EIS Addendum Report In Support Of The Huron Street Watermain Decommissioning

Final Report

Prepared for:
City of London

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Sign-off Sheet

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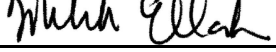
Prepared by 
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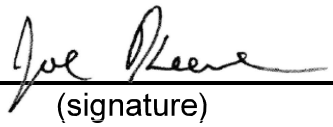
Reviewed by 
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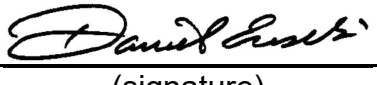
Reviewed by 
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1.0 Introduction

Stantec Consulting Ltd. (Stantec) has been retained by The Corporation of the City of London (City) to prepare an update/addendum to the Environmental Impact Study (EIS) undertaken in 2012 in support of the removal of an exposed, decommissioned watermain extending under the Thames River in the Huron Street Road allowance (the Project) and obtain the required natural environment permits to facilitate the initiative.

1.1 Background

In the fall of 2009, emergency repairs were performed on a 600-mm concrete watermain crossing of the Thames River, located approximately 500 m downstream of the University Drive bridge within the City of London (City). Approximately 25 linear metres of the watermain had become exposed due to natural river scour. The repairs consisted of placing rip-rap and aggregate cover above the exposed watermain and near the valve chamber, which was being affected by streambank erosion.

In 2011 review of the site conditions revealed that some of material installed was displaced both around the valve chamber and above the watermain. The City re-installed the displaced material in October of 2011. In 2014 and 2015 Stantec conducted semi-annual inspections of the watermain crossing and valve chamber and the monitoring showed no exposure of the watermain. However, during these 2014 and 2015 monitoring visits it was observed that much of smaller rip rap installed around the valve chamber had been washed downstream.

Concurrently during this period a Municipal Class Environmental Assessment (the EA) was completed in 2012 to determine viable options for mitigating the exposure. In 2016, the City replaced the previously exposed watermain with a 600-mm HDPE watermain. The preferred option also recommended leaving in place the decommissioned, former active 600-mm concrete watermain.

The EA stipulated that the temporary protection measures and erosion processes should be monitored at the decommissioned watermain as natural river processes may cause the pipe to become re-exposed which may:

- Trap flood debris and impair stream flow; and
- Cause hazards for people using the river recreationally

In 2019, Stantec was retained by the City to prepare and undertake a monitoring program to assess river processes near the decommissioned watermain. Evaluation of these processes aided in the decisions to determine whether the decommissioned watermain should be removed or remain in place. The monitoring was report in 2019, 2020 and 2021.

Based on these findings of the monitoring he City of London initiated the detailed design for the remediation of the abandoned concrete watermain in the Thames River. This undertaking involves continuing the monitoring program and reviewing the options for remediating the abandoned watermain in the river.

1.2 Purpose

Stantec Consulting Ltd. (Stantec) has been retained by the City of London (City) to design the removal of the abandoned concrete Huron Street Watermain and valve chamber, as well as restoration and stabilization of the North Thames River at the crossing. This EIS Addendum supports the remediation work and in particular updates the findings of the 2012 EIS to document ecological (terrestrial and aquatic) features in the Study Area, assess the potential impacts to the natural environment of the proposed watermain removal, identify appropriate measures to avoid or mitigate impacts where possible, and facilitate permitting and other authorizations.

1.3 Study Area and Project Area

The **"Project Area"** refers to the area of construction and temporary construction set up associated with the proposed watermain removal and area improvements (the Project) that will be directly affected by the proposed remediation.

The **"Study Area"** includes the Project Area, plus 120 metres (m) 'adjacent lands' as per the Provincial Policy Statement (PPS; **Figure 1, Appendix A**).

The Study Area is located within the floodplain of the Thames River. The east bank of the river is known as the Baldwin Flats, which is on lands owned by the University of Western Ontario (Western University) and is characterized by a linear deciduous forest community, open space meadows and several formal (Thames Valley Parkway) and informal trails located upstream of Gibbons Park. The northwest bank of the river is also part of Western University and includes a narrow band of deciduous trees separating the active recreation fields and Huron Drive from the Thames River. The banks are approximately 2 meters (m) high in this area, with active erosion occurring along the east bank and bed of the river, which has resulted in the need to replace the existing watermain.

The study will also assess the potential to enhance and restore the function of Project Area section of the Thames River.

1.4 Approach

The remediation of the advancing exposure of decommissioned watermain within the watercourse is intended to reduce the risk to recreationalists (i.e. small watercraft), reduce the risk of debris jams during flood events, reduce on-going impact to aquatic Species at Risk habitat and reduce the potential for future erosion and bank scouring. The removal of the watermain is proposed to include capping and removing approximately 40 m of watermain within the Thames River, 60 m on the east bank including to 5 m past the 100-year erosion limit on the east bank. The proposed works will include the restoration of the channel bed and stabilization of the east bank in consideration of existing condition and species at risk that complete their life cycle process in this section of the Thames River.

This EIS Addendum characterizes the significance and sensitivity of the natural features in the Study Area, identifies potential impacts of the Project on these natural features, and recommends appropriate measures to avoid or minimize potential negative impacts.

This EIS Addendum report reviews and confirms the previously identified significance and sensitivity of the natural features in the Study Area, identifies potential impacts of the Project on these natural features and recommends appropriate measures to avoid or minimize potential negative impacts, including permitting requirements

The information contained in this EIS Addendum is based on published data and data made available through various public agencies, web-based mapping programs and other environmental reports relating to the Study Area. This information was supplemented through field investigations to confirm and refine previous observations. This information has been summarized and the policy implications presented for consideration in support of the removal.

The following site-specific field investigations were undertaken to update the natural heritage attributes documented in the 2012 EIS in the Study Area as per the 2021 terms of reference reviewed and support by both UTRCA and EEPAC:

- Habitat assessment/snag tree inventory for bat SAR during leaf-off (once, Nov- April)
- Two (2) season flora inventory and vegetation community mapping using Ecological Land Classification (spring and summer)
- Canid survey of known coyote den to confirm activity (May)

- Reptile habitat assessment and basking surveys (five surveys late May to early July), with a focus on Queensnake, Eastern Spiny Softshell and Northern Map Turtle
- Aquatic habitat assessment at low flow conditions (once, July-August), including a description of the following, where appropriate:
    - Flow, channel form, riparian characteristics, anthropogenic and other disturbances, enhancement opportunities, substrate, groundwater indicators
    - Temperature, instream habitat features and structures
- Mussel habitat assessment at crossing and downstream/upstream, to confirm presence/absence and identify potential relocation areas (once, July-August)
- Breeding bird surveys (two surveys, late May to early July)
- Incidental wildlife observations and documentation of wildlife evidence (all site visits)
- Screening and documentation of Significant Wildlife Habitat (SWH) using the Ecoregion (7E) Criteria Schedule (summer)
- Screening and documentation of Species At Risk (SAR) using ELC and background data

2.0 Policy Overview

The natural heritage features and functions in the Study Area were assessed in consideration of the requirements of the policy and guideline documents described below.

2.1 Federal Context

2.1.1 Fisheries Act

The Government of Canada is responsible for the management of fisheries resources in Canada through the *Fisheries Act*, administered primarily by Fisheries and Oceans Canada (DFO). The *Fisheries Act* addresses national interests in marine and fresh waters. On June 21, 2019, changes to the Act (Bill C68) received royal assent and became law, restoring lost protections and incorporating modern safeguards into the *Fisheries Act*. On August 28, 2019, provisions of the new Fisheries Act came into force including new protections for fish and fish habitat in the form of standards, codes of practice, and guidelines for projects near water.

The *Fisheries Act* includes prohibitions against harmful alteration, disruption or destruction (HADD) of fish habitat. It extends protection to all fish and fish habitat. When a HADD cannot be avoided or mitigated, a subsection 35(2) authorization with appropriate offsetting of residual adverse effects is required. Section 6 of the Act lists the factors considered by the Minister when considering the approval of an authorization, which are:

- Fisheries management objectives
- Whether there are measures and standards to avoid, mitigate or offset HADD to fish or fish habitat
- The public interest

2.1.2 Species at Risk Act

Federal species at risk (SAR) are identified and assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The federal *SAR Act*, 2002 (SARA) protects wildlife species listed as extirpated, endangered or threatened under Schedule 1 of the Act from harm, harassment, killing, capture or collection. SARA also prohibits the damage or destruction of the residence of listed species, and the destruction of their critical habitat. SARA protections also extend to migratory birds and

some aquatic SAR on non-federal land. The Ministry of the Environment, Conservation and Parks (MECP) may also make an order to protect species on non-federal lands if the species is not adequately protected under provincial laws. Permits for prohibited activities may be issued under Section 73 of SARA. No such orders were known to apply to the Project at the time of this report.

2.1.3 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) protects migratory birds and their nests (Section 4). Section 6 of the Migratory Bird Regulations (Consolidated Regulations of Canada (CRC), c. 1035) prohibits the disturbance, destruction or taking of a nest, egg, or nest shelter of a migratory bird. Disturbance to nests of protected species during vegetation clearing or construction is a contravention of the MBCA.

2.2 Provincial Context

2.2.1 The Planning Act / Provincial Policy Statement

The Provincial Policy Statement (PPS 2020) is issued under the *Planning Act*, R.S.O. 1990, c.P.13 (PA) and supports the planning of land uses across the province. The PPS 2020 provides policy direction for the use and management of land, as well as infrastructure, while protecting the environment and resources and to ensure opportunities for employment and residential development. The PA requires that decisions made by planning authorities are consistent with the policy statements, such as the PPS, which includes policies on development and land use, resources, and public health and safety. Section 2.1 of the PPS discusses natural heritage and requires that natural heritage systems are identified in certain Ecoregions. This includes Ecoregion 7E, where the Study Area is located.

According to Section 2.1.5 of the PPS, development and site alteration are not permitted in the following features:

- Significant wetlands in Ecoregions 5E, 6E and 7E; and
- Significant coastal wetlands

Development and site alteration shall not be permitted in the following unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions:

- Significant Woodlands in Ecoregions 6E and 7E
- Significant Valleylands in Ecoregions 6E and 7E

- Significant Wildlife Habitat
- Areas of Natural and Scientific Interest (ANSIs); and
- Coastal wetlands in Ecoregions 5E, 6E and 7E

Development and site alteration shall not be permitted the following except in accordance with provincial and federal requirements:

- Fish habitat
- Habitat of endangered species and threatened species

Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified above unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

2.2.2 Endangered Species Act

The Endangered Species Act, 2007 (ESA) was created to identify SAR based on the best available scientific information, to protect species that are at risk and their habitats, and to promote the recovery of species that are at risk. The ESA prohibits the killing, harming, harassing, capturing or taking of a living member of a species listed as threatened, endangered or extirpated by the SAR in Ontario (SARO) list, and also prohibits damage to habitat of protected species.

Species thought to be at risk in Ontario are assessed by the Committee on the Status of SAR in Ontario (COSSARO), which is an independent body that reviews species based on the best available science, including community knowledge and Aboriginal traditional knowledge. Once species are classified at risk, they are added to the SARO list in one of four categories (extirpated, endangered, threatened, and special concern). Extirpated, endangered and threatened species on this list automatically receive legal protection under the ESA.

The ESA also provides protection for the habitat of protected species. When a species is classified as endangered or threatened, the habitat of that species is protected under a general definition. The Lieutenant Governor in Council may make regulations prescribing an area as habitat of a species that is listed as extirpated, endangered or threatened on the SARO list. A habitat regulation can prescribe an area as the habitat of a species through the description of boundaries or features of an area, or by describing that area in any other manner. Habitat will be regulated with the goal of protecting habitat that promotes the survival and recovery of endangered or threatened species.

The ESA calls for the creation of recovery strategies for endangered or threatened species, and management plans for special concern species. These documents provide advice to the government on steps to take to protect and recover SAR to healthy population levels.

2.2.3 Upper Thames River Conservation Authority

The *Conservation Authorities Act* (CAA) was created to provide for the organization and delivery of programs and services that further the conservation, restoration, development and management of natural resources in watersheds in Ontario. The CAA is administered by the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF); however, it grants each of Ontario's 36 Conservation Authorities the authority to make regulations within the areas under their respective jurisdictions.

