FINAL REPORT

Scoped Environmental Impact Study

Proposed Central Library, 555 Albert Street, Ottawa, Ontario

Submitted to:

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario K2P 2L7

Attention:
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Submitted by:

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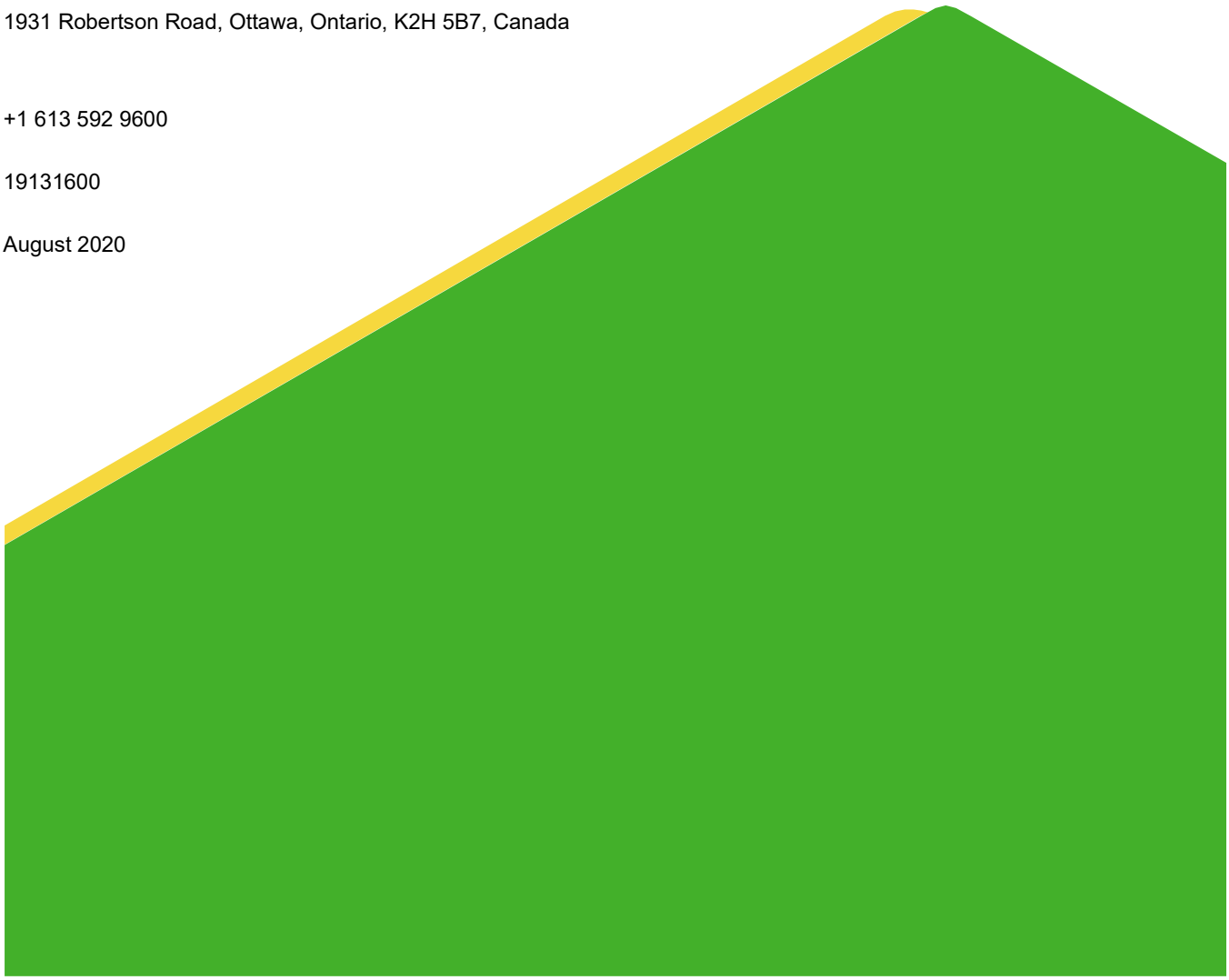

Distribution List

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Table of Contents

FIGURES

APPENDICES

APPENDIX A
Photographic Inventory

APPENDIX B
Species at Risk Screening

APPENDIX C
Resumes

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by the City of Ottawa (the City) to prepare a Scoped Environmental Impact Statement (EIS) for the proposed new Ottawa Central Library project, to be located at 555 Albert Street, City of Ottawa, Ontario (the Site; Figure 1). For the purposes of this report, the study area consists of the land within 120 m of the Site.

This report has been prepared in accordance with the City of Ottawa EIS guidelines (Ottawa 2015a). Golder understands that the City has indicated that the focus of this Scoped EIS should be the potential presence of Species at Risk (SAR) on and adjacent to the Site, particularly habitat for American eel (*Anguilla rostrata*) in the aqueduct, located west of the Site. Consideration of fish habitat in general, as well as migratory birds, has also been included in this report.

2.0 SITE DESCRIPTION

The Site is located on the west side of Albert Street and is bounded by Commissioner Street to the north, construction sites associated with the light rail system to the south and immediately to the west. East of Albert Street is manicured lawns with individual trees extending to Slater Street. The aqueduct associated with the Fleet Street pumping station is located approximately 50 m west of the Site, separated from the Site by a treed slope and narrow band of off-Site construction area. The remainder of the study area consists of urban residential developments. The Site and study area are located within the urban area of the City of Ottawa.

3.0 ENVIRONMENTAL POLICY CONTEXT

As noted, this report is focused on SAR, therefore documents reviewed to gain an understanding of the natural heritage features and regulations that are relevant to the Site include the following:

- *Species at Risk Act* (Canada 2002)
- *Endangered Species Act* (Ontario 2007)
- *Fisheries Act* (Canada 1985)
- *Migratory Birds Convention Act* (Canada 1994)
- City of Ottawa Official Plan (Ottawa 2013)

An overview of the above-noted legislation and policy documents is discussed below.

3.1 Species at Risk

3.1.1 Species at Risk Act (SARA)

At the 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 and Climate Change, species are added to the federal List of Wildlife Species at Risk (Canada 2002). Species that are included on Schedule 1 as endangered or threatened are afforded protection of critical habitat on federal lands under the *Species at Risk Act* (SARA) (Canada 2002). On private or provincially-owned lands, only aquatic species and migratory birds listed as endangered, threatened or extirpated are protected under SARA, unless ordered by the Governor in Council, or unless the project is federally funded or federally governed.

3.1.2 Endangered Species Act (ESA)

Species at risk 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 the Environment, Conservation and Parks, species are added to the provincial *Endangered Species Act* (ESA) that came into effect June 30, 2008 (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 provides general habitat protection to all species listed as threatened or endangered. 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. There are exemptions under the Act for the treatment of certain species and their habitats for some activities.

3.2 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. Under the *Fisheries Act* (Government of Canada 1985), work in and near water must comply with the fish and fish habitat protection provisions of the *Fisheries Act* by incorporating measures to avoid (DFO 2019):

- causing the death of fish
- harmful alteration, disruption or destruction (HADD) of fish habitat in your work, undertaking or activity

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 2019a). DFO will review the project to identify potential risks of the project to the conservation and protection of fish and fish habitat. If potential impacts can be avoided, project approval is not required (DFO 2020a). However, if it is determined that the project will result in death of fish or HADD of fish habitat, an authorization is required under the *Fisheries Act*. Proponents of projects requiring a *Fisheries Act* authorization may be required to submit a habitat offsetting plan, which provides details of how the death of fish and/or HADD of fish habitat will be offset, as well as 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.

3.3 Migratory Birds Convention Act, 1994

The *Migratory Birds Convention Act, 1994* (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.

3.4 City of Ottawa

Proponents are required, under the City Official Plan (OP) (Ottawa 2013), to prepare an EIS following the City’s EIS guidelines (Ottawa 2015a). The EIS must document the occurrence of significant natural heritage features in, and adjacent to, the proposed development area. The policies in the OP address both natural features and natural functions. As noted, the natural heritage features to be addressed in this report are limited to SAR (including fish habitat).

4.0 DESCRIPTION OF DEVELOPMENT PROPOSAL

The proposed plan will involve the development of the entire Site for the purposes of constructing a new public library, which will also house the Library and Archives Canada. The development will include a multi-story building (approximately 216,000 square feet). It is assumed that below grade excavations will extend to approximately 1 metre below the founding slab to a depth of 5 to 7 metres below ground surface (bgs) (Golder 2020a). The proposed work will require excavation below the current groundwater elevation resulting in a requirement for groundwater control (i.e., dewatering) (Golder 2020a). It is understood that the Site is underlain by glacial till, and therefore no blasting will be required for the excavation (Golder 2020b).

