concentration season (Jan 1 – March 31).
- Fencing should be installed around active work areas to prevent movement of wildlife into these areas where they may be harmed.
- Any wildlife encountered within the active work area should be given the opportunity to leave the area on its own without harassment. Gaps in construction boundary fencing should be maintained until vegetation clearing is complete to provide wildlife with a route of escape.
- The area within all isolated work areas (i.e., areas where fencing creates a complete closed barrier) should be surveyed prior to the start of construction and any herpetofauna and other wildlife found must be removed from the area. Relocation of turtles, frogs, and other wildlife will be undertaken by qualified personnel possessing a valid Scientific Collectors Permit obtained from the MNRF.
- In the event that a wildlife individual is injured or does not leave the area on its own within a reasonable time frame (i.e., 24 h), the contractor should contact the City of Brantford Project manager for advice.

6.2.2 TH&B Crossing Bridge

- Avoid removal of the two snag trees during the maternity roosting season for bats (April 30 to July 31). If these trees need to be altered or removed, is it recommended that additional field surveys be completed to confirm if the habitat is being used by SAR bats. it is determined that these trees are habitat for SAR bats, a permit under the ESA may be required prior to removal (see Section 6.3.2).

6.2.3 Input on Alternative Solutions

The option to rehabilitate Lorne Bridge results in the least amount of disturbance to wildlife habitat, both temporarily and permanently, and is therefore the preferable solution. The replacement option is expected to result in significant temporary disturbance of the embankments for staging and equipment access, and the permanent footprint of the bridge would be expanded resulting in permanent loss of wildlife habitat. However, the footprint is expected to expand to the south which would minimize disturbance and permanent adverse impacts to potential amphibian and turtle habitat in the wetland on the north side of Lorne Bridge. Both options have the potential to cause disturbance to the cliff swallows nesting on Lorne Bridge.

All options for Brant's Crossing Bridge are not expected to have any permanent adverse impacts on wildlife or wildlife habitat in the vicinity of the bridge. The options to Close and Retain or Rehabilitate are expected to have the least amount of temporary disturbance to wildlife habitat. The Close and Remove option would require

clearing of the Lowland Deciduous Forest (FOD7) for temporary crane access, which may adversely impact habitat for birds, including eastern wood-pewee, if completed during the nesting season. The Rehabilitate and Raise option requires in-water works which may impact potential habitat for snapping turtle. Snapping turtle individuals may also be at risk of adverse impacts from in-water works associated with the Rehabilitate, Rehabilitate and Raise, and Replace options. Depending on where barricades were installed as part of the Close and Retain or Close and Remove options, there is potential for positive impacts to migration corridor habitat if the footpath to the crossing could be removed and the area rehabilitated.

All options for TH&B Crossing Bridge are not expected to have any permanent adverse impacts on wildlife or wildlife habitat in the vicinity of the bridge. The options to Close and Retain or Rehabilitate are expected to have the least amount of temporary disturbance to wildlife habitat. The Close and Remove option would require clearing of the Lowland Deciduous Forest (FOD7) for temporary crane access, which may adversely impact habitat for birds, including eastern wood-pewee, if completed during the nesting season. The Rehabilitate and Raise option requires in-water works which may impact potential habitat for snapping turtle. Snapping turtle individuals may also be at risk of adverse impacts from in-water works associated with the Rehabilitate, Rehabilitate and Raise, and Replace options. Depending on where barricades were installed as part of the Close and Retain or Close and Remove options, there is potential for positive impacts to migration corridor habitat if the footpath to the crossing could be removed and the area rehabilitated.

Construction of a new pedestrian crossing has the highest likelihood for permanent and temporary impacts on wildlife and wildlife habitats as it will create a new footprint in previously undisturbed areas and result in an increase in cumulative development within the wildlife corridor of the valleyland.

6.3 Threatened and Endangered Species

The following operational constraints and protection recommendations should be considered during project activities to protect species designated threatened or endangered and their habitat.

6.3.1 All Bridges

- Avoid removal of Lowland Deciduous Forest (FOD7) which may provide suitable habitat for tri-colored bat. If clearing of vegetation is required in this area, it is recommended that additional field surveys be completed to confirm if the habitat is being used by tri-colored bat. If habitat is confirmed, a permit under the ESA may be required to remove habitat and vegetation removal, specifically trees, should be avoided during the maternity roosting season for tri-colored bat (April 30 to July 31).
- Avoid removal of rocks, boulders and blocks along the armoured banks of the Grand River which may provide suitable habitat for eastern small-footed myotis. If alteration or removal of the habitat is required, it is recommended that additional field surveys be completed to confirm if the habitat is being used by eastern small-footed myotis. If habitat is confirmed, a permit under the ESA may be required to remove habitat and removal of habitat should avoided during the maternity roosting season for eastern small-footed myotis (April 30 to July 31).
- Regulated habitat for queensnake includes all continuous areas of a watercourse/waterbody up to the high water mark within 250 m of an area being used by queensnake, as well as the area up to 30 m inland from the high water mark. Although no individuals were observed during field surveys, the Grand River is known habitat for this species. It is recommended additional effort to survey for queensnake be conducted. If

presence is confirmed, a permit under the ESA may be required to remove habitat and removal of habitat should avoided during the active season for queensnake (April 15 to October 15).

6.3.2 TH&B Crossing Bridge

- Avoid removal of the two snag trees during the maternity roosting season for bats (April 30 to July 31). If the trees must be removed during this period, an exit survey shall be completed by a qualified biologist no more than 24 h prior to tree removal to confirm use by SAR bats. Any trees confirmed to be in current use will not be removed until the end of the maternity roosting season. A permit under the ESA may be required to remove the trees if it is confirmed as SAR habitat.

6.3.3 Input on Alternative Solutions

The option to rehabilitate Lorne Bridge results in minimal disturbance to potential habitat for SAR, both temporarily and permanently, and is therefore the preferable solution. The replacement option would result in permanent removal of Lowland Deciduous Forest (FOD7), which may provide habitat for tri-colored bat, and likely removal or disturbance of the armoured banks of the Grand River, which may provide habitat for eastern small-footed myotis. The replacement option may also result in permanent removal and alteration of habitat for queensnake.

Most options for Brant's Crossing Bridge are not expected to have any permanent adverse impacts on potential habitat for SAR in the vicinity of the bridge. The Close and Remove option would require clearing of the Lowland Deciduous Forest (FOD7) for temporary crane access, which may adversely impact tri-colored bat. The options to Close and Retain or Rehabilitate are expected to have the least amount of temporary disturbance to SAR habitat. Depending on the access route, the Close and Remove option may also have temporary adverse impacts on habitat for eastern small-footed myotis and queensnake. Queensnake individuals may also be at risk of adverse impacts from activity within and adjacent to the river as part of all options.

Most options for TH&B Crossing Bridge are not expected to have any permanent adverse impacts on potential habitat for SAR in the vicinity of the bridge. The Close and Remove option would require clearing of the Lowland Deciduous Forest (FOD7) for temporary crane access, which may adversely impact potential habitat tri-colored bat, particularly if the snag trees are removed. The options to Close and Retain or Rehabilitate are expected to have the least amount of temporary disturbance to SAR habitat. Depending on the access route, the Close and Remove option may also have temporary adverse impacts on habitat for eastern small-footed myotis and queensnake. Queensnake individuals may also be at risk of adverse impacts from activity within and adjacent to the river as part of all options.

Construction of a new pedestrian crossing has the highest likelihood for permanent and temporary impacts on threatened and endangered species and their habitats as it will create a new footprint in previously undisturbed areas.

6.4 Fish and Fish Habitats

6.4.1 All Bridges

The following operational constraints, mitigation measures and protection recommendations shall be considered during Project activities to protect fish and fish habitats:

- As work is being completed within a fish bearing watercourse a DFO Request for Review shall be submitted for the Project. Dependant upon the type of work being undertaken, residual effects of the project that may result in the harmful alternation, disruption or destruction to fish habitats and/or as a result of the DFO review process, a DFO *Fisheries Act* Authorization for the project may be required.
- As work is taking place within the Grand River, a GRCA permit application for the alteration of the watercourse shall be completed for the Project.
- The extent and duration of near or in-work will be minimized to the extent possible.
- All construction will take place outside of the MNRF restricted fisheries timing window, which restricts in or near water work from **March 15 to July 15 (i.e., in-water work can occur from July 16 to March 14)[1].**
- Construction activities shall be scheduled to avoid wet and rainy periods and in-water works shall be conducted during low flow conditions.
- Existing trails and roads shall be used wherever possible as access routes to avoid disturbance to waterbody banks and riparian vegetation areas.
- The contractor will develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation of the watercourse and wetland during all phases of the Project. A response plan should also be developed that is to be implemented immediately in the event of a sediment release. Effective erosion and sediment control measures shall be installed before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and conduct regular maintenance and repairs as necessary.
- Construction will take place in isolation (i.e., silt curtains/coffer dams and pumps) will be used.
- Temporary water control structures (i.e., silt curtains, coffer dams and sandbags) and materials placed in water will consist of clean, washed sheet material that is adequately embedded to withstand the anticipated flows during construction.
- Flow control methodology will be verified during construction and may change due to site specific requirements. Dewatering methods (if required), shall be developed for the Project.
- Water discharges should be appropriately filtered to remove suspended sediments. The water pump used to dewater the work area will pump water to a sediment control device or will allow for natural attenuation, so that suspended sediments can settle out before re-entry into the watercourse.
- Water withdrawal and by-pass pumps should be appropriately screened using the DFO Freshwater Intake End of Pipe Fish Screen Guidelines (DFO 2020b).
- Fish must be removed from all isolated work areas, prior to construction. Relocation of fish will be undertaken by qualified personnel possessing a valid Licence to Collect Fish for Scientific Purposes obtained from the MNRF.

[1] Note that the winter waterfowl concentration season conflicts with the above and no work is to be completed from January 1 to March 31 of a given year.