The Upper Thames River Conservation Authority (UTRCA) has the responsibility to regulate activities in wetlands, watercourses and hazard lands (e.g., areas in and near rivers, streams, floodplains, wetlands, slopes and shorelines) through the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (O. Reg. Ontario Regulation 157/06,) The UTRCA implements the regulation by issuing permits for works in or near watercourses, valleys, wetlands, or shorelines, when required.

Under the CAA, Authorities have certain regulations with the following objectives:

- To prevent the loss of life and property due to flooding and erosion
- To prevent pollution
- To conserve and enhance natural resources

These policies apply to fill placement and removal or site grading in flood prone areas, erosion prone areas, dynamic beach areas, as well as alteration of watercourses, and interference with wetlands.

2.2.4 Fish and Wildlife Conservation Act

Nests and eggs of wild birds that are not protected by the MBCA, such as raptors (e.g., owls, hawks, and osprey), are protected from harm by the provincial *Fish and Wildlife Conservation Act, 1997* (FWCA).

The FWCA protects snakes and turtles that are listed as specially protected reptiles from hunting or trapping; however, capture and release may be permitted in some cases to avoid harm to individuals of protected species.

Under the FWCA, a Scientific Collectors permit is required to relocate aquatic species from ponds and areas temporarily isolate and dewatered to facilitate construction.

2.3 Local Planning Context

2.3.1 London Official Plan

As of May 2021 consolidation, all Natural Heritage Policies of London's Official Plan are in full effect. The London Plan represents Council's direction for future growth in the City.

Map 5 and Map 6 of the London Plan delineate natural features, hazards and natural resources in the City. The following are present in the Study Area:

- Natural Heritage System – Significant Valleylands watercourses/ponds (Thames River)
- Hazards – UTRCA regulation limit
- Natural Resources - Significant Groundwater Recharge Area, Highly Vulnerable Aquifers, watercourses

2.3.2 City of London Consolidated Tree Protection By-law

The purpose of the City of London's Tree Protection Bylaw (2021) is to regulate the injuring and destruction of trees as well as encourage preservation and planting in the City. Injury and destruction of trees within the Urban Growth boundary larger than 50 centimetres (cm) in diameter and trees within Tree Protection Areas are generally prohibited but may be allowed through the provisioning of a permit.

3.0 Methods

The scope of this EIS Addendum was prepared in consultation with the City of London and the UTRCA **(Appendix B**). Specific methods for the Background Review, Agency Consultation, Field Investigations, and SAR and Provincially Rare Species are provided below.

3.1 Background Review

Background data applicable to the Study Area were obtained through a review of existing documents and information available online. This, included a review in November 2021 for species with known ranges that overlap with the Study Area, including SAR and species of conservation concern (SOCC) (provincially rare species). Background sources reviewed included:

- Natural Heritage Information Centre (NHIC) database (NDMNRF, 2021a)
- Ontario GeoHub, Land Information Ontario (LIO) database (NDMNRF, 2021b)
- SAR in Ontario List (SARO) (MECP, 2021a)
- Fisheries and Oceans Canada Aquatic SAR Mapping (DFO, 2021)
- Environment and Climate Change Canada Critical Habitat Database (ECCC, 2021)
- London Plan - Map 5 and Map 6, including UTRCA regulation limits (City of London, 2016)
- iNaturalist database (iNaturalist, 2021)
- eBird database (eBird, 2021)
- Ontario Reptile and Amphibian Atlas (Ontario Nature, 2017)
- Ontario Breeding Bird Atlas (Cadman et al., 2007)
- Atlas of the Mammals of Ontario (Dobbyn, 1994)
- UTRCA Regulated Area Screening Map (UTRCA, 2018)
- Thames Valley Corridor Study (City of London, 2010)
- Environmental Management Plan for Huron Flats (Dillon Consulting, 1998)

- The Thames River Watershed: A Background Study for Nomination under the Canadian Heritage Rivers System (UTRCA, 1998)
- Huron Street Watermain Scoped EIS (Stantec, 2012)
- LIO website and London Plan natural heritage mapping (City of London, 2016) were assessed to determine the presence and extent of the designated natural features located in the Study Area

There has been significant amount of previous study completed on the Thames River corridor with respect to environmental issues and proposed land uses including:

- The Draft Thames Valley Corridor Study was completed in 2010 as part of the planning process for the corridor
- In 1998 an EIS was completed for the Western University stadium. Its purpose was to identify environmental issues or constraints associated with the building of the stadium facility
- The Upper Thames River Watershed Report Cards were completed in 2007. This report summarizes the features and health of the individual sub-watersheds. The Forks sub watershed is one of fourteen found in the conservation authorities' jurisdiction
- In fall 2009, site investigations were conducted by UTRCA and City of London staff to visually inspect the location of the existing watermain. These site investigations were completed to assess potential impacts of emergency repair works. Further review of potential fish and mussel species was completed in cooperation with MNR and DFO
- Geotechnical work was completed by Golder Associates Ltd. in 2010 and again in 2011. The purpose was to determine subriverine soil conditions and to address any resulting concerns regarding construction of the watermain in the subject area. The recommendations and figures in this EIS Addendum reflect the findings of Golder's geotechnical assessment and recommendations
- Huron Street Watermain Scoped EIS (Stantec, 2012)
- Huron Road Watermain Post-Construction Monitoring (Stantec, 2021) - on-going monitoring 2019 to 2021 of the decommissioned watermain section remaining in the Thames

3.2 Agency Consultation

In addition to the background data described above, information requests were sent to the following agencies on Jan 15, 2021: UTRCA, MNRF, and MECP. Meetings were held with UTRCA, and the City of London Environmental and Ecological Planning Advisory Committee (EEPAC) on March 2, 2021, to discuss the scope of natural heritage and gather information.

3.2.1 UTRCA Consultation

Communications with UTRCA commenced January 15, 2021, at which time the Project Team circulated the Terms of Reference and draft Scoping Checklist by email to UTRCA (**Appendix B**).

The first meeting with UTRCA was held on April 2 to present the scope of the project, and an overview of the EIS Addendum checklist. Stantec shared the results of the completed field surveys to date, and the tentative schedule for the remaining field surveys to be completed.

Consultation with UTRCA continued throughout the study duration to discuss wildlife identified within the Study Area, namely aquatic SAR (**Appendix B**), and additional consultation via conference call on February 7, 2022.

3.2.2 MECP and DFO Consultation

Consultation with MECP and DFO concerning Species and Risk and fish habitat was initiated on October 21, 2021. A harmonized approach to the permitting and approvals has been requested. An Information Gathering Form (IGF) for MECP and a Request for Review (RfR) have been prepared. An IGF may not be required in consideration of the need and nature of the water main removal and in consideration of ESA regulation which applies to Threats to Health and Safety - not-imminent.

3.2.3 EEPAC Consultation

Communications with EEPAC commenced January 15, 2021, at which time the Project Team circulated the Terms of Reference and draft Scoping Checklist by email to EEPAC.

The first meeting with EEPAC was held in conjunction with the UTRCA meeting, on March 2, 2021. This meeting presented the scope of the project, and an overview of the EIS Addendum checklist. Stantec shared the results of the completed field surveys to date, and the tentative schedule for the remaining field surveys to be completed. EEPAC shared confirmation occurrence of Queensnake within the Study Area in 2013.

A second meeting with EEPAC will be scheduled to discuss this report, to present the results of the field investigations, and to discuss potential impacts and recommended mitigation measures.

3.2.4 NDMNRF Consultation

The NDMNRF (formerly MNRF) was contacted on January 15 to request site specific Natural Heritage information. The MNRF responded on March 3 indicating there was no additional information for the site. A Wildlife Scientific Collectors Authorization permit will be required for the relocation of any wildlife (e.g., mussels and fish).

3.2.5 Regulatory Agency Permitting

Permits will be required for the project to advance the project design elements. The permits from the above noted regulatory stakeholders are include in **Section** Error! Reference source not found.**,** Permitting Requirements.

3.3 Field Investigation Methods

In support of the 2012 data confirmation the 2012 recommendations and initial permitting consultation, the following studies were undertaken. Field investigations conducted in 2021 included vegetation surveys using Ecological Land Classification (ELC), botanical inventories, fish and mussel habitat assessment and targeted surveys for bats, reptiles, and breeding birds, as well as habitat assessment for SAR and Significant Wildlife Habitat (SWH).

Dates, times, weather conditions and precipitation (PPT) for the surveys are provided in **Table 1** below. This includes field surveys completed by Scott Gillingwater of UTRCA.

Table 1: Field Survey Dates, Times, and Weather Conditions

Field Survey	Date/Time	Weather				Surveyors
		Temp (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
ELC and Botanical						
SAR Plant Search (False Rue-Anemone)	April 23, 2021	17	3	50	Snow /none	B. Miller
ELC and Spring Botanical	May 31, 2021	9	2	40	None/ none	K. Ellis M. Ellah

Table 1: Field Survey Dates, Times, and Weather Conditions

Field Survey	Date/Time	Weather				Surveyors
		Temp (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
ELC and Summer Botanical	July 29, 2021	26	4	60	Rain/ none	K. Ellis M. Ellah
Reptile Surveys (Presence/Absence)						
Reptile Survey 1	June 8, 2021 11:00 – 13:00	27	3	50	None/ none	S. Gillingwater (UTRCA)
Reptile Survey 2	Week of June 15, 2021	22	3	10	None/ none	S. Gillingwater (UTRCA)
Reptile Survey 3	June 23, 2021 9:30-10:15	21	2	10	None/ none	M. Ellah K. Ellis
Reptile Survey 4	June 23, 2021 13:00 – 14:00	23	3	10	None/ none	S. Gillingwater (UTRCA)
Reptile Survey 5	August 5, 2021	28	2	20	None/ none	M. Ellah
Breeding Bird Surveys						
Breeding Birds – Round 1	May 31, 2021 06:15 – 08:00	9	2	40	None /none	M. Ellah K. Ellis
Breeding Birds – Round 2	June 23, 2021 08:15 – 10:00	21	2	10	None/ none	M. Ellah K. Ellis
Bat Surveys						
Bat maternity roost assessment	April 23, 2021	17	3	50	Snow/ none	B. Miller

Table 1: Field Survey Dates, Times, and Weather Conditions

Field Survey	Date/Time	Weather				Surveyors
		Temp (°C)	Wind (Beaufort Scale)	Cloud (%)	PPT / PPT last 24 hours	
Aquatic Surveys						
Fish and Mussel Habitat Assessment	August 4, 2021	26	1	10	None/ none	M. Ellah

3.3.1 Vegetation Surveys

Vegetation communities were delineated in the field. Vascular plant species lists were recorded separately for each community. Community characterizations were based on the ELC system (Lee et al. 1998), using the updated 2008 community codes.

Two-season botanical inventories were conducted within the Study Area in 2021. The provincial status of plant species is based on the NHIC list of vascular plants (NDMNRF, 2021). Identification of potentially sensitive native plant species is based on their assigned coefficient of conservatism (CC) value, as determined by Oldham et al. (1995). This CC value, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to a specific natural habitat. Species with a CC value of 8, 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters.

An additional survey was conducted to search for False Rue-anemone (*Enemion biternatum*) to confirm presence on site or reasonably assume absence. As this species blooms in early spring (MECP 2021b), the search was conducted in early spring to facilitate recovery and identification, if encountered within the Study Area.

3.3.2 Breeding Bird Survey

Breeding bird surveys were conducted within the Study Area in 2021. Two rounds of surveys for breeding birds were conducted in May and June. Surveys consisted of area searches throughout habitat types. Surveys began at, or within, half an hour of sunrise and were completed by 10:00 a.m.

For bird surveys, observers recorded the following information: date, names of observers, time, weather conditions (temperature, % cloud cover, Beaufort wind scale, visibility, and precipitation), location, species observed and number of individuals of significant species. Although these surveys targeted breeding birds, non-breeding bird

observations were also recorded. Birds documented as flyovers or otherwise not using the Study Area as nesting habitat were documented at the time of observation.

3.3.3 Bat Maternity Roost Survey

Bat tree habitat assessments were conducted within the Study Area. The assessment followed *Survey Protocol for SAR within Treed Habitats; Little Brown Myotis, Northern Myotis & Tri-colored* Bat (Ministry of Natural Resources and Forestry (MNRF) 2017, now NDMNRF). This protocol involves identifying candidate bat maternity roost trees based on the following characteristics:

- Species
- Diameter at breast height (DBH)
- Height
- Presence of loose/peeling bark
- Cavity height (if present)
- Decay class
- Presence of other snags in proximity
- Open canopy

Large diameter trees provide potential maternity roosting opportunities for bat species and contain larger and more variable colony sizes than do smaller diameter trees (Olson and Barclay 2013). For this reason, the methods used for the bat survey focused on identifying and quantifying large diameter trees to evaluate the potential for roost sites.