The project is currently scheduled for completion in 2024.

5.0 METHODS

5.1 Desktop Assessment

Golder conducted a desktop review of published natural heritage data and information available for the Site and the study area. This information served to identify SAR known to be present or having the potential to be present. Information sources consulted include:

- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), including status reports and the online SAR public registry
- Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) Make-a-Map geographic explorer for SAR information queries (MNRF 2020a)
- Atlas of Breeding Birds of Ontario (Cadman et al. 2007)
- eBird online database (eBird 2020)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Bat Conservation International (BCI 2020)
- Ontario Odonata Atlas (MacNaughton et. al 2020)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2020)
- DFO Aquatic Species at Risk Maps (DFO 2019b)
- MNRF Land Information Ontario Aquatic Resources Area Layer (MNRF 2020b)
- MNRF Fish ON-line (MNRF 2019)
- Information contained in natural heritage related map layers from Ontario Base Map series, Natural Resource Values Information System (NRVIS) mapping and Land Information Ontario (LIO 2020)
- Existing aerial imagery and mapping

5.1.1 Species at Risk Screening

A SAR screening was completed for the Site, and focused on the review of records and range maps pertaining to species that are designated as endangered, threatened or special concern under the ESA or designated as endangered or threatened under Schedule 1 of the SARA.

The published SAR data assisted in determining the potential for habitats of SAR to be present. Data from the Site investigations described below were used in combination with the desktop data to determine a final probability of SAR and/or SAR habitats on the Site. The potential for the species to occur was determined through a probability of occurrence. A ranking of low probability indicates no suitable habitat availability for that species and no specimens identified. Moderate probability indicates greater potential for the species to occur, as suitable habitat appeared to be present, but no occurrence of the species was recorded. High probability indicates a known species record and good quality habitat is present.

5.2 Site Reconnaissance

In order to assess the natural features on the Site, a single site reconnaissance was conducted by a Golder ecologist on June 16, 2020. During the site reconnaissance, the Site and study area was assessed using Ecological Land Classification (ELC) standard protocols (Lee et al. 1998) to map the plant communities. Locations of any plant SAR encountered were mapped using a hand-held GPS.

In addition to the ELC, habitat structure and features specific to the habitat requirements of the SAR identified in the desktop assessment on the Site were documented. Area searches for wildlife were conducted following recommended procedures (McDiarmid 2012; Bookhout 1994; Pyle 1984). The species observed (including direct observations, calls, tracks and other signs) were recorded.

6.0 RESULTS

A photographic inventory of the Site is provided in Appendix A. Results of the desktop assessment and site reconnaissance are described below.

6.1 Existing Conditions

The Site consists an active construction area with no plant communities. Vegetation at the Site consisted of non-native and weedy species typically found in disturbed areas, such as wild carrot (*Daucus carota*), Siberian elm (*Ulmus pumila*), common burdock (*Arctium minus*), dog strangling vine (*Cynanchum rossicum*) and wild grape (*Vitis riparia*). Very low numbers of common milkweed (*Asclepias syriaca*) were noted on the Site.

The study area consists primarily of manicured lawns, residences, construction sites and roadways. Three areas of vegetation were observed in the study area (Figure 1; Areas 1, 2 and 3), each of which is described below.

Area 1 consisted of a treed slope approximately 15 m west of the Site, extending down to within 5 m of the aqueduct. Dominant trees and shrubs observed included Manitoba maple (*Acer negundo*), Norway maple (*Acer plantoides*), white elm (*Ulmus americana*), white ash (*Fraxinus americana*) saplings, common buckthorn (*Rhamnus cathartica*) and staghorn sumac (*Rhus typhina*). The understory consisted of a low density of herbaceous species including garlic mustard (*Alliaria petiolata*) and wild grape with abundant woody debris, rocks and concrete pieces, and scattered trash.

An aqueduct is located approximately 50 m west of the Site, at the bottom of a small slope. Between the toe-of-slope and the edge of the aqueduct, a construction access road extends from the south end of the aqueduct for approximately half the length of the aqueduct. The aqueduct is man-made and provides fish habitat, notably for American eel and river redhorse (*Moxostoma carinatum*) (DFO 2019b). During the site reconnaissance, small bodied fish were observed in the shallows. The aqueduct connects to the Ottawa River approximately 800 m upstream and 400 m downstream from Area 1. The Ottawa River is known to support 85 fish species of fish. Of these, 64 fish species have been recorded in the vicinity of the aqueduct inlet and outlet, notably channel darter (*Percina copelandi*), lake sturgeon (*Acipenser fulvescens*), northern brook lamprey (*Ichthyomyzon fossor*), and silver lamprey (*Ichthyomyzon unicuspis*) (Haxton and Chubbuck 2002, MNRF 2019, 2020b; DFO 2019b).

Area 2 consisted of a semi-naturalized area that formed part of the landscaped property associated with an apartment building. Trees in this area included Manitoba maple, planted northern catalpa (*Catalpa speciosa*), Norway maple, common buckthorn, wild grape and tatarian honeysuckle (*Lonicera tatarica*). This area also contained a stone block retaining wall in poor repair, which had numerous cracks and hollows. A natural cliff was present at the western edge of this area, also.

Area 3 consisted of a treed slope east of Slater Street. The dominant species observed included Manitoba maple, Norway maple, sugar maple (*Acer saccharum*), white elm, green ash (*Fraxinus pennsylvanica*), basswood (*Tilia americana*) black walnut (*Juglans nigra*) and a single butternut (*Juglans cinerea*; see Figure 1). The understory and ground layer included common buckthorn, garlic mustard and other common species. Litter was present.

The butternut tree was not assessed to determine if it is a pure butternut or a butternut hybrid. It was approximately 35 cm diameter-at-breast-height and had approximately 50% live crown. The tree showed evidence of butternut canker disease, but no formal butternut health assessment was performed.

Wildlife observed during the site reconnaissance included: American goldfinch (*Spinus tristis*), ring-billed gull (*Larus delawarensis*), yellow warbler (*Setophaga petechia*), American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), song sparrow (*Melospiza melodia*), American robin (*Turdus migratorius*), rock dove (*Columba livia*), red-winged blackbird (*Agelaius phoeniceus*), cliff swallow (*Petrochelidon pyrrhonota*), gray squirrel (*Sciurus carolinensis*) and eastern chipmunk (*Tamias striatus*). No SAR wildlife were observed.

6.2 Species at Risk Screening

Based on the SAR screening (Appendix B), no SAR are likely to be present on the Site. A number of species were determined to have moderate or high probability to be present in the study area (Appendix B), and are discussed below. Those species determined to have a low probability of occurrence are included in Appendix B, but are not discussed further in this report.

Terrestrial Species

- **barn swallow** (*Hirundo rustica*; threatened under the ESA and SARA) – Suitable habitat is present in the study area on or in buildings.
- **chimney swift** (*Chaetura pelagica*; threatened under the ESA and SARA) – Suitable habitat is present in the study area on buildings.
- **common nighthawk** (*Chordeiles minor*; special concern under the ESA, threatened under the SARA) – Suitable habitat is present in the study area on flat-roofed buildings or gravel areas.
- **peregrine falcon** (*Falco peregrinus*; special concern under the ESA and SARA) – Suitable habitat is present in the study area on buildings.
- **eastern small-footed myotis** (*Myotis leibii*; endangered under the ESA) – Suitable habitat is present in the rock retaining wall and cliff area in Area 2.
- **little brown myotis** (*Myotis lucifugus*; endangered under the ESA and SARA) – Suitable habitat is present in the treed areas in the study area.
- **tri-coloured bat** (*Perimyotis subflavus*; endangered under the ESA and SARA) – Suitable habitat is present in the treed areas in the study area.
- **butternut** (endangered under the ESA and SARA) – A single butternut tree was observed in the study area (Figure 1). The regulated habitat for butternut trees includes the area within 0 - 25 m of the tree (to protect the tree itself) and the area between 25 – 50 m of the tree (suitable dispersal habitat). As this tree is located more than 50 m from the Site, no works within the regulated habitat are anticipated.