- The contractor will develop and implement a Spill Prevention and Response Plan that minimizes risk of accidental spills or releases from entering the watercourse during all phases of the Project. Equipment should be in clean condition (free of excess or leaking fuel, lubricants, or any other deleterious substances) and should be operated to minimize disturbance to waterbody banks and riparian vegetation. Perform as many construction activities as possible well away from the watercourse (i.e., staging, preparation, construction of parts). The washing, refuelling, and servicing of machinery and storage of fuel and other materials should be conducted at least 30 m away from the watercourse and wetland to prevent any deleterious substances from entering the water.
- Equipment shall be operated above the high-water mark/from top of bank/from a floating barge unless specified in the contract documents and/or debris removal shall be completed by hand within the watercourse, wherever possible.
- Barges or shrouding shall be used to trap and prevent concrete and other bridge materials from entering the waterbody.
- Limit tree removal to the extent possible. Only the vegetation required to accommodate operational and safety concerns for the Project should be removed. The area over which vegetation in riparian vegetation areas is removed shall affect no more than one third (1/3) of the total woody vegetation in the right-of-way within 30 metres of the ordinary high-water level of a waterbody. Vegetative root masses found within the waterbody banks shall remain undisturbed unless specified in the Contract Documents.
- All disturbed areas should be restored to their original contour and gradient, re-stabilized with appropriate erosion and sediment control measures, and revegetated with native seed mix and/or planted with native species.
- The removal of natural woody debris, rocks, sand, or other material from the banks, the shoreline, or the bed of the watercourse or waterbody will be minimized below the high-water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.
- All stockpiled and water materials (i.e., dredging spoils, construction waste and materials, uprooted or cut aquatic plants, accumulated debris) should be contained and stabilized above the high-water mark of the watercourse to prevent re-entry
- Best management practices, including lighting, noise, sediment and erosion controls, spill prevention, etc., are implemented during the construction phase of the Project.
- All requirements, not described above, but identified as part of advice, permits, approvals or authorizations for the Project from relevant agencies are to be adhered to.

The following are the recommended Ontario Provincial Standard Specification (OPSS), Standard Provisions (SP), and Non-Standard Provisions (NSP) that are to be applied to the Project:

- **OPSS 182** General Specification for Environmental Protection for Construction in and Around Waterbodies and on Waterbody Banks
- **SSP101F23 – Table A** Timing of In-Water Works, Oversight Requirements, and Measures to Avoid Harm to Fish
- **OPSS 804** Construction Specification for Seed and Cover

- **OPSS 805** *182.07.04 Erosion and Sediment Control*
- ***SP 805F01*** *Temporary Erosion and Sediment Control, Timing Constraints for Installation and Removal.*
- **OPSS 180** General Specification for The Management of Excess Materials
- **NSSP** (Equipment Refueling, Maintenance and Washing, Storage Area for Equipment and Materials, General Environmental Protection Requirements, Erosion and Sedimentation Control)
- **WC-12** MTO Drainage Management Manual

6.4.2 Input on Alternative Solutions

The option to Rehabilitate Lorne Bridge results in the least impact on fish and fish habitat. Although in both options, near and in-water works are required, the temporary nature and limited period of disturbance of the activities associated with the Rehabilitation is favourable compared to the Replacement option. The Replacement option will require significant in-water work and disturbance of the embankments and riverbed that may permanently alter the riparian vegetation, substrates, cover and habitat types available, and adversely affect sensitive fish habitat.

For Brant's Crossing Bridge, the options to Close and Retain or Close and Remove are not expected to have any permanent adverse impacts on fish and fish habitat as there will be no increase in the permanent footprint. The close and retain option would have the least amount of impact to fish and fish habitat (including aquatic SAR species and habitat). The Close and Remove option would require vegetation clearing for temporary crane access and equipment use in near water areas. The Close and Remove option would have temporary adverse effects to fish habitat through changes in the riparian and overhanging vegetation available. Although these two options do not address the need for increased slope stabilization and rehabilitation, they would have the least amount of impact to fish and fish habitat and aquatic SAR habitat. The options to Rehabilitate, Rehabilitate and Raise or Replace the Brant's Crossing Bridge have the most potential for adverse effects to fish and fish habitat as all require in-water work and disturbance of the embankments and riverbed, that may permanently alter the riparian vegetation, substrates, cover and habitat types available, and adversely affect sensitive fish habitat. The Rehabilitate and Raise option has the potential for the highest impact to fish and fish habitat due to increased construction duration.

The options for the TH&B Crossing Bridge with the least impact to fish and fish habitat are the Close and Retain or the Close and Remove Option. These options do not require in-water work and the construction will be limited to a short period of temporary disturbance of the riparian area. All other options for Rehabilitation or Replacement require in-water works and have the potential to adversely affect fish and fish habitat as well as aquatic SAR habitat. The Rehabilitate and Raise option is the least favourable due to the longer construction duration, therefore increasing the potential for residual effects to fish and fish habitat such as permanent alterations of the embankments and riverbed, as well as temporary impacts to riparian and overhanging vegetation.

Construction of a new pedestrian crossing has the highest likelihood for permanent and temporary impacts on fish and fish habitats including aquatic SAR and their habitats as it will create a new footprint in previously undisturbed areas.

6.5 Permitting Requirements

As the Project work involves work near or in-water, which is fish habitat under the *Fisheries Act*, a DFO Request for Review (RFR) is required.

As alterations are anticipated within the Grand River, a permit is required under GRCA Regulation 150/06: *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* (Ontario 2006).

Potential suitable habitat for species designated threatened and endangered under the *Endangered Species Act* were identified in the study area. If individuals or habitat are expected to be impacted, a permit or registration under the ESA may be required.

7.0 SUMMARY

A summary of significant natural heritage features identified within the study area, recommended setbacks and other mitigation measures are provided in Table 2.

Potential enhancement opportunities and recommendations are provided in Section 5.0 and include enhancement to riparian and vegetated areas to support fish and wildlife habitats and migration routes as well as enhancement to in-water fish habitat features.

Bridge rehabilitation/replacement activities have the potential to impact sensitive natural systems during design and construction. All phases of the project, including the planning, design, construction, clean-up, and remediation phases, shall avoid or minimize the potential for impacts to the natural features identified. A list of recommended operational constraints, mitigation measures and protection recommendations for consideration during project activities are provided in Section 6.0.

Table 2: Summary of Natural Environment Constraints and Typical Setbacks

Natural Environment Feature	Description and Location	Responsible Agency	Development Constraint[1]	Setback	Setback Flexibility[2]	Mitigation
Significant Valleyland / Environmental Control Policy Area	■ Grand River valleyland	MMAH / MNRF / City of Brantford	Development within or adjacent (i.e., within 120 m) requires impact assessment	10 m from top of bank	Negotiable	■ Must demonstrate no adverse impacts to feature or function
Regulatory Floodplain / Environmental Protection Area	■ As mapped	City of Brantford	Development within or adjacent (i.e., within 120 m) requires impact assessment	Varies	Negotiable	■ Must demonstrate no adverse impacts to feature or function
Significant Wildlife Habitat (Environmental Control Policy Area)	■ Habitat for monarch and common nighthawk – marsh (MAM2-2; MAM2-9) and meadow (CUM) ■ Habitat for eastern wood-pewee - Lowland Deciduous Forest (FOD7) ■ Habitat for snapping turtle – Grand River ■ Regional wildlife corridor – Grand River valleyland ■ Regionally significant Waterfowl Winter Concentration Area – Grand River	City of Brantford	Development within or adjacent (i.e., within 120 m) requires impact assessment	Varies	Negotiable	■ Must demonstrate no adverse impacts to feature or function
Species at Risk - Endangered or Threatened Species	■ Habitat for tri-colored bat (END) - Lowland Deciduous Forest (FOD7) ■ Habitat for queensnake (END) and eastern small-footed myotis (END) – Grand River and banks ■ Habitat for little brown myotis (END) habitat and chimney swift (THR) - structures within study area of Lorne Bridge and TH&B Crossing Bridge	MECP	Development within or adjacent (i.e., within 120 m) requires impact assessment	Varies	Absolute	■ Development proposed within habitat for endangered or threatened species requires a permit ■ Must demonstrate no adverse impacts to species or its habitat, depending on the permit type ■ If species or habitat will be impacted, permitting or authorization under the *Endangered Species Act* may be required
GRCA Regulated Areas (wetland, watercourse or waterbody)	■ Grand River ■ Unevaluated wetland (MAM2-2)	GRCA	Development within or adjacent (i.e., within 30 m) to the watercourse or wetland (i.e., regulated limit) requires impact assessment	30 m from high-water mark	Absolute	■ Development proposed within the regulated limit requires a permit from the GRCA
Fish Habitat	■ Grand River	DFO	Development within or adjacent (i.e., within 30 m) requires impact assessment	15 m (warm water) 30 m (cold/cool water)	Absolute	■ Must demonstrate no adverse impacts to fish or fish habitat ■ If fish or fish habitat will be impacted, permitting under the *Fisheries Act* may be required

Notes: DFO=Department of Fisheries and Oceans; MECP=Ministry of Environment, Conservation, and Parks; MMAH = Ministry of Municipal Affairs and Housing; GRCA=Grand River Conservation Authority
[1] Development constraints are based on the City of Brantford Official Plan (Brantford 2020), Provincial Policy Statement (MMAH 2020a), *Endangered Species Act*, *Fisheries Act*, and GRCA O. Reg. 150/06.
[2] Setback flexibility is defined as follows:
Negotiable – reduced setbacks may be negotiated with the responsible agency, typically through completion of an environmental impact study
Absolute – setbacks are generally not subject to negotiation, except where the proponent obtains appropriate permits from the responsible agency. Permits may not be available for all features.

8.0 CONCLUSIONS AND RECOMMENDATIONS

An overview of the existing natural environment conditions within the study area, for 1) the Lorne Bridge crossing, 2) the Brant's Crossing Bridge and the TH&B Crossing Bridge was provided based on a field survey and a review of existing natural environment data. Recommendations specific to the natural environment assessed and for consideration during the conceptual design and project planning phases of the Project were addressed. Input was also provided on the preferred option from the natural environment perspective for the proposed alternative solutions for each bridge, as provided by GMBP on February 19, 2021.

It is recommended that a comprehensive impact assessment be conducted as part of the detailed design stage to confirm what permits, if any, are required.

9.0 LIMITATIONS

This report was prepared for GMBP for the submission to the City of Brantford. The report, which specifically includes all tables, figures and appendices, is based on data and information collected by Golder, and reflects the conditions within the study area at the time of the site investigations, supplemented by data obtained by Golder from external sources as described in this report. Golder has exercised reasonable skill, care, and diligence to assess the external data acquired during the preparation of this assessment but makes no guarantees or warranties as to the accuracy, currency, or completeness of this information. This report is based upon and limited by circumstances and conditions acknowledged herein, and upon information available at the time of authoring.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

10.0 CLOSURE

We trust that this report meets your requirements. If you have any questions regarding the content of this report, please do not hesitate to contact the undersigned.

Signature Page

Golder Associates Ltd.