3.3.4 Reptile and Amphibian Surveys

Presence/absence reptile surveys were conducted within the Study Area in 2021 by a reptile expert at the UTRCA (three surveys) and Stantec biologists (two surveys). Five surveys were conducted in June and August to target turtles and Queensnake in the shoreline and shallow water communities surrounding the watermain. Surveys focused on areas where suitable habitat was present, including nesting habitat.

For snakes, an area search was conducted by traversing the Study Area and scanning shoreline and shallow areas of the river and potential basking areas with binoculars. For turtles, the surveyor stood at the edge of the water feature and thoroughly scanned the

area with binoculars and by traversing the shallow water community. Observers recorded the following information: date, names of observers, time, weather conditions (temperature, % cloud cover, Beaufort wind scale, and precipitation), location of each survey, species observed and total number of individuals of each species.

Anuran surveys conducted in 2011 did not record evidence of presence in the Study Area and were regarded as absent. Amphibians were only recorded incidentally in 2021 while conducting other field surveys.

3.3.5 Wildlife and Wildlife Habitat

Wildlife habitat is defined as an area where plants, animals and other organisms live, including areas where species concentrate at a vulnerable point in their life cycle and that are important to migratory and non-migratory species. The *Significant Wildlife Habitat (SWH) Ecoregion 7E Criterion Schedule* (the Ecoregion Criteria; MNR 2015) groups wildlife habitat into four categories:

- Seasonal concentration areas of animals
- Rare vegetation communities or specialized habitat for wildlife
- Habitat for species of conservation concern
- Animal movement corridors

Prior to field investigations, the LIO database was accessed to identify records of SWH for the Study Area and adjacent lands. Wildlife habitat surveys were conducted in conjunction with ELC. Wildlife habitat features identified in the MNRF's (2015) SWH Criteria Schedule for 7E were recorded if present, along with a description of the attributes and location of each feature identified.

As per the Significant Wildlife Habitat Technical Guide (SWHTG; OMNR 2000) and the Ecoregion Criteria, targeted species-use surveys for breeding birds and amphibians were also used to confirm the presence of SWH.

3.3.6 Incidental Wildlife

Observations of wildlife and signs of wildlife were recorded during all field investigations and included species that were detected by sight and sound, dens, nests, burrows, browse, tracks, and scat.

3.3.7 Aquatic Habitat Assessment

The Thames River is the main feature of the Study Area (**Figure 1, Appendix A)**. Aquatic habitat assessments for the Thames River were completed on August 4, 2021.

Habitat assessment consisted of a reconnaissance review of the watercourse, (i.e., observations of dimensions, bank stability, morphology) and identification of features that typically contribute to fish and mussel habitat (i.e., in-water and riparian cover, substrate).

3.4 SAR and Provincially Rare Species

Species of Conservation Concern (SOCC) may be designated at the global, national, provincial or local level. For this report, SOCC includes species that are provincially rare (with a Provincial S-rank of S1 to S3), listed as Special Concern (SC) on the SARO list, or terrestrial species listed on Schedule 1 of SARA but not included on the SARO list.

Provincial ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of factors such as abundance, distribution, population trends and threats in Ontario and are not legal designations. By comparing the global and provincial ranks, the status, rarity, and the urgency of conservation needs can be determined. Species with provincial ranks of S1 to S3, and those tracked by MNDMNRF, are considered SOCC. Provincial Sub-National S-ranks are defined as follows:

- S1: critically imperiled; often fewer than 5 occurrences
- S2: imperiled; often fewer than 20 occurrences
- S3: vulnerable; often fewer than 80 occurrences
- S4: apparently secure
- S5: secure
- S?: unranked, or, if following a ranking, rank uncertain (e.g. S3?)

SAR are classified provincially by COSSARO and federally by the COSEWIC. Classifications include:

- Extirpated – no longer occurs in the wild
- Endangered – facing imminent danger of becoming extinct or extirpated

- Threatened – has the potential to become endangered
- Special concern – has the potential to become threatened

SAR protected under the ESA include species listed as threatened and endangered on the current SAR in Ontario (SARO) list (O. Reg. 230/08). Federally protected species include those listed as threatened and endangered on current Schedules under the SARA.

Targeted species-use surveys for breeding birds, reptiles and vegetation were used to document presence\absence of SAR and SOCC. Potential for SAR and SOCC with range overlap with the Study Area was addressed through habitat suitability screening assessments (**Appendix C**).

4.0 Results

Results of the background review and field studies are summarized in the following sections.

4.1 Background Review

4.1.1 Natural Heritage Data

Results of the background records review of the provincial database identified the following natural heritage features, as shown on **Figure 2** (**Appendix A**):

- Aquatic SAR Distribution
- Aquatic SAR Critical Habitat
- Wooded area

Map 5 and Map 6 of the London Plan delineate natural features, hazards and natural resources in the City. The following are present in the Study Area:

- Natural Heritage System – Significant Valleylands, watercourses/ponds (Thames River)
- Hazards – UTRCA regulation limit
- Natural Resources - Significant Groundwater Recharge Area, Highly Vulnerable Aquifers, watercourses/ponds

Provincially Significant Wetlands (PSW), Significant Woodlands, SWH, and Areas of Natural and Scientific Interest (ANSI) were not identified in background information for the Study Area.

4.1.2 Aquatic Habitat and Species

4.1.2.1 Fish Habitat

The Study Area is within The Forks Subwatershed (UTRCA, 2017). The thermal regime of the North Thames River is not mapped (NDMNRF, 2022). Based on the species recorded in this reach listed below, this reach provides coolwater to warmwater thermal habitat.

4.1.2.2 Fish Community

The UTRCA documents 63 fish species and 24 freshwater mussel species within The Forks subwatershed (UTRCA, 2017) with game fish being represented by Smallmouth Bass (*Micropterus dolomieu*), Largemouth Bass (*Micropterus salmoides*), Northern Pike (*Esox Lucius*) and Rainbow Trout (*Oncorhynchus mykiss*). Fish community sampling in the North Thames River nearby (1 km downstream) the Study Area documented 19 fish species (Error! Reference source not found.) (NDMNRF, 2022b). The species are either 'common and apparently secure in Ontario' (S4) or 'very common and demonstrably secure in Ontario' (S5).

Table 2: Fish Community Records near the Study Area

Common Name	Scientific Name	Thermal Regime	Regional Status
Blackside Darter	*Percina maculata*	coolwater	S4
Bluntnose Minnow	*Pimephales notatus*	warmwater	S5
Brook Stickleback	*Culaea inconstans*	coolwater	S5
Central Stoneroller	*Campostoma anomalum*	coolwater	S4
Common Carp	*Cyprinus carpio*	warmwater	SNA
Fantail Darter	*Etheostoma flabellare*	coolwater	S4
Golden Redhorse	*Moxostoma erythrurum*	warmwater	S4
Greenside Darter	*Etheostoma blennioides*	warmwater	S4
Johnny Darter	*Etheostoma nigrum*	coolwater	S5
Logperch	*Percina caprodes*	warmwater	S5
Longnose Dace	*Rhinichthys cataractae*	coolwater	S5
Mimic Shiner	*Notropis volucellus*	warmwater	S5
Northern Hog Sucker	*Hypentelium nigricans*	warmwater	S4
Rainbow Darter	*Etheostoma caeruleum*	coolwater	S4
River Chub	*Nocomis micropogon*	coolwater	S4
Rock Bass	*Ambloplites rupestris*	coolwater	S5
Rosyface Shiner	*Notropis rubellus*	warmwater	S4
Smallmouth Bass	*Micropterus dolomieu*	coolwater	S5
Spotfin Shiner	*Cyprinella spiloptera*	warmwater	S4

Common Name	Scientific Name	Thermal Regime	Regional Status
Striped Shiner	*Luxilus chrysocephalus*	coolwater	S4
White Sucker	*Catostomus commersonii*	coolwater	S5

4.1.2.3 Aquatic SAR

Three aquatic SAR were identified as potentially present in the Study Area. These species include the Black Redhorse (*Moxostoma duquesnei*), Silver Shiner (*Notropis photogenis)* and Wavy-rayed Lampmussel (*Lampsilis fasciola)* (**Table 3**). [redacted]

Table 3: Aquatic SAR Potentially Present in the Study Area

Species	Scientific Name	ESA Status	SARA Status	Source
Fish				
Black Redhorse	*Moxostoma duquesnei*	THR	THR	DFO 2021 UTRCA 2017
Silver Shiner	*Notropis photogenis*	THR	THR	DFO 2021 NDMNRF 2021a UTRCA 2017
Mussels				
Wavy-rayed Lampmussel	*Lampsilis fasciola*	THR	SC	DFO 2021 NDMNRF 2021a

THR – Threatened
SC – Special Concern

4.1.3 Species at Risk and Provincially Rare Species

4.1.3.1 SAR Screening Assessment

Results of the background review identified 16 SAR (Threatened or Endangered) that may occur in the Study Area of which 12 have habitat types that are that are found in the Study Area. Special Concern SAR are listed in the subsequent SOCC screening.

The SAR included:

- Four (4) bird species (preferred habitat does not occur in the Study Area

- Four (4) mammals, SAR bats (preferred habitat is present in the Study Area)
- Two (2) Reptiles (preferred habitat is present in the Study Area)
- Three (3) plants (habitat is absent from the Study Area)
- Three (3) aquatic species (habitat is present in the Study Area)

The SAR habitat screening assessment is detailed in **Appendix C**.

It should be noted that these SAR are those that have been recorded in various databases. This screening assessment is one component of the assessment of SAR in the Study Area. Other SAR are known to occur in the Study Area recorded during field observations and the presence or absence of some of the noted species in the Study Area is further determined based on the supporting field studies described in subsequent sections.

4.1.3.2 SOCC Screening Assessment

Results of the background review identified 13 SOCC that may occur in the Study Area. SOCC are one of the subset of Significant Wildlife Habitat. The potential for SOCC are often described in current assessment methods as either ‘confirmed’ ‘absent’ or ‘candidate’. Candidate meaning there is suitable habitat for the noted species similar to the designation of ‘habitat present’ noted in the SAR assessment. Of the thirteen species, four (4) are confirmed to be in the Study Area, three (3) are candidate (habitat is present) and six (6) are considered absent as their habitat of preference is not considered to be in the Study Area.

The SOCC that may occur in the Study Area include:

- Three (3) insects (habitat is present in the Study Area)
- Three (3) reptiles (habitat is present in the Study Area)
- One (1) bird species (habitat is present in the Study Area)

The SOCC habitat screening assessment is detailed in **Appendix C** as part of the SWH screening assessment.

It should be noted that these SOCC are those that have been recorded in various databases. This screening assessment is one component of the assessment of SOCC in the Study Area. Field observations are incorporated into the SWH (SOCC subset) and the presence or absence of the noted species in the Study Area is further determined based on the supporting field studies described in subsequent sections.

Results of the SAR and SOCC assessment identified a total of 18 species that may occur in the Study Area, detailed in **Table 4**.

Table 4: Recent records of Species at Risk and Species of Conservation Concern (1990 – present) with Suitable Habitat in the Vicinity of the Study Area

Common Name	Scientific Name	Provincial S-rank	SARO	SARA
Terrestrial Species				
Monarch[1]	*Danaus plexippus*	S4B, S2N	SC	SC
Northern Bush Katydid	*Scudderia septentrionalis*	S3?	-	-
Tawny Emperor	*Asterocampa clyton*	S3	-	-
Eastern Spiny Softshell[1]	*Apalone spinifera spinifera*	S3	END	END
Northern Map Turtle[1]	*Graptemys geographica*	S3	SC	SC
Snapping Turtle[2]	*Chelydra serpentina*	S3	SC	SC
Queensnake[2]	*Regina septemvittata*	S2	END	END
Eastern Wood-Pewee[1]	*Contopus virens*	S4B	SC	SC
Small-footed Myotis[4]	*Myotis leibii*	S2S3	END	
Little Brown Myotis[4]	*Myotis lucifugus*	S4	END	END
Northern Myotis[4]	*Myotis septentrionalis*	S3?	END	END
Tri-colored Bat[4]	*Perimyotis subflavus*	S3?	END	END
Midland Painted Turtle	*Chrysemys picta marginata*	S5	-	SC
Aquatic Species				
Black Redhorse[6]	*Moxostoma duquesnei*	S2	THR	THR
Silver Shiner[6]	*Notropis photogenis*	S2/S3	THR	THR
Wavy-rayed Lampmussel[1]	*Lampsilis fasciola*	S1	THR	SC

1 Stantec Observation 2012
2 Ontario Reptile and Amphibian Atlas
3 Ontario Breeding Bird Atlas
4 Atlas of the Mammals of Ontario
5 SARO List
6 DFO 2020

4.2 Field Investigation Results

4.2.1 Vegetation

The Study Area is a mix of various land uses including residential, recreational, and valley lands associated with the Thames River. Wooded areas occur Study Area along the Thames River with riverine vegetation characteristic of floodplains and a high diversity of plant species.