Aquatic Species

- **American eel** (endangered under the ESA) – This species is known to occur in the aqueduct and may be present in the study area.
- **Lake sturgeon** (threatened under the ESA) – This species is known to occur in the Ottawa River, but is not likely to enter the aqueduct within the study area.
- **channel darter** (special concern under the ESA and SARA) – This species is known to occur in the Ottawa River and may be present in the aqueduct within the study area.
- **northern brook lamprey** (special concern under the ESA and SARA) – This species is known to occur in the Ottawa River and may be present in the aqueduct within the study area.
- **river redhorse** (special concern under the ESA and SARA) – This species is known to occur in the aqueduct and may be present in the study area.
- **silver lamprey** (special concern under the ESA) – This species is known to occur in the Ottawa River and may be present in the aqueduct within the study area.
- **hickory nut** (*Obovaria olivaria*) (endangered under the ESA and SARA) – This species is known to occur in the Ottawa River and may be present in the aqueduct within the study area.

Those species listed as threatened or endangered under the ESA, and habitats, are provided protection on the Site by the Act. No special protections are provided to species listed as special concern under the ESA, or the SARA, or their habitats.

7.0 IMPACT ASSESSMENT AND RECOMMENDATIONS

Suitable habitat for SAR has been identified as present, or potentially present, off-Site but within the study area. The physical area of impact of the proposed project is understood to be limited to the Site itself (Figure 1). For this reason, physical removal of habitat suitable for the SAR identified in Section 6.0 as being potentially present in the study area will not occur. Materials suspended in the air by crane have the potential to drop into off-Site habitats, however; this is considered extremely unlikely and the use of standard best practices for suspended loads should mitigate this potential effect sufficiently. Wherever possible, suspension of loads over the aqueduct and Area 1 should be avoided.

Indirect effects to these species and their potential habitats off-Site may result from construction activities, including noise, lighting, vibration and dust. As the Site is located within the urban core and is adjacent to active construction sites (associated with the Light Rail, etc.), the additional impact of construction at the Site on surrounding habitats is expected to be minimal. Standard construction best management practices as described below will be sufficient to mitigate any additional impacts associated with construction at the Site:

- Ensure a dust-management strategy is prepared and implemented.
- Ensure work at the Site meets all relevant noise by-laws for noise level and timing.
- Install downward pointing lighting, and limit the use of lighting to the extent necessary while maintaining safe lighting levels for workers.
- As no blasting is required for the excavation, vibration effects on adjacent habitats are expected to be minimal, and not greater than is already present as a result of adjacent construction activities (e.g., excavation and tunneling for Light Rail).

In addition to the effects discussed above, on-Site dewatering has the potential to cause negative impacts to the habitat of American eel, river redhorse, and other fish species within the aqueduct by reducing water levels in the aqueduct. At this time, the method of dewatering has not been selected, but studies have indicated that the radius of dewatering effects will not extend more than 5 m from the excavation (Golder 2020a). For this reason, no impacts to water levels in the aqueduct are anticipated, and no effects to adjacent vegetation communities are anticipated as the nearest vegetation is more than 10 m from the proposed excavation. According to Golder (2020a), depending on water quality in the excavation, the contractor (with the necessary permissions) may discharge pumped water into the City of Ottawa storm or sanitary sewers. If water quality does not allow for discharge to the sewer, then on-Site treatment or pumping directly into tankers for off-Site disposal may be required. No water from the excavation will be discharged to the aqueduct, therefore no effects to water quality in that habitat are anticipated from this source. If on-Site treatment is required, proper sediment and erosion control measures (discussed below) must be in place.

There is potential that runoff from the Site will enter the aqueduct. This could result in an adverse effect on surface water quality by introducing chemicals and suspended solids into the aqueduct. Exposure to chemicals and suspended sediment can affect the health of fish and lower trophic organisms with effects ranging from minor physiological stress to mortality. Fine sediment can also result in downstream sediment deposition that alters substrate composition and modifies the suitability of habitat for spawning, overwintering, and rearing fish. The release of chemicals or sediment into the aqueduct would be considered a release of a deleterious substance into a fish-bearing watercourse which is a violation of the *Fisheries Act*.

To prevent runoff from the Site from entering the aqueduct, a Sediment and Erosion Control Plan (SECP) will need to be developed by the contractor. The SECP must include a detailed water management plan to mitigate for movement of water off-Site and not into the aqueduct. The following mitigation measures below should be included in the SECP and adhered to (modified from DFO 2019):

- Install, monitor, and manage appropriate erosion and sedimentation control measures to avoid runoff from the Site from entering the aqueduct. This could be accomplished through use of a berm on the aqueduct side of the Site to direct water away from the aqueduct. Adequate and appropriate erosion and sedimentation control materials shall be on Site and available prior to commencement of construction.
- Temporary erosion control measures must be:
  - properly installed
  - installed before or immediately after initial disturbance
  - inspected and properly maintained (e.g., repaired, replaced or supplemented with functional materials) throughout construction until permanent erosion control is established, or reclamation is complete
- Develop a response plan to be implemented immediately in the event of a spill of a deleterious substance. The response plan should outline that work must be stopped and the deleterious substance must be contained to prevent dispersal.
- Reporting any release of deleterious material into the aqueduct.
- Keep an emergency spill kit on Site.
- Washing, refueling, and servicing machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

If these mitigation measures cannot be followed and runoff enters the aqueduct, it would be considered a violation of the *Fisheries Act* and potentially, SARA and ESA. Proponents also have a duty to notify DFO of any release of deleterious substance during the project that cause harm to fish or fish habitat, and outline the steps taken to address the release.

To protect individuals of the species discussed in this report, and all wildlife, the mitigation recommended below should be also implemented:

- Ensure all construction staff are trained to identify SAR potentially present in the study area, in the event that any enter the Site during construction.
- If any wildlife, including SAR, are identified in the work area, stop work immediately and notify the project manager.
- Ensure the construction plans reference and include the relevant recommendations provided in the Protocol for Wildlife Protection During Construction (Ottawa 2015b).
- To avoid injuring SAR and non-SAR birds or their nests or eggs, vegetation clearing and disturbance of gravel areas should take place outside the breeding bird nesting period. According to ECCC (2017), the nesting period for this area occurs between April 8 and August 28. If vegetation removal or disturbance is to occur during the nesting period, a biologist must confirm that no active nest is present in the area of activity by surveying for nests and nesting behaviour, no more than 48 hours before the work. If an active nest is located, it must be buffered and protected until it is no longer active.
- The work site should be kept clean, with no garbage or food scraps that could attract animals or alter their behaviour.

8.0 SUMMARY

Provided the mitigation measures discussed in Section 7.0 of this report are implemented, no negative impacts to SAR or the habitat for American eel (as represented by the aqueduct) on Site or in the study area are anticipated to result from the proposed development.

9.0 LIMITATIONS AND USE OF REPORT

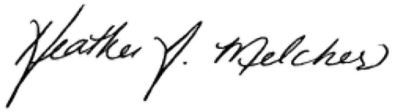
This report was prepared for the City of Ottawa. This report, which specifically includes all tables, figures and appendices, is based on data and information collected by Golder, and reflects the conditions within the study area at the time of the Site investigations, supplemented by data obtained by 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 CLOSING

We trust this report meets your current needs. If you require anything further, please contact the undersigned.

Golder Associates Ltd.



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LEGEND

- BUTTERNUT LOCATION
- ROADWAY
- VEGETATION AREA
- PROPOSED EXCAVATION
- APPROXIMATE SITE BOUNDARY
- 120 m STUDY AREA

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 20 40 80

1:1,750 METRES

CLIENT
CITY OF OTTAWA

PROJECT
ENVIRONMENTAL IMPACT STUDY
PROPOSED CENTRAL LIBRARY, OTTAWA, ONTARIO

TITLE
EXISTING CONDITIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-15
DESIGNED	----
PREPARED	JEM
REVIEWED	GAW
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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APPENDIX A

Photographic Inventory

Photo 1: Site looking northeast

Photo 2: Stone retaining wall at Area 2 north of Site

Photo 3: Cliff at Area 2 north of Site

Photo 4: Fleet St. station

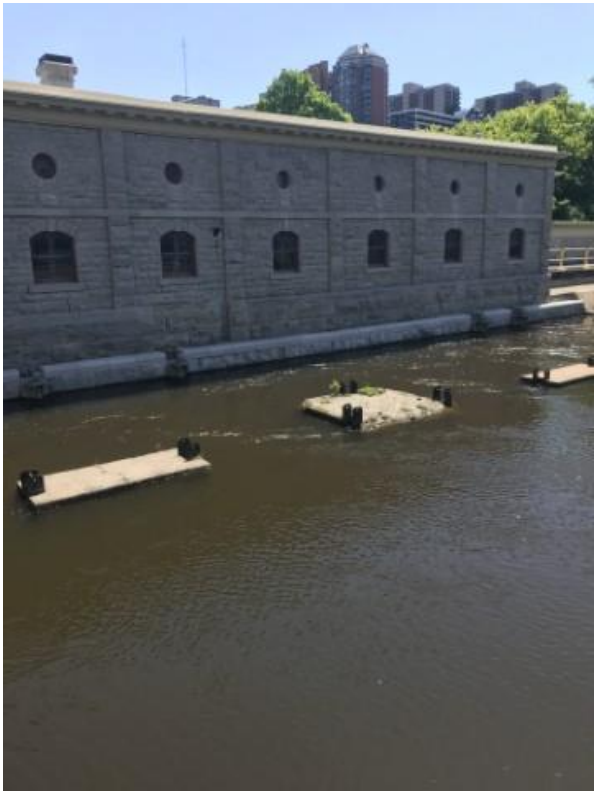

Photo 5: Aqueduct

Photo 6: Aqueduct substrates

Photo 7: Area 1 west of Site

Photo 8: Retaining wall in Area 1 along aqueduct, west of Site

Photo 9: Grade change between Site (right) and aqueduct (left)

Photo 10: Dead / dying trees in Area 2 north of Site

Photo 11: Treed area E of Albert St.