Amber Sabourin, HBSc (Env)
Ecologist

Jill LaPorte, BSc
Aquatic Biologist

Heather Melcher, MSc
Senior Ecologist, Principal

JLL/AS/HM/mp

https://golderassociates.sharepoint.com/sites/113598/project files/6 deliverables/natural environment/final/19128291-r-rev0-ner gmbp brantford bridges combined-04mar2021.docx

REFERENCES

Bat Conservation International (BCI). 2020. Species Profiles. [accessed 24 March 2020]. http://www.batcon.org/resources/media-education/species-profiles

Brant, County of. 2012. County of Brant Official Plan. [accessed 25 June 2020]. https://www.brant.ca/en/invest-in-brant/resources/Text---Official-Plan-final-2016.pdf

Brantford, City of. 2020. The Official Plan of the City of Brantford. [accessed 25 June 2020]. https://www.brantford.ca/en/business-and-development/resources/Documents/Official-Plan/Official-Plan-ALL.pdf

Brown MB, Brown CR. 2019. Barn Swallow (*Hirundo rustica*). In The Birds of North America Online (P. G. Rodewald, ed), version 2.0. Ithaca NY: Cornell Lab of Ornithology; [accessed 20 November 2019]. https://doi.org/10.2173/bna.barswa.02.

Cadman MD, Sutherland DA, Beck GG, Lepage D, Couturier AR, editors. 2007. Atlas of the Breeding Birds of Ontario. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. xxii + 706 p.

Canada (Government of Canada). 1985. *Fisheries Act.* R.S.C., 1985, c. F-14. Current to 28 June 2020. Ottawa ON: Minister of Justice. https://laws-lois.justice.gc.ca/eng/acts/f-14/

Canada (Government of Canada). 1994. *Migratory Birds Convention Act*. S.C. 1994, c. 22. Current to 28 June 2020. Ottawa ON: Minister of Justice. https://laws-lois.justice.gc.ca/eng/acts/m-7.01/

Canada (Government of Canada). 2002. *Species at Risk Act*. S.C. 2002, c. 29. Current to 28 June 2020. Ottawa ON: Minister of Justice. https://laws-lois.justice.gc.ca/eng/acts/s-15.3/

Canadian Council Ministers of the Environment (CCME). 1999. Canadian Environmental Quality Guidelines for the Protection of Aquatic Life (CWQG), 2014 update. Available at: http://ceqg-rcqe.ccme.ca/en/index.html#void. [date unknown – current; accessed 28 June 2020].

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. COSEWIC assessment and status report on the Chimney Swift Chaetura pelagica in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_chaetura_pelagica_e.pdf. vii + 49 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2008. COSEWIC assessment and status report on the Snapping Turtle Chelydra serpentina in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_snapping_turtle_0809_e.pdf. vii + 47 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2010. COSEWIC assessment and status report on the Monarch *Danaus plexippus* in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada. [accessed 22 November 2019]. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Monarch_0810_e1.pdf

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011. COSEWIC assessment and status report on the Barn Swallow Hirundo rustica in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_barn_swallow_0911_eng.pdf. ix + 37 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC assessment and status report on the Eastern Wood-pewee Contopus virensin Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Eastern%20Wood-pewee_2013_e.pdf. x + 39 p.

Dobbyn JS. 1994. Atlas of the Mammals of Ontario. Toronto ON: Federation of Ontario Naturalists. 120 p.

Early Detection and Distribution (EDD) Maps Ontario. 2020. Early Detection and Distribution Mapping System. Developed by The University of Georgia - Center for Invasive Species and Ecosystem Health. Available at: https://www.eddmaps.org/ontario/. [date unknown – current; accessed 28 June 2020].

eBird. 2020. eBird: An online database of bird distribution and abundance. Ithaca NY: eBird; [date unknown – current; accessed 24 March 2020]. https://ebird.org/map/.

ECCC (Environment and Climate Change Canada). 2018. Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Ottawa ON: Environment and Climate Change Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Rs-TroisChauveSourisThreeBats-v01-2019Nov-Eng.pdf. ix + 172 p.

ECCC (Environment and Climate Change Canada). 2020. Species at Risk Public Registry. [modified 29 November 2019; 24 March 2020]. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

Fisheries and Oceans Canada (DFO). 2019. Fisheries Protection Policy Statement. Ecosystem Programs Policy. Her Majesty the Queen in Right of Canada. [Modified: 24 September 2019; Accessed: 16 June 2020] https://www.dfo-mpo.gc.ca/pnw-ppe/policy-politique-eng.html

Fisheries and Oceans Canada (DFO). 2020. Aquatic Species at Risk Mapping. [Accessed 15 June 2020] http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html.

Garrison BA. 1999. Bank Swallow (*Riparia riparia*). The Birds of North America Online (AF Poole and FB Gill, eds). Ithaca NY: Cornell Lab of Ornithology; [accessed 20 November 2019]. https://doi.org/10.2173/bna.414.

Gillingwater SD. 2011. Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://www.ontario.ca/page/queensnake-recovery-strategy.

GRCA (Grand River Conservation Authority). 2001. Technical Background Report for the Grand River Fisheries Management Plan. Draft Report. Prepared for: Fisheries and Oceans Canada. [accessed 15 June 2020] https://www.grandriver.ca/en/our-watershed/resources/Documents/Fishery/Fishery_ManagementPlan_TechReport.pdf

GRCA (Grand River Conservation Authority). 2005. Exceptional Waters Reach State of the Resource Report: Paris to Brantford. Prepared by: R. Scott & J. Imhof, with contributions from S. Bellamy, D. Boyd, S. Cooke, J.Wright, T. Zammit, (GRCA); K. Cornelisse, A.Timmerman, (OMNR). [accessed: 16 June 2020] https://www.grandriver.ca/en/our-watershed/resources/Documents/Fishery/Fishery_Exceptional_State.pdf

GRCA (Grand River Conservation Authority). 2006. Exceptional Waters Resource Management Plan-Draft. 31 March 2006. [accessed: 16 June 2020] https://www.grandriver.ca/en/our-watershed/resources/Documents/Fishery/Fishery_Exceptional_ResourcePlan.pdf

GRCA (Grand River Conservation Authority). 2014. Grand River Watershed Water Management Plan. Prepared by the Project Team, Water Management Plan. Grand River Conservation Authority, Cambridge, ON. 137p. + appendices [accessed 15 June 2020] https://www.grandriver.ca/en/our-watershed/resources/Documents/WMP/Water_WMP_Plan_Complete.pdf

GRCA (Grand River Conservation Authority). 2020. Grand River Information Network. [accessed 29 Jun 2020] https://maps.grandriver.ca/web-gis/public/?theme=General&bbox=407843,4740907,720099,4898615

Humphrey C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (Myotis leibii) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://files.ontario.ca/mnrf_sar_rs_esfm_final_accessible.pdf vii + 76 p.

iNaturalist. 2020. Observations Map. [access 24 July 2020]. https://www.inaturalist.org/observations/.

Jones C, Layberry R, Macnaughton A, Cavasin R, Edwards B. 2020. Ontario Butterfly Atlas. [updated April 2019; accessed 24 March 2020]. Toronto Entomologists' Association. http://www.ontarioinsects.org/atlas_online.htm

Lee HT, Bakowsky WD, Riley J, Bowles J, Puddister M, Uhlig P, McMurray S. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. North Bay ON: Ontario Ministry of Natural Resources, South Central Region, Science Development and Transfer Branch. (SCSS Field Guide FG-02). 225 p.

Leslie J. 2018. Vascular Plants at Risk in Ontario. Savanta Inc. May 2018. [accessed 24 March 2020]. http://cms.savanta.ca/sites/default/files/2018-08/SAR_Document_2018_05_25_1.pdf. 96 p.

MMAH (Ontario Ministry of Municipal Affairs and Housing). 2019. Growth Plan for the Greater Golden Horseshoe. [accessed 22 November 2019]. https://files.ontario.ca/mmah-greater-golden-horseshoe-place-to-grow-english-15may2019.pdf

MMAH (Ontario Ministry of Municipal Affairs and Housing). 2020. Provincial Policy Statement. [accessed 24 July 2020]. https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf

MNR (Ontario Ministry of Natural Resources). 2000. Significant Wildlife Habitat Technical Guide. Peterborough ON: Ontario Ministry of Natural Resources and Forestry Fish and Wildlife Branch, Wildlife Section; [accessed 22 November 2019]. https://docs.ontario.ca/documents/3620/significant-wildlife-habitat-technical-guide.pdf. 151 pp.

MNR (Ontario Ministry of Natural Resources). 2010. Natural Heritage Reference Manual for Natural Heritage Polices of the Provincial Policy Statement, 2005. 2nd Ed. Toronto ON: Queen's Printer for Ontario; [accessed 22 November 2019]. https://docs.ontario.ca/documents/3270/natural-heritage-reference-manual-for-natural.pdf. 233 p.

MNRF (Ontario Ministry of Natural Resources and Forestry). 2014. Ontario Wetland Evaluation System Southern Manual. 3rd Edition, Version 3.3. Queen's Printer for Ontario.

MNRF (Ontario Ministry of Natural Resources and Forestry). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. Peterborough ON: Ontario Ministry of Natural Resources and Forestry Regional Operations Division, Southern Region Resource Section. https://dr6j45jk9xcmk.cloudfront.net/documents/4776/schedule-7e-jan-2015-access-vers-final-s.pdf. 40 p.

MNRF (Ontario Ministry of Natural Resources and Forestry). 2020a. Land Information Ontario. [accessed 24 March 2020]. https://www.ontario.ca/page/land-information-ontario

MNRF (Ontario Ministry of Natural Resources and Forestry). 2020b. Species at Risk in Ontario List. [accessed 24 March 2020]. https://www.ontario.ca/page/species-risk-ontario

MNRF (Ontario Ministry of Natural Resources and Forestry). 2020c. Land Information Ontario, Aquatic Resources Area Layer. Fisheries Section, Species Conservation Policy Branch; [accessed 24 March 2020].

MNRF (Ontario Ministry of Natural Resources and Forestry). 2020d. Fish ON-Line. Queen's Printer for Ontario; [accessed 24 March 2020]. https://www.gisapplication.lrc.gov.on.ca/FishONLine/Index.html?site=FishONLine&viewer=FishONLine&locale=en-US

Ministry of Environment, Conservation and Parks (MECP; formerly Ministry of the Environment [MOE]), 1994. Water Management Policies, Guidelines, Provincial Water Quality Objectives, Ontario. With updates in 2009. Available at: https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives. [date unknown – current; accessed 28 June 2020].