Vegetation communities located in the Study Area are described in **Table 5** below and shown on **Figure 3, Appendix A**.

Table 5: Ecological Land Classification (ELC) Vegetation Types

ELC Code	ELC Type	Description
Forest		
FODM7	Fresh – Moist Lowland Deciduous Forest	Forested community east of the Thames River, mixture of native and invasive species, general dominance of common hackberry (*Celtis occidentalis*) throughout the community as well as Norway maple (*Acer plantanoides*), black walnut (*Juglans nigra*), European buckthorn (*Rhamnus cathartica*), Manitoba maple (*Acer negundo*), goutweed (*Aegopodium podagraria*), and garlic mustard (*Alliaria petiolata*).
FODM8-3	Fresh – Moist Cottonwood Deciduous Forest	Upland forested community associated with the SHTM1-1 community along the west bank of the Thames River. The canopy is characterized by eastern cottonwood (*Populus deltoides*), black walnut, willow species (*Salix* sp.), and London plane tree (*Platanus* × *hispanica*). The sub-canopy includes black walnut, Manitoba maple and riverbank grape (*Vitis riparia*). The understory and ground layer contain Manitoba maple, common hackberry, riverbank grape European buckthorn, red raspberry (*Rubus idaeus*), thicket creeper (*Parthenocissus vitacea*), purple jewelweed (*Impatiens glandulifera*) and goutweed.

ELC Code	ELC Type	Description
Meadow		
MEMM3/THDM4	Dry – Fresh Mixed Meadow/ Deciduous Regeneration Thicket	Meadow community east of the Thames River, ground layer is dominated by Canada goldenrod (*Solidago canadensis*), smooth brome (*Bromus inermis*) and giant ragweed (*Ambrosia trifida*), the canopy contains sporadic black walnut.
MEMM3/THDM4-1	Dry – Fresh Mixed Meadow/ Native Deciduous Regeneration Thicket	Similar to the MEMM3/THDM4 community, with regeneration of native shrubs, predominately staghorn sumac (*Rhus typhina*).
Woodland		
WODM5	Fresh - Moist Deciduous Woodland Ecosite	Forested community southwest of Huron Street. The canopy and sub-canopy are dominated by Freeman maple (*Acer x freemanii*), white ash (*Fraxinus americana*), Manitoba maple, black walnut, with staghorn sumac in the understory and pale jewelweed (*Impatiens pallida*), Virginia stickseed (*Hackelia virginiana*), dame's rocket (*Hesperis matronalis*), and reed canarygrass (*Phalaris arundinacea*) in the ground layer.
Shoreline		
SHO	Open Shoreline	The riparian area along the east bank of the Thames River, characterized by a trail that runs adjacent to it.
SHTM1-1	Cottonwood Mineral Treed Shoreline	The riparian area along the west bank of the Thames River. This community is defined by a sparse canopy of eastern cottonwood.
Aquatic		
SA	Shallow Water	This is the Thames River.
Constructed		
CVR_3	Single Family Residential	Residential community to the east of the Study Area.

ELC Code	ELC Type	Description
CGL_2	Parkland	Community park trail located east of the Thames River and west off of Huron Street.
CGL_4	Recreational	Sports recreational field associated with Western University.

No provincial rare vegetation community types were recorded in the Study Area.

4.2.1.1 Vascular Plant Species

The following is a floristic summary for the Study Area based on botanical surveys conducted in spring and summer of 2021. A detailed list with plant species and their statuses is provided in **Appendix D.**

- A total of 114 species of vascular plants were recorded. This total includes taxa identified to species, subspecies (ssp.) and variation (var.) levels
- 57 of the 114-recorded species are native to Ontario and the remaining 57 are exotic species not native to Ontario
- 46 native species have a provincial rank of S5, indicating they are common with a secure population in Ontario
- 11 native species have a provincial rank of S4, indicating they are uncommon to common, but not rare in the province and populations are apparently secure
- No provincially rare native species with a provincial rank of S1, S2 or S3 were observed in the Study Area
- No SAR plant species were observed in the Study Area. The Threatened False Rue-anemone with known locations associated with the Thames River and its tributaries was not observed within the Study Area
- 3 sensitive native plant species with a high coefficient of conservatism value of 8 were observed (common hackberry, sycamore (*Platanus occidentalis)*, and white trout-lily *Erythronium albidum*). These were observed in the floodplain woods on the east side of the river (FODM7)

4.2.2 Breeding Birds

Twenty-nine bird species were recorded during the breeding bird surveys, including the Eastern Wood-Pewee (*Contopus virens*) which is designated Special Concern provincially.

All species observed are common in Ontario and in the London area and have S4 or S5 provincial. Bird species observed in the Study Area are provided in **Appendix D**.

4.2.3 Bat Maternity Roost Assessment

Treed areas within the Study Area were assessed for their potential to support bat maternity roost trees in 2021. A total of two potential bat maternity roost trees were identified within the Study Area, as shown on **Figure 4 (Appendix A)**. Details of the identified trees is provided below in **Table 6**. The potential bat maternity roost trees could provide habitat for four SAR bats: Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis and Tri-colored Bat.

Table 6: Bat Maternity Roost Trees Identified within the Study Area

Tree #	Species (Common Name)	DBH (cm)	Cavities? (yes/no)	Peeling bark? (yes/no)	Open canopy? (yes/no)	Decay? (yes/ no)	Large DBH? (yes/no)	Tall Tree? (yes/ no)
1	Eastern Cottonwood	35,35	No	Yes	No	No	Yes	No
2	Willow Species	28,30,31	No	Yes	No	No	No	No

4.2.4 Reptile and Amphibian Surveys

Reptile surveys recorded three species of reptiles within the Study Area and adjacent lands and three species of amphibians. The three reptiles recorded are species are at risk: Eastern Spiny Softshell (*Apalone spinifera spinifera*) (Endangered), Northern Map Turtle (*Graptemys geographica*) (Special Concern), and Snapping Turtle (*Chelydra serpentina*) (Special Concern). These species are vulnerable (S3) in provincial sub-national ranking in Ontario. Three amphibian species were observed incidentally: American Toad, Northern Green Frog, and Northern Leopard Frog. A summary of reptiles and incidental amphibians observed is provided below in **Table 7**, and a complete list of reptiles observed, and their status is provided in **Appendix D** with records of SAR and SOCC shown on **Figure 4** (**Appendix A**).

Table 7: Reptile and Amphibian Presence/Absence Survey Results

Reptile Survey	Date	Survey Type	Species Observed (#)	[redacted]
1	June 8, 2021	Presence/Absence	Eastern Spiny Softshell	[redacted]
		Presence/Absence	Northern Map Turtle	[redacted]
		Presence/Absence	Queensnake (0)	[redacted]
		Incidental	American Toad, Northern Green Frog, and Northern Leopard Frog	[redacted]
2	June 15, 2021	Nesting Survey	Eastern Spiny Softshell	[redacted]
3	June 23, 2021	Presence/Absence	Eastern Spiny Softshell (4)	[redacted]
4	June 23, 2021	Presence/Absence	Eastern Spiny Softshell (2)	[redacted]

Table 7: Reptile and Amphibian Presence/Absence Survey Results

Reptile Survey	Date	Survey Type	Species Observed (#)	[redacted]
			Snapping Turtle (3)	[redacted]

The amphibian observed are updated from the 2012 EIS anuran call surveys where no observations were made. The 2012 anuran surveys were conducted in downstream riparian wetland features south of the Study Area.

Eastern Spiny Softshell is designated provincially and federally as Endangered and is afforded general habitat protection under the *ESA*. This species requires sandy beaches and riverbanks for nesting, shallow soft-bottomed waterbodies to function as nurseries and refugia, basking areas and deep pools for thermoregulation, and riffle areas for foraging. Habitat features may occur over a large area, as long as the intervening habitat doesn't prevent the turtles from travelling between them (COSEWIC 2002). [redacted]

Northern Map Turtle is designated federally as Special Concern. This species is not afforded general habitat protection under the *ESA* but recognized and evaluated under SWH. Northern Map turtles are highly aquatic and inhabit slow moving, large rivers and lakes with soft bottoms and abundant aquatic vegetation. Basking sites include rocks and deadheads adjacent to deep water (COSEWIC 2002b). Nesting occurs in soft sand or soil and at a distance from the water while hibernation is communal and occurs at the bottoms of lakes (MacCulloch, 2002). Females leave the water in June to nest (MacCulloch, 2002). [redacted]

Snapping Turtle is designated provincially and federally as Special Concern. This species is not afforded general habitat protection under the *ESA* but recognized and evaluated under SWH. Snapping Turtles inhabit ponds, sloughs, streams, rivers, and shallow bays that are characterized by slow moving water, aquatic vegetation, and soft

bottoms (COSEWIC 2008). [redacted]

Queensnake (*Regina septemvittata*) is designated provincially and federally as Endangered and is afforded general habitat protection under the *ESA*. The Queensnake is an aquatic snake found in rocky, gravelly, or slate stream-bed substrates, with a swift to moderate current and woodland surroundings (COSEWIC 2010). The Queensnake is very rare in the province and is restricted to relatively small sections of a few rivers and wetlands in southwestern Ontario. In addition, the habitat of this species is highly specialized and it is rarely found more than 3 m from water. Wood (1949) noted the following three conditions necessary to support a large population of Queensnakes: permanent area of water, flowing or still, with a temperature at or above 18.3˚C throughout most of the active season; abundant cover, such as flat rocks submerged and/or on the bank; and an abundance of crayfish. [redacted]

4.2.5 Incidental Wildlife Observations

Incidental observations included Striped Skunk (*Mephitis mephitis*), Longnose Gar (*Lepisosteus osseus*), Rock Bass (*Ambloplites rupestris*), and Monarch (*Danaus plexippus*).

Eastern Wood-pewee is designated provincially and federally as Special Concern. This species is not afforded general habitat protection under the *ESA* but recognized and evaluated under the assessment of SWH. Eastern Wood-pewee is a forest bird of deciduous and mixed woods (Cadman et al. 2007) and was observed in suitable breeding habitat during breeding bird surveys. This species is discussed further in **Section 5.5.3**.

Monarch is designated provincially and federally as Special Concern. This species is not afforded general habitat protection under the *ESA* but recognized and evaluated under the assessment of SWH discussed in Section 5.5.3 for SWH. Individuals were observed foraging along the shoreline, they are likely to use the meadow habitat to lay eggs as the host plant, Common Milkweed (*Asclepias syriaca*), was noted throughout.

A complete list of wildlife species observed during field investigations is provided in **Appendix D**.

4.2.6 Aquatic Habitat Assessment

A field assessment of fish and mussel habitat was conducted on August 5, 2021. Areas assessed included the riffle area at the watermain crossing, as well as areas upstream and downstream of the crossing which may be potentially affected during the construction activities. Upstream areas were also assessed as potential mussel relocation and control areas that are required as part of anticipated SAR mussel relocations prior to in-water works.

At the Huron Watermain Crossing location, the North Thames River has a bankfull width of between 25 to 50 m. At the pipeline location there is a riffle that was between 10 and 30 m long. Water depth at the riffle ranged between 0.1 m and 0.3 m. Substrates at the riffle were comprised of boulders and cobbles that were placed on top of the watermain as a measure to reduce erosion and pipe exposure. A geotextile mat associated with this added material was exposed in some areas. Downstream of the watermain there was a pool along the east bank that was at least 1 m deep. The pool had fine substrates (sand and silt). Upstream of the watermain there was a long run that extended at least 100 m. A maintenance hatch cover associated with the watermain is located on the east bank. The banks were low gradient and stable i.e., protected by cobble and boulder. The canopy over the river was open except for a few overhanging trees along the bank. The west bank was vegetated by Fresh Moist Deciduous Forest. The east bank was dominated by dry fresh mixed meadow ecosite.