Photo 12: Retaining wall in Area 3 east of Slater St.

Photo 13: Butternut in Area 3 east of Slater St.

APPENDIX B

Species at Risk Screening

Taxon	Common Name	Scientific Name	Endangered Species Act, Reg. 230/08 SARO List Status[1]	Species at Risk Act, Schedule 1 List of Wildlife SAR Status[2]	COSEWIC Status[3]	Global Rarity Rank[4]	Provincial Rarity Rank[5]	Source(s)*	Ontario Habitat Descriptions	Probability of Occurrence on the Site	Probability of Occurrence in the Study Area
Amphibian	Western chorus frog Great Lakes St. Lawrence / Canadian Shield population	*Pseudacris triseriata*	—	THR	THR	G5TNR	S3	Range	In Ontario, habitat of this amphibian species typically consists of marshes or wooded wetlands, particularly those with dense shrub layers and grasses, as this species is a poor climber. They will breed in almost any fishless pond including roadside ditches, gravel pits and flooded swales in meadows. This species hibernates in terrestrial habitats under rocks, dead trees or leaves, in loose soil or in animal burrows. During hibernation, this species is tolerant of flooding (Environment Canada 2015).	Low - no suitable habitat	Low - no suitable habitat
Arthropod	Monarch	*Danaus plexippus*	SC	SC	END	G4	S2N, S4B	OOA	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (Asclepius 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).	Low - Despite presence of milkweed (Asclepias spp.), the number of individual plants was extremely low.	Low - No milkweed plants were observed in any abundance in the study area.
Bird	Bald eagle	*Haliaeetus leucocephalus*	SC	—	NAR	G5	S2N,S4B	eBird	In Ontario, bald eagle nests are typically found near the shorelines of lakes or large rivers, often on forested islands. The large, conspicuous nests are typically found in large super-canopy trees along water bodies (Buehler 2000).	Low - no suitable habitat	Low - no suitable habitat
Bird	Bank swallow	*Riparia riparia*	THR	THR	THR	G5	S4B	OBBA	In Ontario, bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, 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).	Low - no suitable habitat	Low - no suitable habitat
Bird	Barn swallow	*Hirundo rustica*	THR	THR	THR	G5	S4B	OBBA	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-ways, 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 1999).	Low - no suitable habitat	Moderate - may nest on structures in the study area. None observed.
Bird	Black tern	*Chlidonias niger*	SC	—	NAR	G4	S3B	eBird	In Ontario, black tern breeds in freshwater marshlands where it forms small colonies. It prefers marshes or marsh complexes greater than 20 ha in area and which are not surrounded by wooded area. Black terns are sensitive to the presence of agricultural activities. The black tern nests in wetlands with an even combination of open water and emergent vegetation, and still waters of 0.5-1.2 m deep. Preferred nest sites have short dense vegetation or tall sparse vegetation often consisting of cattails, bulrushes and occasionally burreed or other marshland plants. Black terns also require posts or snags for perching (Weseloh 2007).	Low - no suitable habitat	Low - no suitable habitat
Bird	Bobolink	*Dolichonyx oryzivorus*	THR	THR	THR	G5	S4B	OBBA	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 - no suitable habitat	Low - no suitable habitat
Bird	Canada warbler	*Cardellina canadensis*	SC	THR	THR	G5	S4B	eBird	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 - no suitable habitat	Low - no suitable habitat
Bird	Chimney swift	*Chaetura pelagica*	THR	THR	THR	G5	S4B, S4N	OBBA	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).	Low - no suitable habitat	Moderate - may nest on structures in the study area. None observed.
Bird	Common nighthawk	*Chordeiles minor*	SC	THR	SC	G5	S4B	OBBA	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)	Low - The site is very active with vehicle traffic for the adjacent construction Site. Not likely suitable habitat.	Moderate - may nest on flat-roofed structures or gravel areas in the study area. None observed.
Bird	Eastern meadowlark	*Sturnella magna*	THR	THR	THR	G5	S4B	OBBA	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 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970)	Low - no suitable habitat	Low - no suitable habitat
Bird	Eastern wood-pewee	*Contopus virens*	SC	SC	SC	G5	S4B	OBBA	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).	Low - no suitable habitat	Low - no suitable habitat

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Bird	Peregrine falcon (anatum subspecies)	*Falco peregrinus anatum*	SC	SC	SC	G4	S3B	NHIC	In Ontario, peregrine falcon breeds in areas containing suitable nesting locations and sufficient prey resources. Such habitat includes both natural locations containing cliff faces (heights of 50 - 200 m preferred) and also anthropogenic landscapes including urban centres containing tall buildings, open pit mines and quarries, and road cuts. Peregrine falcons nest on cliff ledges and crevices and building ledges. Nests consist of a simple scrape in the substrate (COSEWIC 2007).	Low - no suitable habitat	Moderate - may nest on structures in the study area. None observed.
Bird	Wood thrush	*Hylocichla mustelina*	SC	THR	THR	G4	S4B	OBBA	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 - no suitable habitat	Low - no suitable habitat
Fish	American eel	*Anguilla rostrata*	END	—	THR	G4	S1?	NHIC	In Ontario, American eel is native to the Lake Ontario, St. Lawrence River and Ottawa River watersheds. Their current distribution includes lakes Huron, Erie, and Superior and their tributaries. The Ottawa River population is considered extirpated. The preferred habitat of the American eel is cool water of lakes and streams with muddy or silty substrates in water temperatures between 16 and 19°C. The American eel is a catadromous fish that lives in fresh water until sexual maturity then migrates to the Sargasso Sea to spawn (Burridge et al. 2010; Eakins 2016).	Low - no suitable habitat	High - known to occur in the aqueduct.
Fish	Channel darter - St. Lawrence populations	*Percina copelandi*	THR	THR	SC	G4	S2	Range	In Ontario, channel darter is found in the lower Great Lakes basin along the shores of Lake Erie, Detroit River, St. Clair River, Lake St. Clair, Ottawa River and some of its tributaries, and in drainages of the Bay of Quinte. Channel darter is a freshwater member of the perch family of fishes. Channel darter can be found in three general types of habitats, depending on which aquatic system they occupy: 1) in lakes, they are found in gravel and coarse sand beach areas; 2) in large river systems, they are typically found in gravel and cobble shoals and riffles; and, 3) in small- to medium-sized rivers, they are typically found in the riffles and pools. Communal spawning occurs in the spring and early summer in upstream areas with moderate to fast current and over fine gravel or small rocks (COSEWIC 2002).	Low - no suitable habitat	Moderate - may be present in the aqueduct
Fish	Lake sturgeon Great Lakes / Upper St.Lawrence population	*Acipenser fulvescens*	THR	—	THR	G3G4TNR	S2	NHIC	In Ontario, lake sturgeon, a large prehistoric freshwater fish, is found in all the Great Lakes and in all drainages of the Great Lakes and of Hudson Bay. This species typically inhabits highly productive shoal areas of large lakes and rivers. They are bottom dwellers, and prefer depths between 5-10 m and mud or gravel substrates. Small sturgeons are often found on gravelly shoals near the mouths of rivers. They spawn in depths of 0.5 to 4.5 m in areas of swift water or rapids. Where suitable spawning rivers are not available, such as in the lower Great Lakes, they are known to spawn in wave action over rocky ledges or around rocky islands (Golder 2011).	Low - no suitable habitat	Low - no suitable habitat
Fish	Silver lamprey - Great Lakes / Upper St.Larence population	*Ichthyomyzon unicuspis*	SC	—	—	G5TNR	S3	Range	In Ontario, silver lamprey is known to occur in the Great Lakes and its tributaries, St. Lawrence River, Lake Nipissing, Lake-of-the-Woods and its tributaries, and the Ottawa River. Silver lamprey is a parasitic freshwater species that undertake spawning migrations in rivers and streams. They are often confused with sea lamprey. Adults prefer the clear waters of large streams, rivers, and lakes. Adults migrate in flowing water with stoney or gravelly bottom material for nesting. Larvae seek out slow flowing areas initially with thick organic layers where they will grow until moving out into predominantly sandy environments where they reside until they reach adulthood (COSEWIC 2012).	Low - no suitable habitat	Moderate - may be present in the aqueduct
Fish	Northern brook lamprey Great Lakes / Upper St.Lawrence population	*Ichthyomyzon fossor*	SC	SC	SC	G4	S3	Range	In Ontario, northern brook lamprey occurs in rivers draining into Lakes Superior, Huron and Erie, as well as in the Ottawa and St. Lawrence Rivers. It is found in clear streams of varying sizes. Adults prefer riffle and run areas of coldwater streams and rivers with gravel and sand substrates. Spawning habitat usually includes a swift current and coarse gravel or rocky substrate, with which males construct inconspicuous nests (COSEWIC 2007).	Low - no suitable habitat	Moderate - may be present in the aqueduct
Fish	River redhorse	*Moxostoma carinatum*	SC	SC	SC	G4	S2	Range	In Ontario, river redhorse is known to occur in the Mississippi River, Ottawa River, Madawaska River, Grand River, Trent River, and Thames River systems. They inhabit moderate to large rivers. The majority of their time is spent in pool habitats with slow-moving water and abundant vegetation. Spawning occurs in areas of shallow, moderate to fast-flowing waters in riffle-run habitats with coarse substrates of gravel and cobble (DFO 2011).	Low - no suitable habitat	Moderate - may be present in the aqueduct
Lichen	Black-foam lichen	*Anzia colpodes*	DD	—	—	G3G5	SH	NHIC	It is found on the trunks of deciduous trees, in openings within mature forests and other areas where both humidity and light levels are high. Humidity may be provided by wetlands or nearby watercourses or lakes. Habitat suitability is decreased as trees become too large or canopy too dense (COSEWIC 2015).	Low - no suitable habitat	Low - no suitable habitat
Lichen	Flooded jellyskin	*Leptogium rivulare*	—	THR	SC	G3G5	S3	Range	In Ontario, flooded jellyskin is found in the eastern region of the province. This lobed, leaf-like lichen grows on the lower trunks of trees in hardwood swamps where flooding occurs in the spring. The most common tree host is black ash, but it has also been recorded on silver maple, trembling aspen, bur oak and white cedar. Trees must be live to support the lichen. These seasonal pond habitats typically occur over top of calcareous bedrock, such as limestone. There is unlikely to be a minimum size requirement for the area of flooded forest habitat available to the lichen, as long as adequate flooding is present (Environment Canada 2013; COSEWIC 2004).	Low - no suitable habitat	Low - no suitable habitat