NHIC (Natural Heritage Information Centre). 2020. Make a Map: Natural Heritage Areas. Peterborough ON: Queen's Printer for Ontario; [accessed 24 March 2020]. https://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US

Ontario (Government of Ontario). 2006. O. Reg. 150/06: Nottawasaga Valley Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Current to 13 July 2020. https://www.ontario.ca/laws/regulation/060150

Ontario (Government of Ontario). 2007. *Endangered Species Act*. S.O. 2007. Current to 13 July 2020. https://www.ontario.ca/laws/statute/07e06

Ontario Nature. 2020. Ontario Reptile and Amphibian Atlas. [accessed 24 March 2020]. https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/species/

Rowe JS. 1972. Forest Regions of Canada. Publication No. 1300. Ottawa ON: Canadian Forestry Service, Department of the Environment. 172 p.

Sandilands A. 2007. Common Nighthawk, pp. 308-309 in Cadman, MD, Sutherland DA, Beck GG, Lepage D, Couturier AR, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature. xxii + 706 p.

Personal Communications

Buck G. 2020. Management Biologist, Ministry of Natural Resources and Forestry-Guelph District. Email response: MNRF Review Grand River Three Bridges Info Request. 5 May 2020.

APPENDIX A

Vegetation and Vegetation Community Results

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	Coeff. of Wetness[c]	ESA[d]	Location[e]
Trees (8 taxa)							
American Elm	*Ulmus americana*	N	S5	G5	-3	–	1, 4
Eastern Cottonwood	*Populus deltoides*	N	S5	G5	0	–	1
Manitoba Maple	*Acer negundo*	(I)	S5	G5	0	–	1
Norway Maple	*Acer platanoides*	I	SNA	GNR	5	–	1
Silver Maple	*Acer saccharinum*	N	S5	G5	-3	–	1
Sugar Maple	*Acer saccharum*	N	S5	G5	3	–	1
White Ash	*Fraxinus americana*	N	S4	G5	3	–	1, 4
Willow sp.	*Salix* sp.	–	–	–	–	–	1
Small trees, shrubs and woody vines (8 taxa)							
Currant sp.	*Ribes* sp.	–	–	–	–	–	3
Fragrant Sumac	*Rhus aromatica*	N	S4	G5	5	–	1
Morrow's Honeysuckle	*Lonicera morrowii*	I	SNA	GNR	3	–	1
Prickly Rose	*Rosa acicularis*	N	S5	G5	3	–	1
Riverbank Grape	*Vitis riparia*	N	S5	G5	0	–	1, 3, 4
Staghorn Sumac	*Rhus typhina*	N	S5	G5	3	–	1, 3, 4
Virginia Creeper	*Parthenocissus quinquefolia*	N	S4?	G5	3	–	1, 3
Willow sp.	*Salix* sp.	–	–	–	–	–	4
Graminoids (4 taxa)							
Creeping Bentgrass	*Agrostis stolonifera*	I	SNA	G5	-3	–	1
European Reed	*Phragmites australis*	I	SNA	G5T5	-3	–	2
Reed Canary Grass	*Phalaris arundinacea*	N	S5	G5	-3	–	2, 3, 4
Smooth Brome	*Bromus inermis*	I	SNA	G5	5	–	1
Forbs (27 taxa)							
Bedstraw sp.	Galium sp.	–	–	–	–	–	4
Bird's-foot Trefoil	*Lotus corniculatus*	I	SNA	GNR	3	–	1
Cabbage Thistle	*Cirsium oleraceum*	I	–	–	–	–	2
Canada Anemone	*Anemonastrum canadense*	N	S5	G5	-3	–	1
Common Comfrey	*Symphytum officinale*	I	SNA	GNR	5	–	2
Common Dandelion	*Taraxacum officinale*	I	SNA	G5	3	–	4
Common Hemp-nettle	*Galeopsis tetrahit*	I	SNA	GNR	3	–	1
Common Milkweed	*Asclepias syriaca*	N	S5	G5	5	–	1
Canada Thistle	*Cirsium arvense*	I	SNA	G5	3	–	1
Dame's Rocket	*Hesperis matronalis*	I	SNA	G4G5	3	–	1, 2, 4
Field Bindweed	*Convolvulus arvensis*	I	SNA	GNR	5	–	2, 3
Field Mustard	*Brassica rapa*	I	SNA	GNR	5	–	4
Garlic Mustard	*Alliaria petiolata*	I	SNA	GNR	0	–	1
Goldenrod	–	–	–	–	–	–	4
Great Burdock	*Arctium lappa*	I	SNA	GNR	3	–	1, 2, 3, 4
Great Ragweed	*Ambrosia trifida*	N	S5	G5	0	–	1
Ground Ivy	*Glechoma hederacea*	I	SNA	GNR	3	–	3, 4
Leafy Spurge	*Euphorbia esula*	I	–	–	–	–	1
Night-flowering Campion	*Silene noctiflora*	I	SNA	GNR	5	–	1
Philadelphia Fleabane	*Erigeron philadelphicus*	N	S5	G5	-3	–	1
Purple-stemmed Angelica	*Angelica atropurpurea*	N	S5	G5	-5	–	3
Slender Yellow Wood-sorrel	*Oxalis dillenii*	N	S5?	G5	3	–	1
Spotted Jewelweed	*Impatiens capensis*	N	S5	G5	-3	–	3
Swamp Loosestrife	*Decodon verticillatus*	N	S5	G5	-5	–	1
Swamp Milkweed	*Asclepias incarnata*	N	S5	G5	-5	–	3
Virginia Waterleaf	*Hydrophyllum virginianum*	N	S5	G5	0	–	1
Wild Carrot	*Daucus carota*	I	SNA	GNR	5	–	1

[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2019)
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
NA = Not applicable [used mainly for abundance of non-natives; NR = Not ranked [used mainly for non-natives];
Q = Taxonomic questions not fully resolved; T = sub-specific taxon (taxa) present in the province; U = Uncertain.

[c] Coefficient of wetness defines a species affinity for wet soil conditions. Negative signs (-) indicate a wet tendency, while postiive signs (+) indicate a dry tendency.

[d] *Endangered Species Act* (ESA), 2007 (O.Reg 242/08 last amended 27 March 2018 as O.Reg 219/18). Species at Risk in Ontario List, 2007 (O.Reg 230/08 last amended 1 Aug 2018 as O. Reg 404/18, s. 1.)
END= Endangered; THR = Threatened; SC = Special Concern

[e] Locations:
1 = FOD7
2 = MAM2-2
3 = MAM2-9
4 = CUM/CUT

APPENDIX B

Species at Risk Screening

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur in the Study Area	Rationale for Potential to Occur in the Study Area
Arthropod	Hackberry emperor	*Asterocampa celtis*	—	—	—	S3	In Ontario, hackberry emperor is found along woodland edges, wooded creeks and wooded roadsides. Caterpillars feed on various hackberries (*Celtis* spp.). Adults rarely take nectar from flowers, instead foraging on sap, rotting fruit, dung and carrion (NatureServe 2018).	Low	No hackberry was observed during the field investigations to provide suitable habitat for host plants. Few trees providing fruit or sap were identified.
Arthropod	Monarch	*Danaus plexippus*	SC	SC	END	S2N, S4B	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there is milkweed (*Asclepias* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies, and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	Moderate	Scattered milkweed plants were observed within the study area. However, this is unlikely to support a large concentration of individuals. Other flowering plants in the meadow marsh and meadow habitats may provide suitable foraging habitat.
Arthropod	Rusty-patched bumble bee	*Bombus affinis*	END	END	END	S1	In Ontario, rusty-patched bumble bee is found in areas from the southern Great Lakes – St. Lawrence forest region southwards into the Carolinian forest. It is a habitat generalist, but it is typically found in open habitats, such as mixed farmland, savannah, marshes, sand dunes, urban and lightly wooded areas. It is cold – tolerant and can be found at high elevations. Most recent sightings in Ontario have been in oak savannah habitat with well-drained, sandy soils and moderately open canopy. It requires an abundance of flowering plants for forage. This species most often builds nests underground in old rodent burrows, but also in hollow tree stumps and fallen dead wood (Colla and Taylor-Pindar 2011). The only recent sightings in Ontario are from the Pinery Provincial Park.	Low	Although there is potential habitat within the riparian areas of the Grand River within the study area, the most recent occurrence record in the area is from 1940. The only currently known population is in Pinery Provincial Park. Due to the rarity of the species within the province, it is not likely to occur within the study area.
Arthropod	Tawny emperor	*Asterocampa clyton*	—	—	—	S3	In Ontario, tawny emperor is found in southwestern Ontario, occurring most commonly in Point Pelee and Pelee Island. The most northerly record in Ontario is from Goderich in Huron County (CBIF 2014). It is primarily a woodland species, and can be found in densely wooded riparian areas, dry woods, open woods, cities, fencerows, and parks. The caterpillars feed on trees of the elm family while adults forage on tree sap, rotting fruit, dung, and carrion (Butterflies and Moths of North America 2019).	Low	Although there is potentially suitable habitat in the riparian areas of the Grand River within the study area, this species is not commonly observed outside of the Pelee region and is unlikely to occur within the study area.
Bird	Bank swallow	*Riparia riparia*	THR	THR	THR	S4B	In Ontario, bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and riverbanks, sand and gravel pits, and roadcuts. Nests are generally built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	Moderate	No suitable exposed banks were observed to provide nesting habitat. Individuals nesting in the local landscape may forage over the Grand River and individuals have been observed along the Grand River in the vicinity of the study area (eBird 2020).