[redacted]

A photographic record of aquatic habitat for the assessed area is provided in **Appendix E**.

5.0 Significant Natural Heritage Features

This section of the EIS Addendum addresses each of the natural heritage features in the Study Area, as defined in the PPS, by characterizing and evaluating their significance and sensitivity. This section also addresses the City of London's natural heritage considerations. This evaluation is used to inform the discussion in Section 7.0 which identifies potential impacts of the Project on these natural features and recommends appropriate measures to avoid or minimize potential negative impacts.

The natural heritage features to be considered in accordance with the PPS and London Plan include:

- Provincially Significant Wetlands
- Wetlands
- Habitat of Endangered and Threatened species
- Significant Woodlands
- Significant Valleylands
- Significant Wildlife Habitat
- Areas of Natural and Scientific Interest (ANSIs)
- Fish Habitat

As discussed in **Section 2.2.1** and **2.3**, in southern Ontario, site alteration is not permitted in Significant Habitat of Endangered and Threatened species, Significant wetlands or Significant coastal wetlands. Development and site alteration may be permitted on lands adjacent to Significant wetlands, and the Significant Habitat of Endangered and Threatened species if it is demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area was identified.

Site alteration is not permitted within, or on lands adjacent to, the other significant natural heritage features unless the ecological function of these lands has been evaluated and it has been demonstrated that no negative impacts on the natural heritage features or their ecological function will occur. Development and site alteration is not permitted within fish habitat except in accordance with provincial and federal requirements.

5.1 Significant Wetlands

The province determines significance of wetlands according to standardized evaluation procedures. Additionally, the planning authority may designate other wetlands significant if they have limited representation within the planning area or are of high quality within the context of the municipality.

There are no PSWs identified during background review (LIO 2021, City of London 2016) occurring within the Study Area.

Results of the field investigations did not identify additional wetlands.

5.2 Significant Woodlands

The London Plan evaluates significance of woodlands based on criteria suggested by the *Natural Heritage Reference Manual* (Ontario Ministry of Natural Resources, 2005) for designating Significant Woodlands at a provincial level include woodland size, ecological function (shape, proximity to other woodlands or natural features, linkages), species diversity, uncommon characteristics, and economic and social values. It is the local planning authority's responsibility to designate Significant Woodlands.

Significant Woodlands are identified on Map 5 of the City of London's OP. No Significant Woodlands were identified in the Study Area.

5.3 Areas of Natural and Scientific Interest (ANSI)

There were no ANSIs identified in the Study Area.

5.4 Significant Valleylands

According to the London Plan:

The identification of Significant Valleylands will be based on an evaluation of their ecological, hazard protection, and water resources management functions including the following considerations:

1. *The valleyland performs an important water resources role relating to headwater functions, surface drainage, groundwater recharge or discharge, or filtering of surface water sediments.*
2. *The valleyland contains distinctive, unusual natural communities or landforms of high quality.*

3. *The valleyland represents mostly continuous, large natural areas that provide for wildlife movement, linkages and connections that typically extend beyond the City or subwatershed boundaries.*
4. *The valleyland provides linkage or a corridor between significant natural heritage features and areas.*
5. *The valleyland provides opportunities to create linkages or corridors and opportunities for rehabilitation of the landform to a natural state, or to a state that can support healthy natural communities.*
6. *The valleyland plays an important role in minimizing land use impacts by providing a physical separation or buffer between incompatible forms of development.*
7. *The valleyland has physical characteristics, related to size, depth and slope gradient, that are susceptible to slope instability or erosion and that are expected to present constraints to development.*
8. *Policy Deleted*
9. *Additional criteria as identified in the Natural Heritage Reference Manual.*

Within the City of London, the entire length of the Thames River corridor is recognized as a significant valleyland as shown on Map 5 (City of London, 2016). Therefore, Significant Valleylands associated with the Thames River occur in the Project Area and Study Area.

5.5 Significant Wildlife Habitat

SWH is one of the more complicated natural heritage features to identify and evaluate. Pursuant to the SWHTG (OMNR 2000), there are four general types of Significant Wildlife Habitat: (a) seasonal concentration areas, (b) rare or specialized habitat, (c) habitat for species of conservation concern or (d) migration corridors.

The Significant Wildlife Habitat Technical Guide (OMNR 2000) and SWH Criteria Schedule for Ecoregion 7E (MNR 2015) were consulted to identify candidate and, where required, confirm SWH. Specialized forms were completed in the field for each vegetation community to document rare or specialized features and candidate habitat types. Targeted field studies were undertaken to confirm candidate SWH types where applicable, the results of which are summarized in **Section 4.2.** Details of the SWH assessment is summarized below.

5.5.1 Seasonal Concentration Areas

Seasonal concentration areas are those sites where large numbers of a species gather together at one time of the year, or where several species congregate. Such areas include, but are not limited to, deer yards, amphibian breeding ponds, snake and bat hibernacula, waterfowl staging and moulting areas, raptor roosts, bird nesting colonies, shorebird staging areas, and passerine migration concentrations.

Candidate seasonal concentration areas were identified Study Area in **Appendix C** for the following SWH:

- Waterfowl Stopover and Staging Area
- Shorebird Migratory Stopover Area
- Bat Maternity Colonies
- Reptile Hibernaculum

Confirmed seasonal concentration area identified in **Appendix C** was for one (1) SWH:

- Turtle Wintering Areas

5.5.2 Rare or Specialized Habitat

Rare or specialized habitats are two separate components. Rare habitats are those with vegetation communities that are considered rare in the province. Generally, community types with SRANKS of S1 to S3 (Critically Imperiled to Vulnerable in Ontario), as defined by the NHIC, could qualify as it is assumed that these habitats are at risk and that they are also likely to support additional wildlife species that are considered significant. No rare habitat occurs within the Study Area.

Specialized habitats are microhabitats that are critical to some wildlife species. Two specialized habitats were confirmed to occur in the Study Area as detailed in **Appendix C**:

[redacted]

- Amphibian Breeding Habitat

5.5.3 Species of Conservation Concern

Habitat for SOCC includes four types of species: (a) those that are rare, (b) those whose populations are significantly declining, (c) those that have been identified as

being at risk to certain common activities, and (d) those with relatively large populations in Ontario compared to the remainder of the globe.

Habitat for SOCC occurs in the Study Area that may support the following candidate species:

- Tawny Emperor
- Midland Painted Turtle
- Northern Bush Katydid

The following SOCC are confirmed to occur within the Study Area (**Appendix C**):

[redacted]

- Northern Map Turtle
- Snapping Turtle

[redacted]

5.5.4 Migration Corridors

Wildlife movement corridors are passageways that are used by wildlife to move between habitats, typically in response to different seasonal habitat requirements. Movement corridors are identified once significant amphibian breeding habitat has been confirmed.

Candidate amphibian movement corridor occurs within the Study Area, associated with the Thames River and its riparian zone.

5.5.5 Significant Wildlife Habitat Summary

The following candidate SWH features were identified in the Study Area per **Appendix C**:

- Waterfowl Stopover and Staging Area
- Shorebird Migratory Stopover Area
- Bat Maternity Colonies
- Reptile Hibernaculum

- Habitat for SOCC for 3 species (Tawny Emperor, Midland Painted Turtle, Northern Bush Katydid)
- Amphibian movement corridor

And the following confirmed SWH features were identified in the Study Area (**Appendix C**):

- Turtle Wintering Areas
- Turtle Nesting Areas
- Amphibian Breeding Habitat

[redacted]

5.6 Significant Habitat for Endangered and Threatened Species

Endangered and Threatened species are identified by the MECP using procedures established by COSSARO. **Appendix C** summarizes SAR that were identified in the background records review and compares habitat requirements for each species to existing conditions of the Study Area as well as results of the site investigations.

Suitable habitat was identified for the following candidate species in the Study Area:

- Four Bat SAR (Little Brown Myotis, Northern Myotis, Small-footed Myotis, Tri-colored Bat)
- One reptile (Queensnake)
- Two aquatic species (Black Redhorse, Silver Shiner)

[redacted]

although none of these were observed during field investigations. Black Redhorse, Silver Shiner and Queensnake are listed as Threatened in Ontario. Four species of bats, Little Brown Myotis, Northern Myotis, Small-footed Myotis, Tri-colored Bat (collectively referred to as bat SAR) have the potential to occur within the riparian woodlands while roosting and open areas (e.g., Thames River, parkland) may provide foraging habitat. Bat SAR are listed as Endangered in Ontario.

[redacted]

5.7 Fish Habitat

Fish habitat, as defined in the federal *Fisheries Act*, are those parts of the environment on which fish depend, directly or indirectly, to carry out their life processes. As described Section 4.5.3, the North Thames River is characterized as supporting a diverse warmwater fish community, which supports a variety of fish and freshwater mussel species, including several SAR.

5.8 Summary of Natural Heritage Constraints

Based on a review of existing information, discussions with City, MNR and UTRCA staff, and observations made during the field investigations, the following natural heritage features should be considered during the preparation of the detailed design for this project to identify and mitigate potential negative impacts associated with the replacement of the watermain.

The following features were identified within the Study Area:

- Designated natural features identified in Map 5 and Map 6 of the London Official Plan, including:
    - Natural Heritage System – Significant Valleylands watercourses/ponds (Thames River)
    - Hazards – UTRCA regulation limit
    - Natural Resources - Significant Groundwater Recharge Area, Highly Vulnerable Aquifers, watercourses

[redacted]

[redacted]

- Candidate SWH identified in the Study Area (Waterfowl Stopover and Staging Area, Shorebird Migratory Stopover Area, Bat Maternity Colonies, Reptile Hibernaculum, Habitat for 3 SOCC - Tawny Emperor, Midland Painted Turtle, Northern Bush Katydid), Amphibian movement corridor
- Fish Habitat associated with the Thames River

6.0 Project Description

The remediation of the advancing exposure of decommissioned watermain within the watercourse is intended to reduce the risk to recreationalists (i.e. small watercraft), reduce the risk of debris jams during flood events, reduce on-going impact to aquatic Species at Risk habitat and reduce the potential for future erosion and bank scouring. The removal of the watermain is proposed to include capping and removing approximately 100 m of watermain, 40m being in the Thames River and 60m on the east bank (see Plan View Construction Plan **Appendix A**), including the valve chamber and temporary rip rap that was installed to provide temporary shoreline protection. The proposed works will include the restoration of the channel bed and stabilization of the east bank in consideration of existing condition and species at risk that complete their life cycle process in this section of the Thames River.

The proposed construction activity will involve the following:

- Permits approved by the appropriate agencies (DFO, MECP, NDMNRF, and UTRCA) will be obtained prior to initiating the construction activities including tree clearing

- Water management and erosion and sediment control measures will be implemented in accordance with the approved water management and erosion and sediment control plans. Works to be completed during low flow conditions (July and August) may be coordinated with the UTRCA for control of upstream water sources

- Mussels to be tagged and relocated to predetermined, designated locations (see **Section 7.4**). Following the mussels' removal, an in-water AquaDam will be installed around the Thames River work site. In-water work to be completed as dry works by isolating the work area using pumps or diversion techniques. The isolated area will be subject to fish, mussel and turtle (if required) removal in accordance with the fish removal plan (see **Section 7.4**). Existing flows will be maintained downstream of the de-watered work area

- Concurrently with in-water works, a maintenance laydown, work and staging areas, and dewatering area will be prepared for the construction of the AquaDam. There shall be no clearing or cutting of trees or shrubs except as allowed by permits. Construction of bank stabilization, including all grading and bank protection structure installations, will be completed and areas shall be seeded/planted according to a planting plan as provided in the detailed design. Flow dissipaters, filter bags or other appropriate measures will be used at any pump discharge location to prevent erosion and the deposition of deleterious substances into the watercourse

7.0 Potential Impacts and Mitigation Recommendations

The environmental impacts that may reasonably be expected to occur as a result of the proposed construction of the watermain have been identified and discussed in this section. Potential direct and indirect impacts, as well as short-term and long-term impacts, associated with the proposed works have been considered and appropriate mitigation measures recommended within the context of the Class EA approvals.