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Lichen	Pale-bellied frost lichen	*Physconia subpallida*	END	END	END	GNR	S2S3	Range	In Ontario, pale-bellied frost lichen grows on trees in mature, deciduous forests with relatively open understory, but moderate to high canopy cover. Common host trees include ash, black walnut, hop-hornbeam, and elm, although in Ontario, it is most often found on hop-hornbeam. This lichen has also been found growing on fence rails and rocks (Lewis 2011).	Low - no suitable habitat	Low - no suitable habitat
Mammal	Eastern small-footed myotis	*Myotis leibii*	END	—	—	G4	S2S3	BCI	This species is not known to roost within 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. It occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017)	Low - no suitable habitat	Moderate - this species may roost in the rock retaining wall or in the cliff face in Area 2.
Mammal	Little brown myotis	*Myotis lucifugus*	END	END	END	G3	S4	BCI	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 (Environment Canada 2015).	Low - no suitable habitat	Moderate - some trees with crevices, cavities, peeling bark were observed in Areas 2 and 3, mainly. Structures in the study area may also provide habitat.
Mammal	Northern myotis	*Myotis septentrionalis*	END	END	END	G1G2	S3	BCI	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 (Environment Canada 2015).	Low - no suitable habitat	Low - this species is most often associated with forested areas.
Mammal	Tri-colored bat	*Perimyotis subflavus*	END	END	END	G2G3	S3?	BCI	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 (Environment Canada 2015).	Low - no suitable habitat	Moderate - this species may roost in trees in the study area.
Mollusc	Hickorynut	*Obovaria olivaria*	END	—	END	G4	S1?	DFO	In Ontario, hickorynut is primarily found in murky, low-gradient rivers with clay-sand or clay-gravel substrate. This mussel is generally found on sandy substrates in deep water, usually exceeding 2-3 m, with a moderate to strong current (COSEWIC 2011).	Low - no suitable habitat	
Reptile	Blanding's turtle Great Lakes / St.Lawrence population	*Emydoidea blandingii*	THR	THR	END	G4	S3	ORAA	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 2005).	Low - no suitable habitat	Low - no suitable habitat
Reptile	Eastern ribbonsnake Great Lakes population	*Thamnophis sauritius*	SC	SC	SC	G5	S4	Range	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012).	Low - no suitable habitat	Low - no suitable habitat
Reptile	Milksnake	*Lampropeltis triangulum*	NAR	SC	SC	G5	S4	ORAA	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).	Low - no suitable habitat	Moderate - this species is a habitat generalist and may be found in the study area.
Reptile	Northern map turtle	*Graptemys geographica*	SC	SC	SC	G5	S3	Range	In Ontario, the 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 - no suitable habitat	Low - no suitable habitat

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Reptile	Snapping turtle	*Chelydra serpentina*	SC	SC	SC	G5	S3	ORAA	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).	Low - no suitable habitat	Low - no suitable habitat
Reptile	Stinkpot or Eastern musk turtle	*Sternotherus odoratus*	SC	THR	SC	G5	S3	ORAA	In Ontario, eastern musk turtle is very rarely out of water and prefers permanent bodies of water that are shallow and clear, with little or no current and soft substrates with abundant organic materials. Abundant floating and submerged vegetation is preferred. Hibernation occurs in soft substrates under water. Eggs are sometimes laid on open ground, or in shallow nests in decaying vegetation, shallow gravel or rock crevices (COSEWIC 2012).	Low - no suitable habitat	Low - no suitable habitat
Vascular Plant	American ginseng	*Panax quinquefolius*	END	END	END	G3G4	S2	Range	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 neutral, loamy soils (COSEWIC 2000).	Low - no suitable habitat	Low - no suitable habitat
Vascular Plant	Butternut	*Juglans cinerea*	END	END	END	G4	S2?	Range	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 - no suitable habitat	High - one individual observed in the study area.
Vascular Plant	Horn-leaved riverweed	*Podostemum ceratophyllum*	—	—	—	G5	S2	NHIC	Horn-leaved riverweed grows in waterfalls, rapids and fast-flowing rivers and streams, anchored to rocky substrate.	Low - no suitable habitat	Low - no suitable habitat

Notes:

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 2 June 2017 as O. Reg 167/17, 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 13 June 2018); 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 Global Ranks (GRANK) are Rarity Ranks assigned to a species based on their range-wide status. GRANKS are assigned by a group of consensus of Conservation Data Centres (CDCs), scientific experts and the Nature Conservancy. These ranks are not legal designations. G1 (Extremely Rare), G2 (Very Rare), G3 (Rare to uncommon), G4 (Common), G5 (Very Common), GH (Historic, no record in last 20yrs), GU (Status uncertain), GX (Globally extinct), ? (Inexact number rank), G? (Unranked), Q (Questionable), T (rank applies to subspecies or variety). Last assessed August 2011

5 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 November 2017.

6 General Habitat Protection is applied when a species is newly listed as endangered or threatened on the SARO list under the ESA, 2007. The definition of general habitat applies to areas that a species currently depends on. These areas may include dens and nests, wetlands, forests and other areas essential for breeding, rearing, feeding, hibernation and migration. General habitat protection will also apply to all listed endangered or threatened species without a species-specific habitat regulation as of June 30, 2013 (ESA 2007, c.6, s.10 (2)). Regulated Habitat is species-specific habitat used as the legal description of that species habitat. Once a species-specific habitat regulation is created, it replaces general habitat protection. Refer to O.Reg 242/08 for full details regarding regulated habitat.