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur in the Study Area	Rationale for Potential to Occur in the Study Area
Bird	Barn swallow	*Hirundo rustica*	THR	THR	THR	S4B	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-way's, and wetlands (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 2019).	Moderate	Although any of the three bridges may provide potential nesting habitat, no nests were observed during field investigations. The Grand River provides suitable foraging habitat and individuals have been observed along the Grand River in the vicinity of the study area (eBird 2020).
Bird	Bobolink	*Dolichonyx oryzivorus*	THR	THR	THR	S4B	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Renfrew et al. 2015).	Low	There is no suitable breeding habitat within the study area.
Bird	Canada warbler	*Cardellina canadensis*	SC	THR	THR	S4B	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low	There is no suitable breeding habitat within the study area.
Bird	Cerulean warbler	*Setophaga cerulea*	THR	END	END	S3B	In Ontario, breeding habitat of cerulean warbler consists of second-growth or mature deciduous forest with a tall canopy of uneven vertical structure and a sparse understory. This habitat occurs in both wet bottomland forests and upland areas, and often contains large hickory and oak trees. This species may be attracted to gaps or openings in the upper canopy. The cerulean warbler is associated with large forest tracks but may occur in woodlots as small as 10 ha (COSEWIC 2010). Nests are usually built on a horizontal limb in the mid-story or canopy of a large deciduous tree (Buehler et al. 2013).	Low	There is no suitable breeding habitat within the study area.
Bird	Chimney swift	*Chaetura pelagica*	THR	THR	THR	S4B, S4N	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	High	Chimney swift was observed flying over the study area during field investigations and was likely foraging over the Grand River. Buildings within the study area may have chimneys that are suitable to support nesting or roosting habitat for this species.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur in the Study Area	Rationale for Potential to Occur in the Study Area
Bird	Common nighthawk	*Chordeiles minor*	SC	THR	SC	S4B	In Ontario, these aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bogs, fens, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007).	Moderate	The riparian habitat and some of the islands of the Grand River within the study area may provide suitable nesting habitat, and the open riparian corridor may also provide suitable foraging habitat. In addition, there are occurrence records in the vicinity of the study area (eBird 2020).
Bird	Eastern meadowlark	*Sturnella magna*	THR	THR	THR	S4B	In Ontario, eastern meadowlark breeds in pastures, hayfields, meadows and old fields. Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2019). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970).	Low	There is no suitable breeding habitat within the study area.
Bird	Eastern wood-pewee	*Contopus virens*	SC	SC	SC	S4B	In Ontario, eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats, including deciduous, coniferous, or mixed forests. It occurs most frequently in forests with some degree of openness. Intermediate-aged forests with a relatively sparse midstory are preferred. In younger forests with a relatively dense midstory, it tends to inhabit the edges. Also occurs in anthropogenic habitats providing an open forested aspect such as parks and suburban neighborhoods. Nest is constructed atop a horizontal branch, 1-2 m above the ground, in a wide variety of deciduous and coniferous trees (COSEWIC 2012).	Moderate	The deciduous riparian forest along the Grand River may provide suitable habitat.
Bird	Golden-winged warbler	*Vermivora chrysoptera*	SC	THR	THR	S4B	In Ontario, golden-winged warbler breeds in regenerating scrub habitat with dense ground cover and a patchwork of shrubs, usually surrounded by forest. Their preferred habitat is characteristic of a successional landscape associated with natural or anthropogenic disturbance such as rights-of-way, and field edges or openings resulting from logging or burning. The nest of the golden-winged warbler is built on the ground at the base of a shrub or leafy plant, often at the shaded edge of the forest or at the edge of a forest opening (Confer et al. 2011).	Low	There is no suitable shrubland habitat within the study area.
Bird	Grasshopper sparrow *pratensis* subspecies	*Ammodramus savannarum* (pratensis subspecies)	SC	SC	SC	S4B	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Low	There is no suitable breeding habitat within the study area.
Bird	Red-headed woodpecker	*Melanerpes erythrocephalus*	SC	THR	END	S4B	In Ontario, red-headed woodpecker breeds in open, deciduous woodlands or woodland edges and are often found in parks, cemeteries, golf courses, orchards and savannahs (Woodliffe 2007). They may also breed in forest clearings or open agricultural areas provided that large trees are available for nesting. They prefer forests with little or no understory vegetation. They are often associated with beech or oak forests, beaver ponds and swamp forests where snags are numerous. Nests are excavated in the trunks of large dead trees (Frei et al. 2017).	Low	Few large snags or cavity trees were observed in the deciduous riparian forest along the Grand River to provide suitable habitat.

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Bird	Wood thrush	*Hylocichla mustelina*	SC	THR	THR	S4B	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than 16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012).	Low	The deciduous riparian forest along the Grand River does not have preferred habitat characteristics to support this species.
Fish	Black redhorse	*Moxostoma duquesnei*	THR	THR	THR	S2	In Ontario, black redhorse is limited to only six watersheds. In the Lake Huron drainage, it is found in the Bayfield River, Maitland River and Ausable River watersheds. In the Lake Erie drainage, it is known from the Catfish Creek and Grand River watersheds. It is also present in the Thames River watershed in the Lake St. Clair drainage. The Catfish Creek population is considered extirpated. Black redhorse is a species of freshwater fish endemic to Ontario. Habitats are typically found in moderately sized to large rivers and streams with moderate flows. It is rarely found associated with aquatic vegetation. Preferred substrates include rubble, gravel, sand, boulders and silt. In summer, this fish species generally prefers pools, and they overwinter in deeper pools. Spring spawning has been observed in riffle habitats, over substrates ranging from fine gravel to large cobble, and at water temperatures between 15°C and 21°C (COSEWIC 2015).	Moderate	The Grand River within the study area may provide suitable habitat.
Fish	Eastern sand darter	*Ammocrypta pellucida*	END	THR	THR	S2	In Ontario, eastern sand darter is a warmwater species that is found in Lakes Erie and St. Clair, as well as the Thames River, Big Creek, Grand River and East Sydenham River. Eastern sand darter is a translucent and elongated freshwater fish. This fish favours sandy bottoms of streams and rivers as well as sandy shoals in lakes. It frequents water over limestone bottoms covered with a thin layer of mud and is found in riffles over rubble and gravel, and silted sand bottoms. Females may spawn more than once in a breeding season, typically in sandy areas with slow moving water (COSEWIC 2009).	High	The Grand River within the study area likely provides suitable habitat. DFO has classified this reach of the Grand River as critical habitat for this species.
Fish	Silver shiner	*Notropis photogenis*	THR	THR	THR	S2S3	In Ontario, silver shiner is found in the Thames and Grand Rivers, and it has been recently reported in Bronte Creek and Sixteen Mile Creek which flow into Lake Ontario. They prefer moderately-flowing sections of larger streams with clear water and moderate currents. Usual substrates include gravel, rubble, boulder, and sand. Aquatic vegetation may be present or absent. Silver shiner most frequently occurs in deep, swift riffles and faster currents of pools below riffles. Spawning habitat is suggested to occur in relatively deep riffles (COSEWIC 2011).	Moderate	The Grand River within the study area may provide suitable habitat.
Mammal	Eastern small-footed myotis	*Myotis leibii*	END	—	—	S2S3	In Ontario, eastern small-footed myotis is not known to roost in trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles, but it occasionally inhabits buildings. Entrances of caves or abandoned mines where humidity is low, and temperatures are cool and sometimes subfreezing may be used as hibernacula (Humphrey 2017).	Moderate	The armoured banks of the Grand River within the study area may provide suitable roosting habitat for this species. No potential hibernacula were identified within the study area.

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Mammal	Little brown myotis	*Myotis lucifugus*	END	END	END	S3	In Ontario, this specie's range is extensive and covers much of the province. It will roost in both natural and man-made structures. Roosting colonies require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas. May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (ECCC 2018).	Moderate	Buildings within the study area may provide suitable roosting habitat. Although trees within the deciduous riparian forest along the Grand River is semi-mature, few snag or cavity trees were observed within the study area. The Grand River may provide suitable foraging habitat. No potential hibernacula were identified within the study area.
Mammal	Northern myotis	*Myotis septentrionalis*	END	END	END	S3	In Ontario, this species' range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (ECCC 2018).	Low	Although trees within the deciduous riparian forest along the Grand River is semi-mature, few snag or cavity trees were observed within the study area. The Grand River may provide suitable foraging habitat. No potential hibernacula were identified within the study area.
Mammal	Tri-colored bat	*Perimyotis subflavus*	END	END	END	S3?	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada. They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernation sites are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year (ECCC 2018).	Moderate	The deciduous riparian forest along the Grand River is semi-mature and may provide clumps of leaves and squirrel nests for roosting habitat. The Grand River may provide suitable foraging habitat. No potential hibernacula were identified within the study area.
Mollusc	Rainbow	*Villosa iris*	SC	SC	SC	S2S3	In Ontario, rainbow mussel is found in shallow, well-oxygenated waters of small to medium-sized rivers and sometimes lakes. It is most abundant in waters less than 1 m deep. Preferred substrates are cobble, gravel, sand and occasionally mud (COSEWIC 2015).	Moderate	The Grand River within the study area may provide suitable habitat.
Mollusc	Wavy-rayed lampmussel	*Lampsilis fasciola*	THR	END	SC	S1	In Ontario, wavy-rayed lampmussel inhabits clear, medium-sized rivers and streams, with steady flow and stable substrate. It is typically found in clean sand or gravel substrates, often stabilized with cobble or boulders, in and around riffle areas up to 1 m in depth. It may also be found in large creeks and rivers (Morris 2011).	Moderate	The Grand River within the study area may provide suitable habitat.
Reptile	Blanding's turtle - Great Lakes / St. Lawrence population	*Emydoidea blandingii*	THR	THR	END	S3	In Ontario, Blanding's turtle will use a range of aquatic habitats, but favor those with shallow, standing or slow-moving water, rich nutrient levels, organic substrates and abundant aquatic vegetation. They will use rivers but prefer slow-moving currents and are likely only transients in this type of habitat. This species is known to travel great distances over land in the spring in order to reach nesting sites, which can include dry conifer or mixed forests, partially vegetated fields, and roadsides. Suitable nesting substrates include organic soils, sands, gravel and cobble. They hibernate underwater and infrequently under debris close to water bodies (COSEWIC 2016).	Low	The Grand River within the study area is unlikely to provide suitable habitat due to high flow conditions, lack of aquatic vegetation and lack of organic substrates.