An assessment of overall net environmental impacts is also provided based on the implementation of appropriate mitigation, restoration and enhancement measures to improve the overall integrity of the natural system in the area. Where direct impacts to SAR habitat or are expected to occur, recommended steps to consult with relevant agencies and/or obtain authorization are discussed.

Site-specific and standard mitigation recommendations are identified below to mitigate potential impacts to natural features and enhance the natural heritage system where appropriate. Site-specific measures are recommended to address the specific natural heritage features and functions identified for the Project Location, while standard measures address strategies that are typically required for construction such as flagging, signage, etc.

Impacts to SAR are the primary concern at the site as there are a number of terrestrial and aquatic SAR that occur in the Study Area and some that are known to occur in the footprint of the proposed construction envelope, Project Area. These SAR species are also discussed in **Section 7.4.**

7.1 Impacts to Vegetation Communities

Temporary loss of vegetation will occur where the Project Footprint overlays natural features and vegetation removal is required to facilitate construction. To the extent possible, encroachment into any of the natural areas has been a primary consideration in the development of the removal design and Plan.

The following temporary loss of natural vegetation in natural ELC communities within the Project Area is shown below **Table 8**).

Table 8: Natural Vegetation Loss per Ecosite Associated with the Project

ELC Ecosite	ELC Code 2008	Area within Project Footprint (ha)	Percent of Project Footprint
Fresh – Moist Lowland Deciduous Forest	FODM7	0.2	24%
Dry – Fresh Mixed Meadow/ Deciduous Regeneration Thicket	MEMM3/ THDM4	0.13	16%
Dry – Fresh Mixed Meadow/ Native Deciduous Regeneration Thicket	MEMM3/ THDM4-1	0.03	3%
Shallow Water	SA	0.14	17%
Open Shoreline	SHO	0.06	7%
Cottonwood Mineral Treed Shoreline	SHTM1-1	-	-
Fresh - Moist Deciduous Woodland Ecosite	WODM5	0.02	2%
	Total	0.58	

The remaining impacts (0.27 ha, 31%) of the Project will be to build up ELC communities CGL_2, CGL_4, and CVR_3.

Additional impacts to the area vegetation are associated with the introduction of invasive species. These impacts are addressed through the application of Clean Equipment Protocol address in the following mitigation section

Erosion and sediment is an on-going concern at all construction sites and in particular areas where aquatic receptor are a key component of the construction area such this project site. Erosion and sediment control are applicable to vegetation protection, and wildlife habitat both terrestrial and aquatic. As such it is included in following vegetation mitigation as a first step in the process of applying protective measures to the various receptors in the study area.

7.1.1 Mitigation for Vegetation

7.1.1.1 Vegetation Removal –Mitigation

Protection, restoration and enhancement opportunities generally include the following:

- Stake and delineate the boundaries of the Project work area to avoid accidental encroachment, protect areas of vegetation retention, as well as provide erosion and sediment control (discussed in **Section 7.1.2**)
- Restoration of any removed vegetation using a diverse selection of native plant species to accommodate flood flows, recreation and wildlife migration
- Maintain floodplain area on either side of the river to maintain wildlife passage opportunities and habitat diversity within the corridor; and
- Accommodate paths and pathway connections within the constructed area for recreational purposes
- Remove vegetation outside the breeding bird window, not between April 3 and August 15 (see **Section 7.2.1.2**)

A landscape planting plan is recommended for the detailed design of this project. The plan should consist of native wildflowers and grasses, shrubs, and deciduous trees to offer restoration to areas disturbed by construction and to enhance the existing communities.

7.1.2 Sediment and Erosion Control

Erosion and Sediment Control (ESC) fencing offers protection to both vegetated and aquatic environments. In some case where SAR is known to frequent the area of the work site, ESC fencing installation can serve as exclusionary fencing for various wildlife species. The details of Erosion and Sediment control are discussed below in Aquatic Habitat mitigation found in **Section 7.3.1.1.**

7.1.3 Clean Equipment Protocol

Standard measures for revegetation of disturbed areas will be implemented to reduce opportunities for invasive plants. A clean equipment protocol will be implemented during construction to reduce the potential for the introduction and spread of invasive plants. The protocol should be developed in consideration of the Clean Equipment Protocol for Industry (Halloran et al., 2013).

7.2 Potential Impacts to Wildlife

Reptiles, amphibians, and other ground-dwelling animals may occasionally enter work areas. Interaction with wildlife during construction may result in injuries or direct mortality to these species or indirect effects through habitat degradation and

disturbance through noise. The Thames River provides important habitat and acts as a movement corridor for both aquatic and terrestrial wildlife in the Study Area.

Migratory birds and their nests are protected from harm and disturbance under the MBCA. Although nests of migratory birds were not observed during field investigations, the presence of breeding birds was documented within the potential for nests to occur in vegetation that will be cleared.

7.2.1 Study Area Mitigation to Wildlife

7.2.1.1 Avoidance of Wildlife

Sediment and erosion control fencing (geotextile fences) are effective for the temporary exclusion of amphibians and reptiles. Light duty geotextile fences are suitable for construction duration lasting up to one season while heavy-duty geotextile fences are effective for up to 2 to 3 years. Geotextile fencing with nylon mesh should be avoided due to the risk of entanglement by snakes. Specific details for reptiles and amphibian exclusion fencing are further detailed in **Section 7.4.2**.

7.2.1.2 Bird Nests

The Regional Nesting Period (RNP) is the period when the percent of total nesting species is expected to be greater than 10%. The RNP for the Study Area is considered to fall between April 3 and August 15, although nesting also infrequently occurs outside of this period (Government of Canada 2018). No part of the Project that could result in the incidental take of bird nests should be performed within the RNP unless an avian biologist is retained to conduct nest sweeps of the Project Area a maximum of seven days prior to works. The biologist will search for nests or signs of nesting of migratory birds within and adjacent to the Project Area. Where the sweep determines that no nests are present, the Project can commence within the searched area. If the Project is delayed beyond the seven-day effective window for the nest sweep, a new sweep will be required.

If a migratory bird nest is located within the work area at any time, a no-disturbance buffer will be delineated. This buffer will be maintained for the entire duration of the nest activity, which will be determined using periodic checks by the avian biologist. The radius of the buffer generally varies from 5 m – 60 m depending on the sensitivity of the nesting species. The Project will not resume within the nest buffer until the nest is confirmed to be no longer active.

7.3 Potential Impacts to Aquatic Habitat

Potential impacts to fish and mussel habitat can include direct habitat loss or indirect impacts to habitat. Direct impacts may result from the placement of structures or fill below the high-water mark, including new substrate materials used to replace the removed water main and any modifications to the riverbank adjacent to the water main removal.

Although regulated habitat for Silver Shiner has not been defined in the ESA, the species has been afforded similar additional protections under the ESA as Redside Dace (O. Reg. 242/08 Section 23.1), which includes protections of habitat within the meander belt width of the watercourse plus 30 m.

Much of the access road, laydown areas and pipe removal will be located within the 30 m buffer zone surrounding the meander belt width of the North Thames River, which is protected habitat for Silver Shiner. The defined meander belt width for the North Thames River at this location was not available at the time of writing this report but is assumed to include the entire Project Area.

The cobble and geotextile material that is currently in place at the proposed work location will be removed then the pipeline and a water main valve (on shore) will be removed. By removing the cobble, geotextile and pipeline, the water depth may increase which may result in deeper riffle or run habitat similar to the run habitat currently present upstream and downstream from the riffle. By removing the onshore valve, the hardened bank (boulders) at this location will also be removed and a new bank will be created. This restoration will result in a greater channel width, similar to that found upstream and downstream from the work location. Habitat alteration is anticipated to be minimal and an overall benefit and net gain to fish habitat will be realized as more fish habitat will be created as result of removing the hard rip rap.

Indirect impacts may result from the potential for sediment transport from exposed soil surfaces, potential entry of construction debris (e.g., dust) into the water and spills associated with refueling of equipment. Suspended sediments increase turbidity of the water column, which can impair vision and subsequent feeding by fish that are sight-hunters. Suspended sediments can also abrade gill membranes leading to physical stress, and impact prey organisms' behavioral changes (i.e., avoidance, etc.). Heavier sediments can deposit on coarser substrates that may be used for spawning, incubation of juvenile fish and mussels, or food production, thereby impacting those habitat functions.

Indirect impacts are generally reduced through the implementation of standard mitigation measures to protect fish and fish habitat (**Section 7.3.1**).

7.3.1 Aquatic Species and Habitat Mitigation

Precautions should be taken to reduce the potential for erosion and sedimentation into the North Thames River, including appropriate silt and sediment control during site preparation (i.e. mussel transfer and AquaDam installation) and construction activities.

7.3.1.1 Erosion and Sediment Control

As noted above, ESC can be instrumental in protecting aquatic receptors and species which live in the North Thames River and riparian zones as well terrestrial vegetation and SAR habitats, both aquatic and terrestrial.

Erosion and sediment (E&S) transport is possible at all construction sites. The goal of E&S mitigation is to reduce the potential for erosion and subsequent sediment release through various methods of control.

In areas where erosion (wind, rain, slope erosion) has the potential to occur, minimizing the extent of erosion and its advancement within the disturbed construction area is critical to avoiding impact to natural areas near the watermain removal.

Mitigation measures for sedimentation, erosion, and dust control should be implemented to prevent sediment and dust from entering sensitive natural features. The primary principles associated with sedimentation and erosion protection measures are to: (1) minimize the duration of soil exposure; (2) retain existing vegetation where feasible; (3) encourage re-vegetation; (4) divert runoff away from exposed soils; (5) keep runoff velocities low; and to (6) trap sediment as close to the source as possible.

To address these principles, the following mitigation measures are proposed:

- Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas
- Equipment should not be permitted to enter any natural areas beyond the vegetation protection fencing
- Equipment should be re-fueled a minimum of 30 m away from all watercourses to avoid potential impacts if an accidental spill occurs. Spill control materials, including absorbent barriers and mats, should be kept on site to immediately address any accidental spills
- In addition to any specified requirements and prior to grading operations, additional silt fence should be available on site to provide a contingency supply in the event of an emergency

- All sediment and erosion controls should be monitored regularly and properly maintained as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is re-established
- Disturbed natural areas and the existing hard shoreline area found in the vicinity of the valve chamber should be restored to pre-construction conditions, or new naturalized shoreline.
- Silt fencing and/or barriers such as sediment logs (i.e., SiltSoxx™) should be used along all work zones where there is potential for sedimentation of watercourses or wetlands, or inadvertent encroachment of construction vehicles into trees or natural areas
- Dust could be controlled by using water instead of chemical suppressants in dust-sensitive areas such as the mapped natural heritage features
- All exposed soil areas should be stabilized (native seed mixes; sourced locally if possible) and re-vegetated, through the placement of seed and mulching or seed and an erosion control blanket, promptly upon completion of construction activities
- In addition to any specified requirements, additional silt fence and/or silt logs should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency
- Sediment and erosion controls should be monitored regularly and properly maintained as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is re-established
- A *Sediment and Erosion Control Plan* specific to the site will be developed, to be approved by the City and will be kept on site pre and during construction activities

The following mitigation measures will be incorporated regarding in-water construction activities:

- In-water activities have been scheduled outside the restricted activity timing windows for the protection of spring spawning species. In-water activities will be completed between July 15 and March 15 of the following year
- A spills emergency response plan will be developed and kept on site
- Work will be completed during low flow conditions

- A fish rescue and mussel transfer will be completed by qualified staff under a NDMNRF license to collect fish
- In-water work will be completed in the dry by isolating the work area using an AquaDam water filled coffer dam. (see Plan View Construction Plan, **Appendix A**). Flow can will be maintained around the work area through the section of the channel that is not isolated
- Water quality monitoring for turbidity (NTU) during in-water construction activities. If the water downstream of the construction activities become visibly turbid then work will be halted, and adjustments made. The contractor will keep a log to document water quality visual observations
- Machinery shall arrive on site in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds
- Where possible, operate machinery on land above the top of bank of watercourses

In general, potential impacts to aquatic habitat can be mitigated through site control measures, such as previously mentioned sediment and erosion controls, and other measures to prevent the entry of substances and debris into the water. For in-water work or access, construction timing windows can be employed to reduce the risk of impacts occurring during sensitive life periods such as spawning and emergence of young fish. In water activities will be completed outside of the restricted window for the protection of spring spawning species that is applied by NDMNRF Aylmer District i.e., March 15 to July 15. The restricted timing window for this reach was confirmed in an email from NDMNRF (Jason Webb, Management Biologist) on January 11, 2022. Harm to fish can be reduced through isolation of work areas using coffer dams, AquaDams or other work area isolation techniques, removal of fish and mussels from the isolated area and performing works in the dry work area to reduce resuspension of sediments during construction.