[7] Refer to the individual species' federal recovery strategy for a full description of the critical habitat (http://www.sararegistry.gc.ca/sar/recovery/recovery_e.cfm)

General References:

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*Species Codes derived from the following sources: Birds – 53rd AOU Supplement (2012); Amphibians – Marsh Monitoring Program (Bird Studies Canada 2003); Fish – Golder; Reptiles – Golder.
*NHIC (Natural Heritage Information Centre); ROM (Royal Ontario Museum); OBBA (Ontario Breeding Bird Atlas); Herp Atlas (Reptiles and Amphibians of Ontario); Odonata Atlas (of Ontario); Mammal Atlas (of Ontario); BCI (Bat Conservation International); Butterfly Atlas (Ontario Butterfly Atlas)
'—' No status

APPENDIX C

Resumes

Golder Associates Ltd. – Mississauga

Education

M.Sc. Applied Marine Science, University of Plymouth, Devon, UK, 1998

B.Sc. (Honours) Biology, Laurentian University, Sudbury, Ontario, 1996

Certifications

PADI Master Scuba Diver Trainer, 2000

Small Craft Boat Operator, 2003

Small Non-pleasure Vessel Basic Safety - MED A3, 2011

Canadian Red Cross First Aid and CPR, 2012

WHMIS Training, 1990, 2001, 2004

Languages

English – Fluent

Employment History

Golder Associates Ltd. – Mississauga, Ontario
Principal, Senior Ecologist (2004 to Present)

Heather Melcher is a Principal, Senior Ecologist and Project Manager/Director with Golder Associates. Heather has over 18 years of experience working in a number of sectors including transportation, oil and gas, transmission, land development, power, aggregates and mining. Her experience lies in designing, managing and carrying out environmental impact assessments within provincial and federal frameworks and environmental land use policies for projects of various size and complexity. She leads a team of ecologists and multi-disciplinary project teams to holistically assess potential project impacts through integration of components. Heather works closely with provincial and federal agencies to help her clients navigate changing planning and species at risk (SAR) legislation. Heather has experience developing rehabilitation plans for disturbed sites and biodiversity plans that integrate the ecology of a smaller site into the regional system as well as developing compensation habitat plans and mitigation plans for SAR. Heather is also a recognized expert witness for Local Planning Appeal Tribunal (LPAT) hearings in Ontario.

ESG International – Guelph, Ontario
Ecologist/Environmental Planner (2002 to 2003)

Specialized in resource management and land use planning. Worked with clients, residential and commercial land developers, land planners and regulatory agencies to obtain permits and approvals, specifically within the framework of Niagara Escarpment and Oak Ridges Moraine legislation. Compiled, assessed and reported on marine data collected for international projects.

CBCL Ltd – Halifax, Nova Scotia
Ecologist/Environmental Planner (2001 to 2002)

Intermediate project manager responsible for designing and implementing environmental effects monitoring, environmental impact assessment, and natural heritage projects. Developed and implemented marine and freshwater fisheries and benthic investigations, aquatic habitat assessments, and water quality and sediment assessments. Liaised with clients and regulatory agencies (federal and provincial), to obtain development permits and approvals.

Southeast Environmental Association – Montague, Prince Edward Island
Bacterial Water Quality Project Coordinator (2000 to 2002)

Responsible for collection of freshwater samples and laboratory analysis of faecal coliform bacteria to determine the effects of livestock farming runoff on the shellfish industry. Liaised with landowners and the agricultural engineer to establish effective remediation efforts, and developed education initiatives involving the general public, farmers and shell fishers. Reported to a multi-stakeholder board.

PROJECT EXPERIENCE – SPECIES AT RISK

TransCanada - Various Sites in Ontario
Ontario, Canada

Natural environment component lead for multi-year annual SAR and migratory bird monitoring at numerous sites across Ontario since 2012. In support of TransCanada's right-of-way maintenance brushing program. Provide SAR advice and liaise with MNRF to develop construction monitoring protocols for SAR and migratory birds. Lead crews to complete monitoring on an annual basis.

Leader Resources Services Ltd.
Various Locations, Ontario, Canada

Project manager for a number of wind power projects under the Ontario Renewable Energy Approvals Act (REA). Worked with the client and the MNRF to develop protocols and coordinate field surveys. Completed and submitted ESA permitting applications and compensation plans.

Lafarge Canada Ltd.
Various Locations, Ontario, Canada

Project manager and natural environment component lead for a number of licence applications for proposed new and expanded aggregate extraction operations (pits and quarries) in Ontario under the ARA. Developed survey protocols, consulted with the MNRF, registered for activities under the ESA (Notice of Activity), completed Information Gathering Forms (IGF), prepared and submitted permit applications and developed compensation plans.

PROJECT EXPERIENCE – TRANSMISSION

Hydro One Circuit B5C/B6C Line Refurbishment EA
Westover to Burlington, Ontario, Canada

Natural environment component lead for a provincial Class Environmental Assessment for a 40 km line refurbishment. Designed the field program (terrestrial and aquatic), analysed and integrated data with other physical resource disciplines. Completed a comprehensive and integrated impact assessment. Led consultation with regulatory agencies including two district MNRF offices, Hamilton Conservation Authority, Conservation Halton, Grand River Conservation Authority, Niagara Escarpment Commission, and participating in the public consultation process. Provided input into alternatives assessment for temporary hydro line bypass and developed reports.

Wataynikaneyap Power Phase 2 Transmission Line
Northwestern Ontario, Canada

Senior advisor and technical reviewer for the wildlife component of permitting. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the federal Species at Risk Act (SARA). Provided senior leadership and technical guidance and review for all deliverables.

Nextbridge East-West Tie Transmission Line
Wawa to Thunder Bay, Ontario, Canada

Senior advisor and technical reviewer for wildlife permitting for the construction and operation of a 450 km transmission corridor. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and ECCC/CWS, and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the SARA. Provided senior leadership and technical guidance and review for all deliverables.

PROJECT EXPERIENCE – SERVICING/INFRASTRUCTURE

Peel Wastewater Treatment Plan
Region of Peel, Ontario, Canada

Project manager and senior advisor and technical reviewer for the natural environment component for a Schedule C Environmental Assessment for the capacity expansion of the central Mississauga wastewater system. Managed a multi-disciplinary team including natural environment, archaeology, cultural heritage, and geotechnical engineering. Designed the natural environment field program and worked with the component lead to analyse and intepret data. Provided senior leadership and technical guidance and review for all natural environment deliverables.

Niagara Falls Wastewater Servicing Strategy
Niagara Falls, Ontario, Canada

Natural environment component lead for a Class Environmental Assessment for a Niagara Falls wastewater servicing strategy for a new south Niagara Falls wastewater treatment plant. Developed ecological matrices for determining the short-list of alternative sites, including constraints anlayses, designed field program and managed a team of ecologists. Analysed, interpreted and integrated data with physical resource components. Completed impact assessment, developed reports and participated in the public consultation process.

Clarksburg Master Servicing Plan
Clarksburg, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class Environmental Assessment. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

Cambridge Zone 3
Cambridge, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class Environmental Assessment for regional water system upgrades in Cambridge and North Dumfries. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

PROJECT EXPERIENCE – RENEWABLE ENERGY

Trillium Power Wind Corporation
Lake Ontario, Ontario, Canada

Project manager and natural environment lead for an offshore wind power project in Lake Ontario under O. Reg. 359/09 Renewable Energy Approvals (REA). Coordinated and managed a multi-disciplinary team comprised of noise specialists, biologists, archaeologists, public consultation specialists, aboriginal engagement specialists, visual impact assessment specialists and geophysicists. Designed terrestrial and aquatic field surveys, including avian, bat and fisheries assessments. Led provincial and federal agency consultation and participated in public open houses. Impact assessment and reporting, designed to satisfy both provincial and federal (CEAA) requirements, was underway when the project was curtailed.

Leader Resources Services Corporation
Various Locations, Ontario, Canada

Project manager and project director/senior technical advisor for four wind farm projects under O. Reg. 359/09 REA in Huron County, Ontario. Coordinated and managed a multi-disciplinary team comprised of noise specialists, natural heritage specialists, archaeologists, cultural heritage specialists, public consultation specialists and aboriginal engagement specialists. Led regulatory agency consultation specifically regarding SAR, avian and bat issues, and participated in public consultation process. Directed and reviewed all baseline natural environment impact assessment, mitigation and monitoring reporting, including species at risk, waterbodies, and wildlife/habitat (with a focus on birds and bats). Completed REA-specific project reports.