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Reptile	Eastern hog-nosed snake	*Heterodon platirhinos*	THR	THR	THR	S3	In Ontario, eastern hog-nosed snake can be classified as a habitat generalist as it uses a variety of habitats across its range. This snake typically uses habitat with open vegetation cover, including open woodlands, wetlands, fields, forest edges, beaches and dunes, and disturbed sites, most often near water. In the Georgian Bay area, disturbed fields, rock barrens and forests appear to be preferred habitats. This species relies on sandy well drained soils. Hibernation occurs in sandy soils below the frost line. This species has been observed excavating hibernation sites in mixed intolerant upland forests. Nesting and oviposition have been noted in upland sandy areas and rock outcrops under large flat rocks. The majority of their diet is comprised of American toad and Fowler's toad (Kraus 2011).	Low	Although there is wetland, riparian woodland and aquatic habitat within the study area, it is relatively small. This snake species is unlikely to be found in this urban landscape. In addition, there are no recent occurrence records in the Brantford region.
Reptile	Milksnake	*Lampropeltis triangulum*	NAR	SC	SC	S4	In Ontario, milksnake uses a wide range of habitats including prairies, pastures, hayfields, wetlands and various forest types, and is well-known in rural areas where it frequents older buildings. Proximity to water and cover enhances habitat suitability. Hibernation takes place in mammal burrows, hollow logs, gravel or soil banks, and old foundations (COSEWIC 2014).	Moderate	The wetland and riparian forest within the study area may provide suitable habitat.
Reptile	Northern map turtle	*Graptemys geographica*	SC	SC	SC	S3	In Ontario, northern map turtle prefers large waterbodies with slow-moving currents, soft substrates, and abundant aquatic vegetation. Ideal stretches of shoreline contain suitable basking sites, such as rocks and logs. Along Lakes Erie and Ontario, this species occurs in marsh habitat and undeveloped shorelines. It is also found in small to large rivers with slow to moderate flow. Hibernation takes place in soft substrates under deep water (COSEWIC 2012).	Low	The Grand River within the study area is unlikely to provide suitable habitat due to high flow conditions, lack of aquatic vegetation and lack of organic substrates.
Reptile	Queensnake	*Regina septemvittata*	END	END	END	S2	In Ontario, queensnake requires permanent aquatic habitat with large flat rocks, either submerged or on the bank/shoreline. Individuals rarely leave the shoreline of permanent bodies of water with abundant shoreline cover and a healthy population of crayfish. They are fairly intolerant of silty substrates and most commonly are found in streams with bedrock and gravel substrates. The best sites have water temperatures that remain at or above 18°C during the active season, have a swift to moderate current and woodland surroundings. Hibernacula may occur in the abutments of old bridges, in clay slopes above the high-water mark and in bedrock fissures (Gillingwater 2011).	Moderate	The Grand River is known to support queensnake and there are observations of individuals in the vicinity of the study area (iNaturalist 2020). The armoured banks of the river within the study area may provide suitable habitat.
Reptile	Snapping turtle	*Chelydra serpentina*	SC	SC	SC	S3	In Ontario, snapping turtle uses a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. Nesting sites consist of sand or gravel banks along waterways or roadways (COSEWIC 2008).	Moderate	The Grand River within the study area may provide suitable habitat, particularly in marshy bays, such as the bay adjacent to the Lorne Bridge.
Vascular Plant	American chestnut	*Castanea dentata*	END	END	END	S1S2	In Ontario, American chestnut occurs in mixed or deciduous forests in the Carolinian zone (Farrar 1995). It is often found in communities with dense canopy cover and often associated with oak and maple. This tree grows primarily on acidic, sand or gravel soils (Boland et al. 2012).	Low	No individuals were observed within the study area during field investigations.

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Vascular Plant	American columbo	*Frasera caroliniensis*	END	END	END	S2	In Ontario, American columbo is most commonly associated with open deciduous forested slopes, but it can also be found in thickets, swamps and clearings. It is often associated with oak, hickory and sassafras trees. American columbo grows on a wide variety of soils, particularly dry mesic to mesic clay and clay loam soils (Environment Canada 2019).	Low	Although the deciduous riparian forest along the Grand River within the study area may provide suitable habitat, no individuals were observed during field investigations.
Vascular Plant	American ginseng	*Panax quinquefolius*	END	END	END	S2	In Ontario, American ginseng is found in moist, undisturbed and relatively mature deciduous woods often dominated by sugar maple. It is commonly found on well-drained, south-facing slopes. American ginseng grows under closed canopies in well-drained soils of glacier origin that have a neutral pH (ECCC 2018).	Low	There is no suitable undisturbed forest habitat within the study area. In addition, no individuals were observed within the study area during field investigations.
Vascular Plant	Bird's-foot violet	*Viola pedata*	END	END	END	S1	In Ontario, bird's-foot violet is typically found in open black oak savannahs and fields in dry to moist, sandy, acidic soils. Bird's-foot violet is at the northernmost edge of its range in Ontario (Environment Canada 2019). It is known at only five sites in southern Ontario.	Low	There is no suitable habitat within the study area.
Vascular Plant	Broad beech fern	*Phegopteris hexagonoptera*	SC	—	SC	S3	In Ontario, broad beech fern inhabits rich, undisturbed mature deciduous forest dominated by beech and maple. It typically grows in moist to wet, sandy soils of lower valley slopes and occasionally swamps (van Overbeeke et al. 2013).	Low	There is no suitable undisturbed forest habitat within the study area. In addition, no individuals were observed within the study area during field investigations.
Vascular Plant	Butternut	*Juglans cinerea*	END	END	END	S2?	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Low	Although the deciduous riparian forest along the Grand River within the study area may provide suitable habitat, no individuals were observed during field investigations.
Vascular Plant	Common hoptree	*Ptelea trifoliata*	SC	SC	SC	S3	In Ontario, common hoptree grows in open woodlands, thickets, dry prairies and along dry, and rocky shorelines. It typically occurs in sunny areas with dry sandy or rocky soils (Farrar 1995).	Low	Although the deciduous riparian forest along the Grand River within the study area may provide suitable habitat, this tree is rare within Canada, and is only known to occur along the north shore of Lake Erie (Ontario, 2020). It is unlikely to occur within the study area. No individuals were observed during field investigations.
Vascular Plant	Downy yellow false foxglove	*Aureolaria virginica*	—	—	END	S1	In Ontario, downy yellow false foxglove grows in dry open woods and savannahs (Oldham and Brinker 2009).	Low	There is no suitable habitat within the study area. In addition, no individuals were observed within the study area during field investigations.
Vascular Plant	Eastern flowering dogwood	*Cornus florida*	END	END	END	S2?	In Ontario, eastern flowering dogwood grows in the understory of dry to rich deciduous forests, especially on hillsides and riverbanks. It prefers sandy acidic soils but occasionally is found in loams, clays and organic soils (Waldron 2003). This species is restricted to the Carolinian zone of southern Ontario.	Low	Although the deciduous riparian forest along the Grand River within the study area may provide suitable habitat, no individuals were observed during field investigations.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur in the Study Area	Rationale for Potential to Occur in the Study Area
Vascular Plant	Fern-leaved yellow false foxglove	*Aureolaria pedicularia*	—	—	THR	S2?	In Ontario, fern-leaved yellow false foxglove grows in dry open woods and thickets, often on sand, as well as in savannahs (Oldham and Brinker 2009).	Low	The deciduous riparian forest along the Grand River within the study area does not have preferred habitat conditions. In addition, no individuals were observed within the study area during field investigations.
Vascular Plant	Gattinger's agalinis	*Agalinis gattingeri*	END	END	END	S2S3	In Ontario, this species is found in dry tallgrass prairies in Lambton County and on alvars in Bruce County and Manitoulin Island region. Prefers to grow in open or semi-open habitats (Jones 2015).	Low	There is no dry prairie habitat within the study area.
Vascular Plant	Green comet milkweed	*Asclepias viridiflora*	—	—	—	S2	In Ontario, green comet milkweed grows in open, sandy woodlands and sand dunes, as well as in alvar (Oldham and Brinker 2009).	Low	There is no suitable sandy/alvar habitat within the study area.
Vascular Plant	Green dragon	*Arisaema dracontium*	SC	—	SC	S3	In Ontario, green dragon occurs in somewhat wet to wet deciduous forests along streams. In particular, it grows in maple forest and forest dominated by red ash and white elm trees. Green dragon is restricted to shaded or partially shaded seasonally inundated floodplains (Donley et al. 2013). It is primarily restricted to southwestern Ontario.	Low	Although the deciduous riparian forest along the Grand River within the study area may provide suitable habitat, no individuals were observed during field investigations.
Vascular Plant	Smooth yellow false foxglove	*Aureolaria flava*	—	—	THR	S2?	Smooth yellow false foxglove is generally found in dry, open upland oak savannas and woodlands (Arkansas Native Plant Society 2019; Canada 2019).	Low	There is no dry savannah or woodlands within the study area.
Vascular Plant	Soft-hairy false gromwell	*Lithospermum parviflorum* (Formerly *Onosmodium molle*)	—	—	—	S2	This species grows on dry, open, rocky or gravelly hillsides, in old fields, pastures, thickets, and open woodlands in calcareous regions.	Low	There is no suitable habitat within the study area.

[1] *Endangered Species Act* (ESA), 2007 (O.Reg 242/08 last amended 27 March 2018 as O.Reg 219/18). Species at Risk in Ontario List, 2007 (O.Reg 230/08 last amended 1 Aug 2018 as O. Reg 404/18, s. 1.); Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

[2] *Species at Risk Act* (SARA), 2002. Schedule 1 (Last amended 25 January 2020); Part 1 (Extirpated), Part 2 (Endangered), Part 3 (Threatened), Part 4 (Special Concern)

[3] Committee on the Status of Endangered Wildlife in Canada (COSEWIC) http://www.cosewic.gc.ca/

[4] Provincial Ranks (SRANK) are Rarity Ranks assigned to a species or ecological communities, by the Natural Heritage Information Centre (NHIC). These ranks are not legal designations. SRANKS are evaluated by NHIC on a continual basis and updated lists produced annually. SX (Presumed Extirpated), SH (Possibly Extirpated - Historical), S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure), SNA (Not Applicable), S#S# (Range Rank), S? (Not ranked yet), SAB (Breeding Accident), SAN (Non-breeding Accident), SX (Apparently Extirpated). Last assessed December 2019.

[5] References

Arkansas Native Plant Society. 2019. Know Your Natives - Yellow False Foxgloves. [accessed 16 August 2019]. https://anps.org/2014/10/03/know-your-natives-yellow-false-foxgloves/

Boland GJ, Ambrose J, Husband B, Elliott KA, Melzer MS. 2012. Recovery Strategy for the American Chestnut (Castanea dentata) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://files.ontario.ca/environment-and-energy/species-at-risk/stdprod_075550.pdf. vi + 43 p.

Brown MB, Brown CR. 2019. Barn Swallow (Hirundo rustica). In The Birds of North America Online (P. G. Rodewald, ed), version 2.0. Ithaca NY: Cornell Lab of Ornithology; [accessed 20 November 2019]. https://doi.org/10.2173/bna.barswa.02.