7.4 SAR Mitigation

Potential impacts to SAR are similar to those outlined for wildlife in **Section 7.2** and the mitigation for overall wildlife protection are considered pertinent to the protection of many SAR.

Proposed mitigation for SAR is provided in the following sections based on Stantec's experience with these species on other projects. These mitigation measures will be subject to additional correspondence with the City of London and the administrator of the ESA (MECP).

7.4.1 SAR Wildlife – Mammals (Bats)

To further reduce the likelihood of harm to bats, it is recommended that trees greater than 10 cm diameter at breast height (DBH) be removed outside the bat maternity roost season. Bats typically give birth in late May to early June, and females fly with newborn young until they become excessively heavy. Young begin to fly in mid- to late-June, at age three to four weeks. Rearing is completed by August and bats move to hibernacula in August or September (Broders et al. 2006, Cagle and Cockrum 1943, Gerson 1984). Therefore, removal of trees greater than 10 cm DBH is not recommended between May 1 to October 1. If tree clearing is required within this window, maternity exit surveys may be conducted prior to the tree removals to determine if bats are using the trees. Maternity exit surveys are conducted during the evening and include visual and acoustic surveys using accepted protocols.

7.4.2 SAR Reptiles, including Spiny Softshell, Northern Map Turtle and Queensnake

[redacted]

To address potential impacts to turtles that may be overwintering in the Thames River, construction of the Project is recommended to occur outside their sensitive period, not between approximately November 1 and April 14. [redacted]

- Fencing will be installed upon commencement of construction (prior to construction activities) and will be monitored and maintained in-place until the end of construction activities

- Fencing will be installed in accordance with '*Reptile and Amphibian Exclusion Fencing: Best Practices, Version 1.0'* (OMNR 2013; **Appendix F**):
    - The recommended height of fencing is a minimum of 60 cm and adjusted in consideration of topography. To deter digging it is recommended that the fence be buried 10 cm below grade with an additional 10 cm horizontal lip ('keyed in') on the species side
    - Fencing reinforced with a woven nylon mesh is not an acceptable material as this can cause entanglement and mortality for snakes
    - At access locations, it is recommended that the fence be designed to curve inward in order to direct animals from the area of exclusion (Figure 1, OMNR, 2013; **Appendix F**)
    - Daily inspection of fences at regular intervals throughout the active season. These inspections are important for areas of geotextile fencing as well as permeable fence types where fencing is subject to water flow events (inspect to remove debris build up). Damage that affects the integrity of the fence (e.g. tear, loose edges, collapses, etc.) should be fixed promptly
- Maintenance vehicle traffic on access roads will primarily be restricted to daytime hours. Vehicle speeds will be restricted to 20 km/h or less. Speed limit signage will be installed to communicate the 20 km/hr limit
- All observations of Queensnake, Northern Map Turtle and Spiny Softshell on site should be recorded and submitted to MECP and UTRCA, with any observed fatalities reported to MECP immediately
- In the unlikely event that a Queensnake, Northern Map Turtle or Spiny Softshell enters the work area and is in immediate danger, a 30 m buffer should be placed on the work area and construction activities should cease until the turtle or snake has vacated the work area on its own accord before recommencing construction activity. Alternately, the turtle or snake should be relocated by a qualified biologist if permissible with approval through consultation with MECP
- If a nesting Spiny Softshell is observed or if a turtle nest is identified in the Project Area either during construction or operation of the Project, the MECP should be contacted immediately. A 5 m buffer should be applied to the nest site, or 30 m to a nesting female, and maintained until the MECP provides additional direction. Turtle nests should not be touched as it can damage eggs

- It should be noted that during the mussel move described below a manual method of feeling through the substrate will be used to gather Spiny Softshell's buried in the substrate. Once the AquaDam is installed and prior to working in the area, additional turtle search will be conducted by manual feel through substrate in areas that offer good silty habitat or areas where turtles were observed during the mussel relocation effort

- All persons entering the site should be provided training about Queensnake and Spiny Softshell and proper steps to take upon encountering these individuals. Continual awareness and avoidance of Spiny Softshells nesting on, or crossing, roadways will be encouraged through training programs for those individuals with access to the Project Location

Consultation with MECP is recommended to determine authorization requirements for work in habitat of Queensnake and Spiny Softshells, it is anticipated that all SAR authorization will be complete through a registration of Notice of Activity authorization process based on the type of work being proposed.

7.4.3 SAR - Mussel Including Wavy-rayed Lampmussel

Prior to in-water works associated with the Huron Water Main removal, all mussels will need to be relocated following accepted protocols (Mackie et al. 2008) from the prescribed search area likely to be affected by those activities. These include installation of coffer dams or AquaDams to isolate the work area, and access routes, temporary causeways that may be needed for access and any areas where material, equipment or personnel may impact in-water areas of the North Thames River. Mussels will be collected manual by feel through riverbed substrate for buried mussels (i.e. racooning).

The relocation timing window based on mussel species and habitat present restricts handling of mussels to a period when water temperatures are above 16°C, which typically occurs between June 15 and September 30 in any given year.

Follow-up monitoring of relocated SAR mussels one month, one year and two years post-relocation may also be required (Mackie et al. 2008) as a condition of ESA or SARA permitting.

7.4.4 SAR Fish, including Silver Shiner and Black Redhorse

Mitigation measures to avoid harm to Silver Shiner and other fish SAR include:

- Maintaining the flow of the North Thames River without interruption during construction

- Stabilize exposed soil, earth or substrates to prevent sediment or deleterious substances from entering the stream or watercourse within 5 days after the soil, earth or substrate becomes exposed
- Any equipment, stockpiled material or construction material shall be stored outside the critical habitat of Silver Shiner and in a manner that prevents sediment or deleterious substances from entering the habitat of Silver Shiner
- A double row of sediment control fencing consisting of a non-woven material with staked straw bales shall be installed and maintained to prevent sediment from entering any part of the habitat of Silver Shiner
- Any sediment-laden water that is proposed for discharge shall be filtered to remove the sediment before it enters any part of the habitat of Silver Shiner. The dewatering area for water collected for the isolated work zone are shown on the Plan View Construction drawing in **Appendix A**
- Native plants shall be planted in the area to restore shorelines and upland habitat disturbed during construction

8.0 Permitting Requirements

8.1 Fisheries Act

As previously described in Section 2.1.1. the *Fisheries Act* prohibits projects causing a HADD to fish and fish habitat unless authorized by DFO. The proposed watermain removal plan will be submitted to DFO as a Request for Review (RfR). If DFO determines that the proposed work will result in a HADD of fish habitat or the killing of fish through means other than fishing, an application for Authorization under the *Fisheries Act* may need to be submitted to DFO. Initial correspondence with DFO has been initiated, **Appendix B**, Agency Correspondence.

8.2 Species at Risk Act

The Project has the potential to harm or harass protected fish species and will, therefore, require a federal SARA Permit from the DFO for all in-water activities that could potentially affect Silver Shiner and Black Redhorse or their habitat. This SARA Permit may be issued as part of an Authorization received from DFO through the RfR process, or a separate SARA permit application may need to be submitted to DFO prior to the proposed works. Initial correspondence with DFO has been initiated, see **Appendix B**, Agency Correspondence.

8.3 Endangered Species Act

In order to proceed with the Project, authorizations under the ESA may be required for Eastern Spiny Softshell, Queensnake, bat SAR (Little Brown Myotis, Northern Myotis, Eastern Small-footed Bat, Tri-colored Bat), Wavy-rayed Lampmussel, Black Redhorse, and Silver Shiner. A summary of requirements is presented below:

- [redacted]

- **Bat SAR Little Brown Myotis, Northern Myotis, Eastern Small-footed Bat, Tri-colored Bat)**: Removal of candidate roost trees outside of the active period (i.e., do not remove between October 1 and April 1) is anticipated to avoid impacts to these species. The removal of two (2) potential roost trees are not expected to impact these species with candidate roost trees expected to occur throughout the treed portions of the Study Area (and beyond). In the event that removal is required during the active season, exit surveys and consultation with MECP is recommended. Initial correspondence with MECP has been initiated, **Appendix B**, Agency Correspondence

- **Black Redhorse, Silver Shiner, Wavy-rayed Lampmussel:** Consultation with the MECP is recommended to determine authorization requirements under the ESA. It is unlikely, due to the predicted area of in-water disturbance (i.e., greater than 100 m^2), that the project could qualify for an exemption under Ontario Regulation 23.4 of the ESA (Aquatic Species). The project could require an ESA 17(2)(c) Permit from the MECP for all in-water activities that could potentially affect Black Redhorse, Silver Shiner, and Wavy-rayed Lampmussel or their habitat or registered under the ESA under Threats to Health and Safety - not-imminent. Habitat protection for Silver Shiner extends to the meander width of the watercourse plus 30 m. A 17(2)(c) net benefit permit may require additional offsetting measures for each of these species that will be negotiated with MECP as part of the authorization process. Initial correspondence with DFO and MECP has been initiated, **Appendix B**, Agency Correspondence

- It should be noted that ESA permitting may be obtained under Section 8 Protection of Health and Safety of the ESA which and states the provisions of the Act do not apply to a person who is acting to protect a human being. Discussion and supporting information for MECP is on-going.

8.4 Conservation Authority Regulated Areas

Under O. Reg. 157/06 a permit is required for development or interference with wetlands and alterations to shorelines and watercourses. The Project Area is located within UTRCA regulation limits associated with the Thames River. A permit application package for submission to UTRCA will include the following information:

- Maps and photographs showing the location of Project work relative to regulated features
- Environmental mitigation measures for sediment and erosion control, re-vegetation and seeding
- Other site-specific data as required

Consultation with UTRCA during detailed design is recommended to confirm permit application requirements.

8.5 Fish and Wildlife Conservation Act

If in-water work involving isolation techniques requires relocation of fish, mussels, turtles or other wildlife, a Wildlife Scientific Collectors Authorization may be required from the NDMNRF under the *Fish and Wildlife Conservation Act*.

8.6 City of London Tree Protection By-law

Several components of tree compensation must be considered as follows.

- Tree Protection Bylaw https://london.ca/by-laws/5321 applies to the Distinctive Trees (greater than 50cm DBH)
- Typically the approach in the Forest City considers the 'forest' component; compensating for both the feature (# of trees removed) and function (forest habitat, land/area ratio). A 2:1 replacement ratio is anticipated
- Based on Policy 399_4b, trees will generally be replaced at a ratio of one replacement tree for every 10 centimeters of tree diameter that is removed
- Tree replacement requirements will be determined in consultation with the City of London as construction plans are finalized

8.7 Summary Of Natural Heritage Permits

The permit and required authorization summarized in **Table 9** are associated with, in-water works, species at risk, wildlife salvage in dewatering area. Other permits related to topics beyond natural heritage such as Transport Canada approval are include in the construction specifications.

Table 9: Huron Watermain Removal Natural Heritage Permitting Requirements

Regulatory Agency	Applicable Legislation	Permit Type	Permit application Documents
Department of Fisheries and Oceans	Fisheries Act	Fisheries Act Authorization or Letter of Advice	Request for Review (RfR)
MECP	Endangered Species Act (ESA)	Huron Watermain Removal Natural Heritage Permitting, Standard Authorization or registration of Notice of Activity	Information Gathering Form and Alternative Assessment Form and 17(2)(c) Overall Benefit Application or Registration under Section 23.18 Threats to Health and Safety – Not-Imminent
MNRF	Fish and Wildlife Act	Fish Collection Permit Wildlife Collection Permit	Licence to collect fish for Scientific Purposes Wildlife Scientific Collectors Authorization
UTRCA	Conservation Authority Act	Ontario Regulation 157/06 – Development Interference with Wetlands and Alterations to Shorelines and Watercourse	Section 28 Application

9.0 Summary and Conclusions

This EIS Addendum provides supporting documentation for the Huron Street Watermain Crossing Replacement EA. The EIS Addendum describes applicable natural heritage policies, results of the natural heritage assessment, impact mitigation and permitting requirements.