PROJECT EXPERIENCE – OIL & GAS

Enbridge Bayview Avenue Pipeline Replacement
Ontario, Canada

Natural environment component lead for pipeline replacement project. Coordinated SAR screening, natural heritage feature mapping, site investigations, impact assessment, tree inventory, DFO self-assessment, consultation with MECP, registration of activities (NoA) under the Endangered Species Act and development of mitigation plan. Worked with team to obtain Toronto and Region Conservation Authority (TRCA) permits.

Enbirdge Pipelines Inc. Line 9
Southern Ontario, Canada

Project manager for natural environment component of pipeline maintenance project in southern Ontario. Coordinated SAR screening and natural heritage feature mapping, site investigations, identification of permit requirements and constraint mapping in support of brushing and other maintenance activities.

TransCanada Bear Creek Rehabilitation
Ontario, Canada

Natural environment component lead for Bear Creek rehabilitation following washout and exposure of the pipeline in the creek bed. Completed baseline existing conditions reporting including fish and fish habitat, SAR and riparian habitat to meet Conservation Authority, MNRF and DFO requirements. Worked with Golder's hydrology team to obtain Conservation Authority permits, develop a rehabilitation plan suitable for the existing conditions and fish community, and recommended appropriate mitigation during construction.

TransCanada Greater Golden Horseshoe Facilities Modifications
Ontario, Canada

Natural environment component lead for an environmental and socio-economic assessment for modifications to a number of facilities under the National Energy Board (NEB). Responsibilities included designing the field program (vegetation, wetlands, wildlife, fish and fish habitat), analysing data, completing the baseline and effects assessment, liaising with agencies and permitting.

TransCanada Eastern Mainline Project
Ontario, Canada

Vegetation and wetland component lead for an environmental and socio-economic assessment for a 392 km new construction pipeline in southern Ontario under the National Energy Board (NEB). Designed the field program, analysed data, completed the baseline and effects assessment and reporting. Consulted and negotiated with the MNRF, Environment and Climate Change Canada (ECCC) and local Conservation Authorities, prepared permit applications, and addressed Information Requests (IRs).

TRAINING

Microsoft Project Level 1 Training
2008

Royal Ontario Museum (ROM) Fish ID Workshop
2005

Introduction and Intermediate MapInfo Professional Training
2000

PROFESSIONAL AFFILIATIONS

Professional Association of Diving Instructors (PADI)

Director, Ontario Stone Sand and Gravel Association (OSSGA) Board of Directors

PUBLICATIONS

Conference Proceedings

Melcher, Heather. 2015. *Bats and the Aggregate Industry*. Ontario Stone Sand and Gravel Association Annual General Meeting, February. Toronto, Canada.

Melcher, Heather. 2014. *Changes to the Ontario Endangered Species Act and Implications to the Aggregate Industry*. Ontario Stone Sand and Gravel Association Annual General Meeting, February. Ottawa, Canada.

Other

Melcher, Heather. 2001; 2002. Effects of Agricultural Inputs of Faecal Coliforms on the Shellfish Industry in Prince Edward Island. Annual Monitoring Report. Prince Edward Island.

Education

H.B.Sc. (Env) Honours Environmental Science, University of Guelph, Guelph, ON, 2004

Certifications

MNRF Ecological Land Classification - Training Certificate, 2004

MNRF Ontario Wetland Evaluation System - Training Certificate, 2005

MNRF Butternut Health Assessor , 2011

Languages

English – Fluent

Golder Associates Ltd. – Ottawa

Terrestrial Ecologist

Gwendolyn has been providing ecological consulting services since 2004, with particular knowledge in the field of terrestrial ecology. Supported by her depth of experience, Gwendolyn thrives on anticipating and providing pro-active solutions for clients' needs as they navigate the natural environment approvals process. She is skilled at agency and community liaison, and prides herself on providing creative, efficient and positive outcomes for her clients.

Gwendolyn has authored numerous environmental impact statements, species at risk studies, natural heritage assessments, and due diligence reports for a variety of sectors, including residential development, recreational development, aggregates, energy projects (transmission lines, pipelines and renewable energy), as well as for municipalities, and federal and provincial agencies. She has also provided terrestrial ecology peer review services.

Gwendolyn's expertise is founded on years of direct in-field experience, where she gained extensive skills in identifying and understanding the ecology of Ontario's flora, fauna, and plant communities. Gwendolyn is certified in both the Ministry of Natural Resources and Forestry (MNRF) Ecological Land Classification (ELC) and Wetland Evaluation systems, as well as being an MNRF certified Butternut Health Assessor.

Employment History

Golder Associates Ltd. – Ottawa, ON

Ecologist and Project Manager (2011 to Present)

Gwendolyn is the senior ecologist located in the Ottawa office where she provides a range of terrestrial ecology services, including designing field programs and managing projects for numerous client sectors.

Stantec Consulting Ltd. – Guelph, ON

Ecologist and Project Manager (2004 to 2011)

Gwendolyn provided a range of terrestrial ecology services, including: designing and carrying out detailed field programs; natural features monitoring and species at risk surveys. Gwendolyn was also responsible for managing projects for a range of client sectors.

PROJECT EXPERIENCE – AGGREGATES

Arnott Pit
Ontario, Canada

Prepared a Natural Environment Level II report for Thomas Cavanagh Construction Ltd. according to the Aggregate Resources Act for an aggregate pit. Work included discussions with the MNRF, field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans.

Rideau Road Quarry
Ottawa, ON, Canada

Prepared a Natural Environment Level II report for R.W.Tomlinson Ltd. according to the Aggregate Resources Act for a small limestone quarry expansion. Work included discussions with the MNRF, field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans.

Canaan Quarry
Ontario, Canada

Prepared a Natural Environment Level I report for Cornwall Sand and Gravel according to the Aggregate Resources Act for a limestone quarry expansion. Work included a review of all published materials relating to the natural heritage features at the site, undertaking a scoped in-field review of the on-site features, and authoring the final report.

Karson Kennedy Pit
Ontario, Canada

Prepared a Natural Environment Level II report for Karson Aggregates according to the Aggregate Resources Act for a small sand pit project. Work included discussions with the MNRF, designing and undertaking the field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation and rehabilitation plans. Worked with the Mississippi Valley Conservation Authority to develop an environmental monitoring program.

PROJECT EXPERIENCE – ECOLOGY PEER REVIEW SERVICES

City of Kingston
Kingston, Ontario, Canada

Retained by the City of Kingston to provide environmental peer review services. Reviewed an Environmental Impact Study (EIS) for the severance of a parcel of land from the Little Cataraqui Creek Conservation Area, and provided comments with respect to the adequacy of scope and appropriateness of conclusions made in the report.

County of Peterborough
Peterborough, Ontario, Canada

Retained in 2010 by the County of Peterborough to provide environmental peer review services. Reviewed Environmental Impact Studies (EIS) for residential and recreational developments within the County, and provided comments with respect to the adequacy of scope, and appropriateness of conclusions made in the reports.

County of Frontenac
Frontenac, Ontario, Canada

Retained in 2008/2009 by the County of Frontenac to provide environmental peer review services. Reviewed Environmental Impact Studies (EIS) for residential and recreational developments within the County, and provided comments with respect to the adequacy of scope, and appropriateness of conclusions made in the reports.

PROJECT EXPERIENCE – ECOLOGY

Former CFB Rockcliffe
Ottawa, Ontario, Canada

Golder provided multi-disciplinary support to the redevelopment of the former CFB Rockcliffe site to a multi-use urban development. In support of the application to the City of Ottawa by Canada Lands Company, the Natural Environment team prepared the environmental impact statement and the tree conservation report, based on the proposed development plan. The evaluation of natural heritage features for this project site included the integration of provincial and federal regulations and associated best practices for mitigation of potential impacts. Adjacent lands owned by the National Capital Commission were also reviewed as part of this project.

Capital Region Resource Recovery Centre
Ottawa, ON, Canada

Natural Environment lead for the Environmental Assessment of a new integrated waste management facility. Responsible for obtaining the required approvals from the South Nation Conservation Authority, Fisheries and Oceans Canada, and from the MNRF for species at risk (barn swallow).

Gatineau Park Trail Improvements
Chelsea, QC, Canada

Golder was retained by the National Capital Commission (NCC) to prepare an Ecological Characterization Report in support of proposed trail improvements at Trails 5, 27 and 29 within Gatineau Park (federal lands). Work included mapping of vegetation communities, a fish habitat assessment, and targeted searches for species at riskor their potential habitat along the trails.The final report outlined the existing natural environment and identified mitigation measures to be employed to protect those features from potential negative impacts.