Buehler DA, Hamel PB, Boves T. 2013. Cerulean Warbler (Setophaga cerulean). In The Birds of North America (AF Poole, ed), version 2.0. Ithaca, NY: Cornell Lab of Ornithology; [accessed 29 November 2019]. https://doi.org/10.2173/bna.511

Butterflies and Moths of North America. 2019. Tawny Emperor Asterocampa clyton. [Accessed 27 February 2020]. https://www.butterfliesandmoths.org/species/Asterocampa-clyton

Canada (Government of Canada). 2019. Species Profile - Smooth Yellow False Foxglove. [modified 20 November 2011; accessed 16 August 2019]. https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1405.

CBIF (Canadian Biodiversity Information Facility). 2014. Tawny Emperor (Asterocampa clyton). [Accessed 27 February 2020]. https://www.cbif.gc.ca/eng/species-bank/butterflies-of-canada/tawny-emperor/?id=1370403265790.

Colla SR, Taylor-Pindar A. 2011. Recovery Strategy for the Rusty-patched Bumble Bee (Bombus affinis) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 29 November 2019]. https://www.ontario.ca/page/rusty-patched-bumble-bee-recovery-strategy. vi + 21 p.

Confer JL, Hartman P, Roth A. 2011. Golden-winged Warbler (Vermivora chrysoptera). In The Birds of North America (AF Poole ed), version 2.0. Ithaca, NY: Cornell Lab of Ornithology; [accessed 19 December 2018]. https://doi.org/10.2173/bna.20.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. COSEWIC assessment and status report on the Chimney Swift Chaetura pelagica in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_chaetura_pelagica_e.pdf. vii + 49 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2008. COSEWIC assessment and status report on the Snapping Turtle Chelydra serpentina in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_snapping_turtle_0809_e.pdf. vii + 47 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2009. COSEWIC assessment and status report on the Eastern Sand Darter Ammocrypta pellucida, Ontario populations and Quebec populations, in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Eastern%20Sand%20Darter_0810_e.pdf. vii + 49 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2010. COSEWIC assessment and status report on the Monarch Danaus plexippus in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Monarch_0810_e1.pdf. vii + 43 p.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2010. COSEWIC assessment and status report on the Cerulean Warbler Dendroica cerulean in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_cerulean_warbler_e.pdf. x + 40 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011. COSEWIC assessment and status report on the Barn Swallow Hirundo rustica in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 22 November 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_barn_swallow_0911_eng.pdf. ix + 37 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011. COSEWIC assessment and status report on the Silver Shiner Notropis photogenis in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_silver_shiner_0911_eng.pdf. xi + 45 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC assessment and status report on the Eastern Wood-pewee Contopus virensin Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Eastern%20Wood-pewee_2013_e.pdf. x + 39 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC assessment and status report on the Wood Thrush Hylocichla mustelina in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Wood%20Thrush_2013_e.pdf. ix + 46 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC assessment and status report on the Northern Map Turtle Graptemys geographica in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_tortue_geog_n_map_turtle_1113_e.pdf. xi + 63 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2013. COSEWIC assessment and status report on the Grasshopper Sparrow pratensis subspecies Ammodramus savannarum pratensis in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Grasshopper%20Sparrow_2013_e.pdf. ix + 36 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2014. COSEWIC assessment and status report on the Milksnake Lampropeltis triangulum in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Eastern%20Milksnake_2014_e.pdf. x +61 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2015. COSEWIC assessment and update status report on the black redhorse Moxostoma duquesnei in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Black%20Redhorse_2015_e.pdf. xii + 50 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2015. COSEWIC assessment and status report on the Rainbow Villosa iris in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Rainbow_2015_e.pdf. xii + 82 p.
COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2016. COSEWIC assessment and update status report on the Blanding's Turtle Emydoidea blandingii (Nova Scotia population and Great Lakes/St. Lawrence population) in Canada. Ottawa ON: Committee on the Status of Endangered Wildlife in Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Blanding%E2%80%99s%20Turtle_2016_e.pdf. xix + 110 p.
Donley R, Jalava JV, van Overbeeke J. 2013. Management plan for the Green Dragon (Arisaema dracontium) in Ontario. Ontario Management Plan Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 12 December 2019]. https://www.ontario.ca/page/green-dragon-management-plan. vi + 43 p.
ECCC (Environment and Climate Change Canada). 2018. Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Ottawa ON: Environment and Climate Change Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Rs-TroisChauveSourisThreeBats-v01-2019Nov-Eng.pdf. ix + 172 p.
ECCC (Environment and Climate Change Canada). 2018. Recovery Strategy for the American Ginseng (Panax quinquefolius) in Canada. Species at Risk Act Recovery Strategy Series. Ottawa ON: Environment and Climate Change Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_american_ginseng_e_final.pdf. vii + 32 p.
ECCC (Environment and Climate Change Canada). 2019. Recovery Strategy for the American Columbo (Frasera caroliniensis) in Canada. Species at Risk Act Recovery Strategy Series. Ottawa ON: Environment and Climate Change Canada; [accessed 02 December 2019]. https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_american_columbo_e_final.pdf. 23 p.
ECCC (Environment and Climate Change Canada). 2019. Recovery Strategy for the Bird's-foot Violet (Viola pedata) in Canada. Species at Risk Act Recovery Strategy Series. Ottawa ON: Environment and Climate Change Canada; [accessed 02 December 2019]. http://publications.gc.ca/collections/collection_2019/eccc/En3-4-312-2019-eng.pdf. 23 p.
Farrar JL. 1995. Trees in Canada. Markham, ON: Fitzhenry & Whiteside Limited and Ottawa, ON: Canadian Forest Service, Natural Resources Canada. 502 p.
Frei B, Smith KG, Withgott JH, Rodewald PG, Pyle P, Patten MA. 2017. Red-headed Woodpecker (Melanerpes erythrocephalus). In The Birds of North America (PG Rodewald, ed), version 2.1. Ithaca, NY: Cornell Lab of Ornithology; [accessed 02 December 2019]. https://doi.org/10.2173/bna.rehwoo.02.1.
Gabhauer MA. 2007. Bobolink, pp. 586-587 in Cadman MD, Sutherland DA, Beck GG, Lepage D, Couturier AT, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature. xxii + 706 p.
Garrison BA. 1999. Bank Swallow (Riparia riparia). The Birds of North America Online (AF Poole and FB Gill, eds). Ithaca NY: Cornell Lab of Ornithology; [accessed 20 November 2019]. https://doi.org/10.2173/bna.414.
Gillingwater SD. 2011. Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://www.ontario.ca/page/queensnake-recovery-strategy.
Hull SD, Shaffer JA, Lawrence DI. 2019. The effects of management practices on grassland birds: Eastern Meadowlark (Sturnella magna). Jamestown ND: US Geological Survey; [accessed 02 December 2019]. https://pubs.usgs.gov/pp/1842/mm/pp1842MM.pdf.
Humphrey C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (Myotis leibii) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://files.ontario.ca/mnrf_sar_rs_esfm_final_accessible.pdf vii + 76 p.
Jones J. 2015. Recovery strategy for the Gattinger's Agalinis (Agalinis gattingeri) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 12 December 2019]. https://www.ontario.ca/page/skinners-agalinis-recovery-strategy. vi + 33 p.
Kraus T. 2011. Recovery Strategy for the Eastern Hog-nosed Snake (Heterodon platirhinos) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. Adoption of the Recovery Strategy for the Eastern Hog-nosed Snake (Heterodon platirhinos) in Canada (Seburn 2009). https://files.ontario.ca/environment-and-energy/species-at-risk/stdprod_086030.pdf. i + 6 p + Appendix vi + 24 p.
McLaren P. 2007. Canada Warbler, pp. 528-529 in Cadman MD, Sutherland DA, Beck GG, Lepage D, Couturier AT, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature. xxii + 706 p.
Morris TJ. 2011. Recovery Strategy for the Wavy-rayed Lampmussel (Lampsilis fasciola) in Ontario. Ontario Recovery Strategy Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://www.ontario.ca/page/wavy-rayed-lampmussel-recovery-strategy.
NatureServe. 2018. Hackberry Emperor. NatureServe; [2009-current; accessed 19 December 2018]. http://explorer.natureserve.org/servlet/NatureServe?searchName=Asterocampa+celtis
Oldham MJ, Brinker SR. 2009. Rare Vascular Plants of Ontario. 4th ed. Peterborough, ON: Natural Heritage Information Centre, Ontario Ministry of Natural Resources. 188 p.
Reitsma L, Goodnow M, Hallworth MT, Conway CJ. 2009. Canada Warbler (Cardellina canadensis). In The Birds of North America Online (A. Poole, ed.), version 2.0. Ithaca NY: Cornell Lab of Ornithology; [accessed 29 November 2019]. https://doi.org/10.2173/bna.421.
Renfrew R, Strong AM, Perlut NG, Martin SG, Gavin TA. 2015. Bobolink (Dolichonyx oryzivorus). In The Birds of North America (PG Rodewald, ed.), version 2.0. Ithaca NY: Cornell Lab of Ornithology; [accessed 29 November 2019]. https://doi.org/10.2173/bna.176.
Roseberry JL, Klimstra WD. 1970. The nesting ecology and reproductive performance of the Eastern Meadowlark. The Wilson Bulletin 82(3): 243-267.
Sandilands A. 2007. Common Nighthawk, pp. 308-309 in Cadman, MD, Sutherland DA, Beck GG, Lepage D, Couturier AR, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature. xxii + 706 p.
van Overbeeke JC, Jalava JV, Donley RH. 2013. Management Plan for the Broad Beech Fern (Phegopteris hexagonoptera) in Ontario. Ontario Management Plan Series. Peterborough ON: Ontario Ministry of Natural Resources; [accessed 02 December 2019]. https://www.ontario.ca/page/broad-beech-fern-management-plan. v + 25 p.
Voss EG, Reznicek AA. 2012. Field Manual of Michigan Flora. Ann Arbour MI: University of Michigan Press. 990 p.
Waldron G. 2003. Trees of the Carolinian Forest: A Guide to Species, their Ecology and Uses. Erin, ON: The Boston Mills Press. 275 p.
Woodliffe PA. 2007. Red-headed Woodpecker, pp. 320-321 in Cadman MD, Sutherland DA, Beck GG, Lepage D, Couturier AR, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Toronto ON: Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature. xxii + 706 p.