Champlain Node Park Improvements
Ottawa, ON, Canada

Golder was retained by the National Capital Commission (NCC) to prepare an Ecological Characterization Report and Environmental Effects Evaluation (EEE) in support of proposed amenity improvements at the Champlain Node park along the Ottawa River (federal lands). Work included mapping of vegetation communities, a shoreline and fish habitat assessment, a detailed tree inventory and mapping of invasive species, a wetland assessment according to federal guidelines, and targeted botanical and wildlife surveys.The final report outlined the existing natural environment and identified mitigation measures to be employed to protect those features from potential negative impacts.

Kingston Third Crossing of the Cataraqui River
Kingston, ON, Canada

Golder was part of the team selected by the City of Kingston to assist in preparing the preliminary design for the third crossing bridge over the Cataraqui River. Golder biology worked with a multi-disciplinary team to identify potential natural environment constraints that helped to inform the proposed design. The key natural features in the Study Area included the Cataraqui River Marshes provincially significant wetland, fish habitat in the Cataraqui River, shoreline wetlands and woodlands, and potential habitat for species at risk. Golder biology provided input to the lighting design for the bridge structure that respected the sensitive nature of the area, and also provided input to the landscaping plan that incorporated micro-habitats and native species. The team worked closely with the City of Kingston and Parks Canada.

Claridge Greenbank Lands
Ottawa, ON, Canada

Golder was retained by Claridge Homes to prepare an Environmental Impact Study (EIS) and Tree Conservation report, including all necessary fieldwork, for this Site. Golder worked with the client and the City of Ottawa to address all natural environment issues at the Site, including the potential presence of Species at Risk bats and birds, as well as fish habitat in the Jock River.

Claridge Maplegrove Road
Ottawa, ON, Canada

Golder was retained by Claridge Homes to prepare an Environmental Impact Study (EIS) and Tree Conservation report, including all necessary fieldwork, for this Site. Golder worked with the client and the Ministry of Natural Resources and Forestry to provide solutions that met the clients needs as well as natural heritage policy requirements at the municipal and provincial levels. Species at Risk encountered at the Site included butternut, and the potential for Blanding's turtle which was addressed through the preparation of an Information Gathering Form.

Claridge Riverside South Lands
Ottawa, ON, Canada

Golder designed and undertook a comprehensive field program at the Site to characterize the natural features present. An Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) in support of Claridge Homes' proposed residential development was then prepared which identified mitigation measures to limit potential impacts to the significant natural features identified. Those features included wetlands, headwater drainage features, woodlands, and Species at Risk including butternut.

Ottawa Police Services - South Campus
Ottawa, ON, Canada

Prepared an Environmental Impact Study (EIS) for the proposed South Campus institutional development project. Located adjacent to the Rideau River, the assessment included consideration of a number of Species at Risk, including Blanding's turtle, as well as fish habitat and surface water setbacks.

Greystone Village - Former Oblates Property
Ottawa, Ontario, Canada

Golder worked with the Regional Group on this exciting redevelopment of the historic Oblates property in Ottawa, along the Rideau River. The site was assessed for natural heritage values, and an Environmental Impact Study and Tree Conservation Report were prepared. Work included liason with the Rideau Conservation Authority and local community groups.

Species at Risk Studies - Various Projects
Various Location, Ontario, Canada

Gwendolyn has been involved in the design and undertaking of numerous studies for various Species At Risk in Ontario, and assessments of their habitats. Surveys followed accepted, standardized protocols and habitats were assessed against established criteria, where available. Species for which these types of studies have been undertaken include, but are not limited to: Fowler's Toad, Western Chorus Frog, Jefferson Salamander, Black Rat Snake, Eastern Hog-nosed Snake, Massassauga Rattlesnake, Short-eared Owl, Barn Swallow, Bobolink, Eastern Meadowlark, Peregrine Falcon, Least Bittern, West Virginia White, American Badger, Little Brown Bat and Northern Myotis, Eastern Foxsnake, Spiny Softshell, Blanding's Turtle, Butternut, American Hart's Tongue Fern, and American Ginseng, Gwendolyn has successfully navigated the over-all benefit permitting process under the Endangered Species Act for butternut and has performed work under the new O.Reg. 242/08 for American Ginseng. Gwendolyn's work with SAR has involved close liaison with the MNR, experts from academia, and involvement of public interest groups such as the Sierra Club of Canada and local Field Naturalist clubs.

O'Brien House Bat Maternity Colony Study Gatineau Park, QC, Canada	Golder was retained to assess the presence or absence of SAR bats using this historic building for maternity roosting. The study included daytime surveys to assess potential habitat and search for evidence of bats, while nighttime surveys focused on visually locating bats exiting the structure, according to standard protocols. Remote acoustic detection units were used to determine species present. Collaborated with the National Capital Commission (NCC), who is the landowner.
Connaught Range Turtle Nesting Study Ottawa, ON, Canada	Golder was retained by PWGSC to assess current SAR turtle nesting at the Connaught Range, and design a strategy to prevent future nesting, while at the same time offering alternate nesting habitat. Golder's plan was designed in consideration of rigorous shooting range requirements, while offering a safe nesting area for turtles away from the active range.
Environmental Management Plan for Urban Expansion Lands Areas 9a and 9b Ottawa, Ontario, Canada	Prepared an Environmental Management Plan (EMP) for two parcels of land, which included coordination and incorporation of materials from a number of external partners. The EMP provided a framework for future development of the area through a range of detailed studies, and included extensive consultation with City and Conservation Authority staff.
Brockville Employment Lands Brockville, Ontario, Canada	Designed a natural heritage study of a 130 acre property in the City of Brockville, with the intention of determining the potentially developable area in consideration of the natural environment features present at the Site, on behalf of the City of Brockville. Results were presented in a preliminary Environmental Impact Study for consideration as part of a Secondary Plan study for the Site.
Claridge Lands - 4789 Bank Street Ottawa, Ontario, Canada	Golder was retained by Claridge Homes to prepare an Environmental Impact Study (EIS) and Tree Conservation report, including all necessary fieldwork, for this Site. Golder worked with the client, City of Ottawa, South Nation Conservation and the Ministry of Natural Resources and Forestry to provide solutions that met the clients needs as well as natural heritage policy requirements at the municipal and provincial levels.
Remer Lands EIS and Environmental Management Plan Ottawa, Ontario, Canada	Golder provided natural heritage expertise in assisting the Regional Group to clear conditions for this draft-approved subdivision in Ottawa. This challenging project included a full inventory of the flora and fauna at the site in order to prepare an Environmental Management Plan, Environmental Impact Study and Tree Conservation Report for the site. Golder worked with the client, City of Ottawa, South Nation Conservation and the Ministry of Natural Resources and Forestry to navigate this challenging project and provide solutions that met the clients needs as well as natural heritage policy requirements at the municipal and provincial levels.
Dallan Lands - EIS Guelph, Ontario, Canada	Prepared an Environmental Impact Study for this proposed residential development. Multi-year field inventories related to flora and fauna were performed, including species at risk (Jefferson Salamander), and wetland boundaries were evaluated in co-operation with the Grand River Conservation Authority. Review of potential impacts was undertaken and presented in an Environmental Impact Statement. On-going consultation with public interest groups, University of Guelph experts, and City staff to develop a design plan in respect of complicated natural heritage features.

University of Waterloo Northwest Campus EIS
Waterloo, Ontario , Canada

Undertook a review and assessment of the natural heritage components associated with the subject lands, including floral, faunal and community investigations. The information gathered was used to create an updated Greenspace System on the subject lands and to propose trail linkages between the site and adjacent lands. Reviewed the draft plan of development in relation to the subject lands in order to identify potential environmental effects and recommend mitigation measures.

City of Hamilton Nature Counts Program
Ontario, Canada

Performed ELC within the City of Hamilton's boundary, from Ancaster to Puslinch. Designated Areas of Natural and Scientific Interest (ANSI) were inventoried for flora, fauna and disturbance level, and classified using ELC. Other tasks included air photo interpretation, field navigation and leadership.

TRAINING

Ontario Stream Assessment Protocol (OSAP) - Headwater Drainage Features
Ministry of Natural Resources and Forestry, 2017

Habitat Restoration Planning and Implementation
Northwest Environmental Training Centre, 2014

Wetland Creation Workshop
Toronto Zoo, 2010

MNRF Data Sensitivity Training
Ministry of Natural Resources and Forestry, 2014

St. John's Ambulance First Aid Training
2017

PROFESSIONAL AFFILIATIONS

Ontario Vernal Pool Association

Field Botanists of Ontario

golder.com