APPENDIX C

Wildlife and Wildlife Habitat Results

Common Name	Scientific Name	SRANK[a]	GRANK[a]	ESA[b]
Birds				
American Goldfinch	*Spinus tristis*	S5B	G5	—
American Robin	*Turdus migratorius*	S5B	G5	—
Baltimore Oriole	*Icterus galbula*	S4B	G5	—
Belted Kingfisher	*Megaceryle alcyon*	S4B	G5	—
Black-capped Chickadee	*Poecile atricapillus*	S5	G5	—
Blue Jay	*Cyanocitta cristata*	S5	G5	—
Canada Goose	*Branta canadensis*	S5	G5	—
Cedar Waxwing	*Bombycilla cedrorum*	S5B	G5	—
Chimney Swift	***Chaetura pelagica***	**S4B,S4N**	**G4G5**	**THR**
Chipping Sparrow	*Spizella passerina*	S5B	G5	—
Cliff Swallow	*Petrochelidon pyrrhonota*	S4B	G5	—
Common Grackle	*Quiscalus quiscula*	S5B	G5	—
European Starling	*Sturnus vulgaris*	SNA	G5	—
Gray Catbird	*Dumetella carolinensis*	S4B	G5	—
House Sparrow	*Passer domesticus*	SNA	G5	—
House Wren	*Troglodytes aedon*	S5B	G5	—
Killdeer	*Charadrius vociferus*	S5B,S5N	G5	—
Mallard	*Anas platyrhynchos*	S5	G5	—
Mourning Dove	*Zenaida macroura*	S5	G5	—
Northern Cardinal	*Cardinalis cardinalis*	S5	G5	—
Northern Flicker	*Colaptes auratus*	S4B	G5	—
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S4B	G5	—
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5	—
Ring-billed Gull	*Larus delawarensis*	S5B,S4N	G5	—
Rock Pigeon	*Columba livia*	SNA	G5	—
Song Sparrow	*Melospiza melodia*	S5B	G5	—
Tree Swallow	*Tachycineta bicolor*	S4B	G5	—
Warbling Vireo	*Vireo gilvus*	S5B	G5	—
Yellow Warbler	*Setophaga petechia*	S5B	G5	—
Mammals				
Eastern Chipmunk	*Tamias striatus*	S5	G5	—
Eastern Gray Squirrel	*Sciurus carolinensis*	S5	G5	—
Amphibians				
American Toad	*Anaxyrus americanus*	S5	G5	—

[a] Ranks based upon determinations made by the Ontario Natural Heritage Information Centre
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
SNA = Not applicable for Ontario Ranking (e.g. Exotic species)

[b] *Endangered Species Act* (ESA), 2007. General (O.Reg 242/08 last amended 27 March 2018 as O.Reg 219/18). Species at Risk in Ontario List (O.Reg 230/08 last amended 1 Aug 2018 as O. Reg 404/18, s. 1.)
END= Endangered; THR = Threatened; SC = Special Concern;

Bolded text indicates species at risk.

APPENDIX D

Surface Water Features, Fish and Fish Habitat Results

Common Name	Latin Name	S Rank[a]	G Rank[a]	Native / Introduced Common[a]	Tolerance to Environmental Disturbances[a]	Grand River Study Area [b,c, d, e]
Black Crappie	*Pomoxis nigromaculatus*	S4	G5	Native/Introduced	Tolerant	X
Blackside Darter	*Percina maculata*	S4	G5	Native/Introduced	Intermediate	X
Black Redhorse	*Moxostoma duquesnei*	S2	G5	Native/Introduced	Intolerant	X
Bluegill	*Lepomis macrochirus*	S5	G5	Native	Intermediate	X
Bluntnose Minnow	*Pimephales notatus*	S5	G5	Native	Intermediate	X
Bowfin	*Amia calva*	S4	G5	Native	Intermediate	X
Brown Bullhead	*Ameiurus nebulosus*	S5	G5	Native	Intermediate	X
Channel Catfish	*Ictalurus punctatus*	S4	G5	Native	Tolerant	X
Coho Salmon	*Oncorhynchus kisutch*	SNA	G5	Introduced	Intolerant	X
Common Carp	*Cyprinus carpio*	SNA	G5	Introduced	Tolerant	X
Eastern Sand Darter	*Ammocrypta pellucida*	S2	G4	Native/Rare	Intolerant	X
Freshwater Drum	*Aplodinotus grunniens*	S5	G5	Native	Tolerant	X
Greenside Darter	*Etheostoma blennioides*	S4	G5	Native/Introduced	Intermediate	X
Golden Redhorse	*Moxostoma erythrurum*	S4	G5	Native	Intermediate	X
Greater Redhorse	*Moxostoma valenciennesi*	S3	G4	Native	Intolerant	X
Johnny Darter	*Etheostoma nigrum*	S5	G5	Native	Tolerant	X
Largemouth Bass	*Micropterus salmoides*	S5	G5	Native	Tolerant	X
Logperch	*Percina caprodes*	S5	G5	Native	Intolerant	X
Mimic Shiner	*Notropis volucellus*	S5	G5	native	Intermediate	X
Mooneye	*Hiodon tergisus*	S4	G5	Native	Intolerant	X
Muskellunge	*Esox masquinongy*	S4	G5	Native	Intermediate	X
Northern Hog Sucker	*Hypentelium nigricans*	S4	G5	Native	Intermediate	X
Northern Pike	*Esox lucius*	S5	G5	Native	Intermediate	X
Pumpkinseed	*Lepomis gibbosus*	S5	G5	Native	Intermediate	X
Rainbow Darter	*Etheostoma caeruleum*	S4	G5	Native	Intolerant	X
Rainbow Trout	*Oncorhynchus mykiss*	SNA	G5	Introduced	Intolerant	X
Rock Bass	*Ambloplites rupestris*	S5	G5	Native	Intermediate	X
Round Goby	*Neogobius melanostomus*	SNA	G5	Introduced	Intermediate	X
Shorthead Redhorse	*Moxostoma macrolepidotum*	S5	G5	Native	Intermediate	X
Silver Shiner	*Notropis photogenis*	S2/S3	G5	Native	Intolerant	X
Spotfin Shiner	*Cyprinella spiloptera*	S4	G5	Native	Intermediate	X
Smallmouth Bass	*Micropterus dolomieu*	S5	G5	Native/Introduced	Intermediate	X
Tessellated Darter	*Etheostoma olmstedi*	S4	G5	Native	Intermediate	X
Walleye	*Sander vitreus vitreus*	S5	G5T5	Native	Intermediate	X
White Crappie	*Pomoxis annularis*	S4	G5	Native	Tolerant	X
White Sucker	*Catostomus commersonii*	S5	G5	Native	Tolerant	X
Yellow Bullhead	*Ameiurus natalis*	S4	G5	Native	Tolerant	X
Yellow Perch	*Perca flavescens*	S5	G5	Native	Intermediate	X
Mussels						
Wavy-Rayed Lampmussel	*Lampsilis fasciola*	S1?[f]	G4[f]	Native[f]	Intolerant[f]	X
Rainbow	*Villosa iris*	S2/S3[g]	G5[g]	Native[g]	Intolerant[g]	X

Notes: X = present.

(a) Eakins, R. J. 2020. Ontario Freshwater Fishes Life History Database. Version 4.86. Online database. Available at: http://www.ontariofishes.ca Accessed May 2020

(b) MNRF. 2020. Fish ON-Line Availabel at: https://www.gisapplication.lrc.gov.on.ca/FishONLine/Index.html?site=FishONLine&viewer=FishONLine&locale=en-US. Accessed: Accessed May 2020

(c) MNRF. 2020. Land Information Ontario Aquatics Resource Layer. Accessed Ma2020

(d) DFO. 2020. Aquatic Species at Risk Mapping. Availabel at: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html. Accessed Accessed May2020

(e) EDD Maps. 2020.

(f) Morris, T. J. 2011. Recovery Strategy for the Wavy-rayed Lampmussel (Lampsilis fasciola) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. ii + 4 pp.+ Appendix viii + 41 pp.+ Appendix. https://www.ontario.ca/page/wavy-rayed-lampmussel-recovery-strategy

(g) COSEWIC 2006. COSEWIC assessment and status report on the Rainbow mussel Villosa iris in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 38 pages https://www.sararegistry.gc.ca/default.asp?lang=En&n=4D4699E4-1

APPENDIX E

Photographic Log

Photograph 1: Facing upstream 50 m upstream from Lorne Bridge.

Photograph 2: Facing downstream 50 m upstream from Lorne Bridge.

Photograph 3: Facing upstream from Lorne Bridge.

Photograph 4: Facing downstream from Lorne Bridge.

Photograph 9: Facing downstream from Lorne Bridge towards left downstream bank.

Photograph 10: Facing right downstream bank from Lorne Bridge.

Photograph 5: Facing upstream 200m D/S from Lorne Bridge.

Photograph 6: Facing downstream 200m D/S from Lorne Bridge.

Photograph7: Facing left downstream bank at 50 m upstream from Lorne Bridge.

Photograph 8: Downstream side of east Lorne bridge abutment.

Photograph 9: Upstream side of east Lorne bridge abutment.

Photograph 10: Downstream side of Lorne Bridge.

Photograph 1: Facing upstream from Brant's Crossing Bridge.

Photograph 2: Facing downstream from Brant's Crossing Bridge.

Photograph 3: Facing left downstream bank on upstream side of Brant's Crossing Bridge.

Photograph 4: Facing right downstream bank on upstream side of Brant's crossing Bridge.

Photograph 9: Riprap along left downstream bank on upstream side of Brant's Crossing Bridge.

Photograph 10: Downstream side of east bridge abutment of Brant's Crossing Bridge.

Photograph 5: Downstream side of Brant's Crossing Bridge facing towards right downstream bank.

Photograph 6: Bank erosion on left downstream bank just downstream from Brant's Crossing Bridge.

Photograph 7: Facing upstream 200 m downstream of Brant's Crossing Bridge.

Photograph 8: Facing downstream 200 m downstream of Brant's Crossing Bridge.

Photograph 1: Facing upstream from TH&B Rail Bridge.

Photograph 2: Facing downstream from TH&B Rail Bridge.

Photograph 3: Upstream side of east abutment of the TH&B Rail Bridge from east bank.

Photograph 4: Facing upstream side of TH&B Rail Bridge from east bank.

Photograph 9: Facing downstream side of TH&B Rail Bridge from left downstream bank.

Photograph 10: Facing downstream side of west bridge abutment - TH&B Rail Bridge.

Photograph 5: Old bridge abutment on left downstream bank just downstream from TH&B Rail Bridge.

Photograph 6: Facing downstream from TH&B Rail Bridge towards right downstream bank at opposite old bridge abutment.

Photograph 7: Facing upstream 200 m downstream from TH&B Rail Bridge.

Photograph 8: Facing downstream 200 m downstream from TH&B Rail Bridge.

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