The City of London OP identifies watercourses/ponds, Significant Valleylands, UTRCA regulation limit in the Study Area associated with the Thames River. Fish habitat is also identified in background provincial mapping.

The natural heritage assessment included background data collection and agency correspondence, site investigations and biological field surveys in 2021. This assessment and the associated studies confirm the 2012 Stantec finding and provide an update to refine the Project scope to meet the requirements of the current policy, legislation and permitting requirements. Surveys and assessments of vegetation communities, wildlife populations, SWH, SAR habitat and aquatic habitat were completed.

The Study Area is a mix of various land uses including residential, recreational, and valleylands associated with the Thames River. These habitats were found to support two SAR (Spiny Softshell and Wavy-rayed Lampmussel) and candidate SAR habitat for Little Brown Myotis, Northern Myotis, Small-footed Myotis, Tri-colored Bat, Queensnake, Black Redhorse, and Silver Shiner.

Confirmed SWH occurs in the Study Area for Turtle Wintering Areas, Turtle Nesting Areas, Amphibian Breeding Habitat, Habitat for SOCC for 4 species (Monarch, Northern Map Turtle, Snapping Turtle, Eastern Wood-pewee) as well as candidate SWH for Waterfowl Stopover and Staging Area, Shorebird Migratory Stopover Area, Bat Maternity Colonies, Reptile Hibernaculum, Habitat for 3 SOCC (Tawny Emperor, Midland Painted Turtle, Northern Bush Katydid), and Amphibian movement corridor.

Recommended wildlife impact mitigation from construction includes adhering to Primary Nesting Period vegetation clearing windows, erecting geotextile fabric fencing at potential wildlife crossing locations and visual searches for wildlife during construction. Other mitigation includes sediment and erosion control plan, clean equipment protocol, and a landscape restoration plan. Detailed measures for SAR are included that are subject to final consultation with UTRCA and MECP.

Permitting requirements include the potential for a project review under the *Fisheries Act (Request for Review RfR)*, an UTRCA O. Reg. 157/06 permit, potential for a license and/or authorization under the FWCA, tree permit, and the submission of an Information

Gathering Form (IGF) to determine requirements under the ESA. Permitting is anticipated to be managed and registered under the ESA under Threats to Health and Safety - not-imminent. It should be noted that protection and mitigation initiative for SAR outline in this EIS Addendum are identical for which ever ESA permitting process is applied to this project.

The Project is anticipated to have minimal impact to the natural habitat found within the Study Area. The proposed works do not impact significant or protected features in the Study Area, natural vegetation loss is predicted to be low and mitigation techniques can be utilized to reduce impact on wildlife. With this EIS Addendum, Stantec determines the Project complies with applicable federal, provincial, and municipal policies and is anticipated to have temporary, minor, and mitigatable impacts to the local ecosystem.

The below water surface geotextile material that is currently this exposed is potential a threat to SAR will be removed and the removal and shoreline restorations of the previously installed temporary protective rip rap will result in an increase of aquatic habitat in the North Thames River. The restoration of the riverbed and shoreline riparian areas are considered to be an overall positive influence on the natural heritage features of the area through the removal of the decommissioned portion of the watermain while eliminating the current safety concerns associated with the present condition of the watermain and value chamber.

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February 11, 2022

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Appendix A
Figures

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January 2022
165630191

Stantec

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Contains information licensed under City of London Open Data License.

Legend
- Study Area (120 m)
- Project Footprint
- Flow Direction
- Assessment Parcel

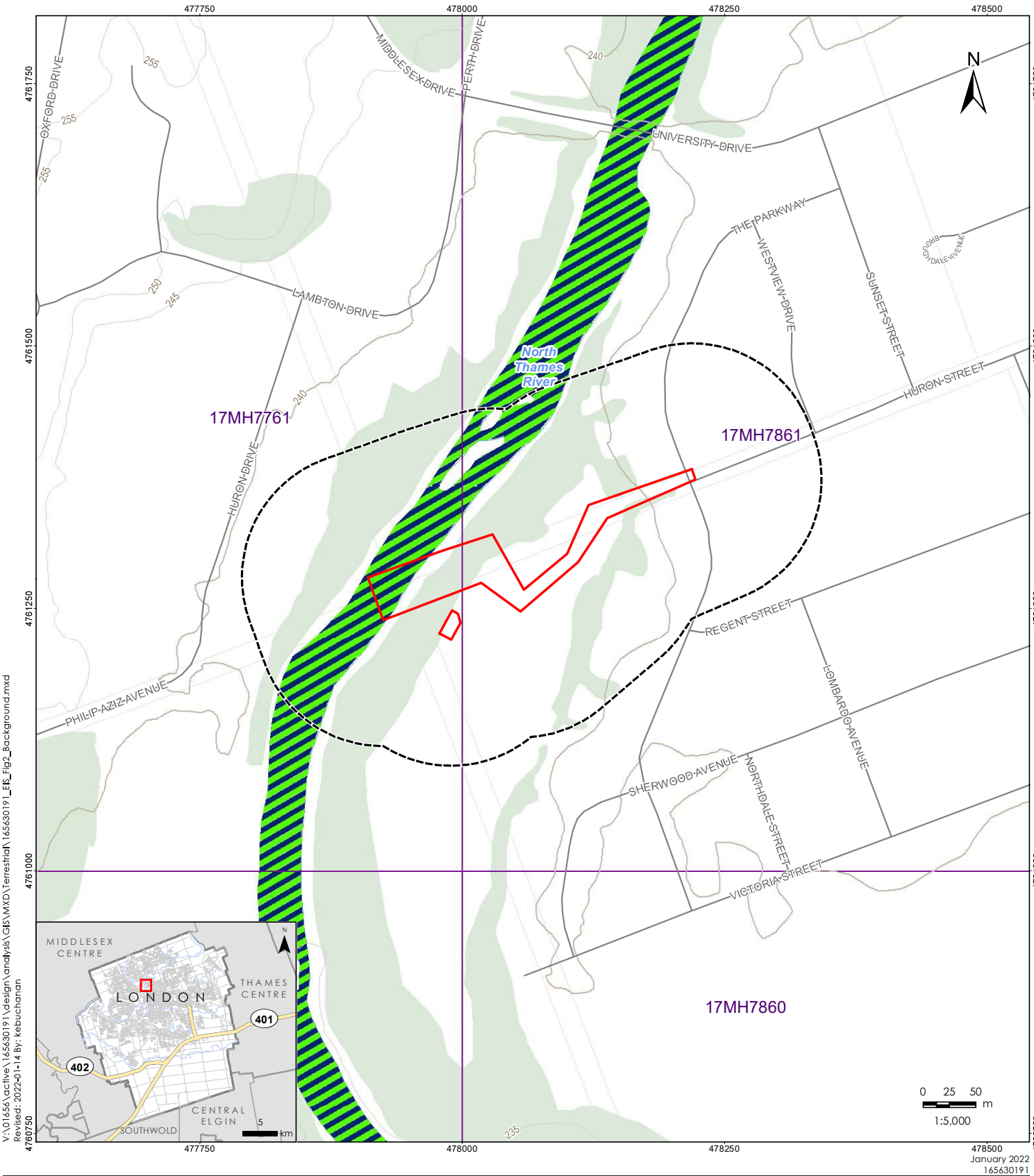
Client/Project

City of London
Huron Street Watermain Remediation
Environmental Impact Study

Figure No.
1

Title

Study Area



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Revised: 2022-01-14 By: kebuchanan

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Legend
- Study Area (120 m)
- Project Footprint
- Contour (10 m Interval)
- Contour (5 m Interval)
- 1 km UTM Grid
- Aquatic Species at Risk Distribution
- Aquatic Species at Risk Critical Habitat
- Waterbody
- Lot Fabric
- Wooded Area

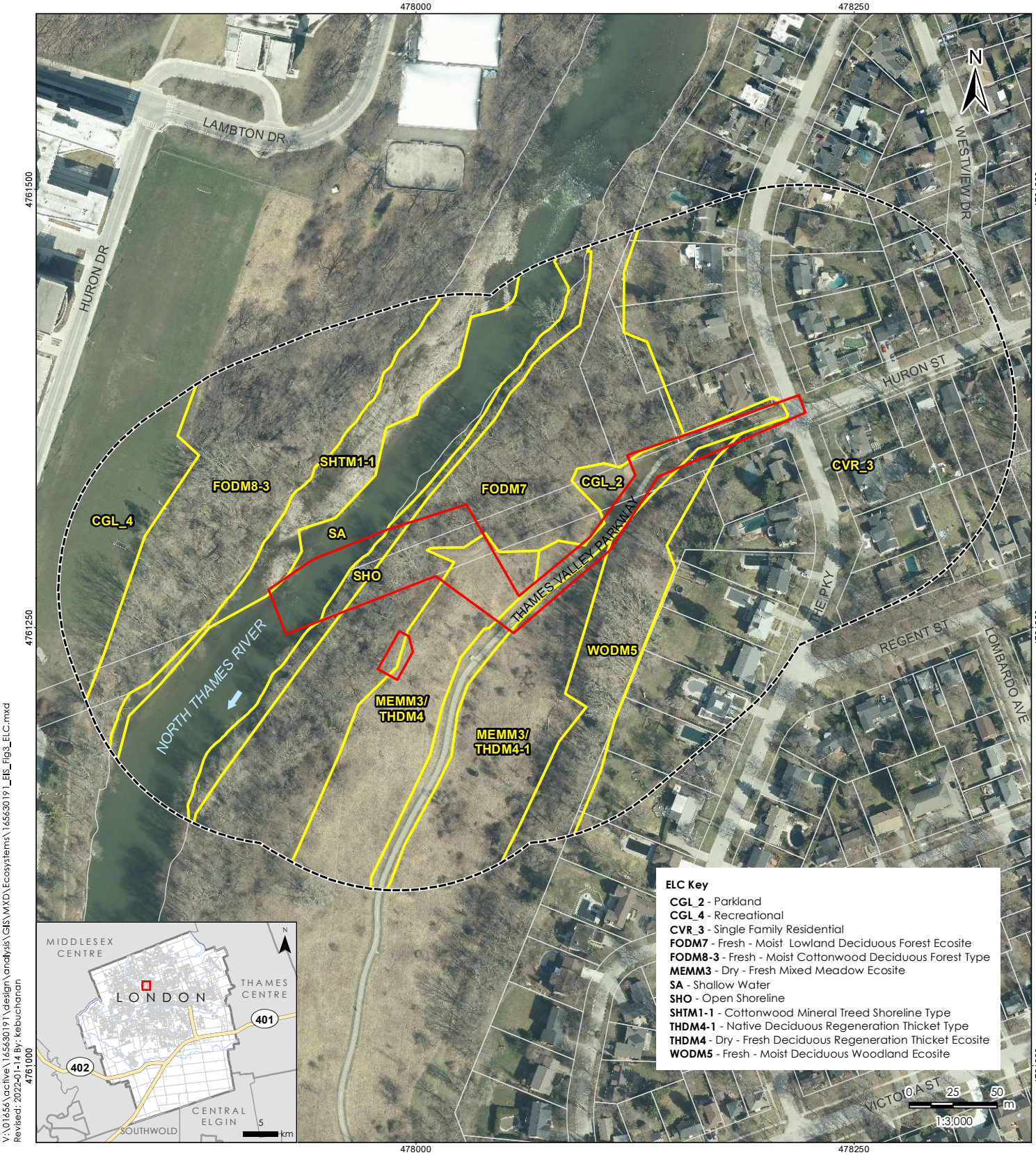
Client/Project

City of London
Huron Street Watermain Remediation
Environmental Impact Study

Figure No.
2

Title

Background Data Review



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January 2022
165630191

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Legend
- Study Area (120 m)
- Project Footprint
- Flow Direction
- Ecological Land Classification
- Assessment Parcel

Client/Project

City of London
Huron Street Watermain Remediation
Environmental Impact Study

Figure No.

3

Title

Ecological Land Classification

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Revised: 2022-02-11 By: kebuchanan

February 2022
165630191

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Notes
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Legend

- Study Area (120 m)
- Project Footprint
- Flow Direction
- Proposed Mussel Control Area
- Proposed Mussel Relocation Area
- Assessment Parcel
- Bat Cavity Tree
- Aquatic SAR Habitat

Species At Risk Observation

- *Confidential*

Client/Project

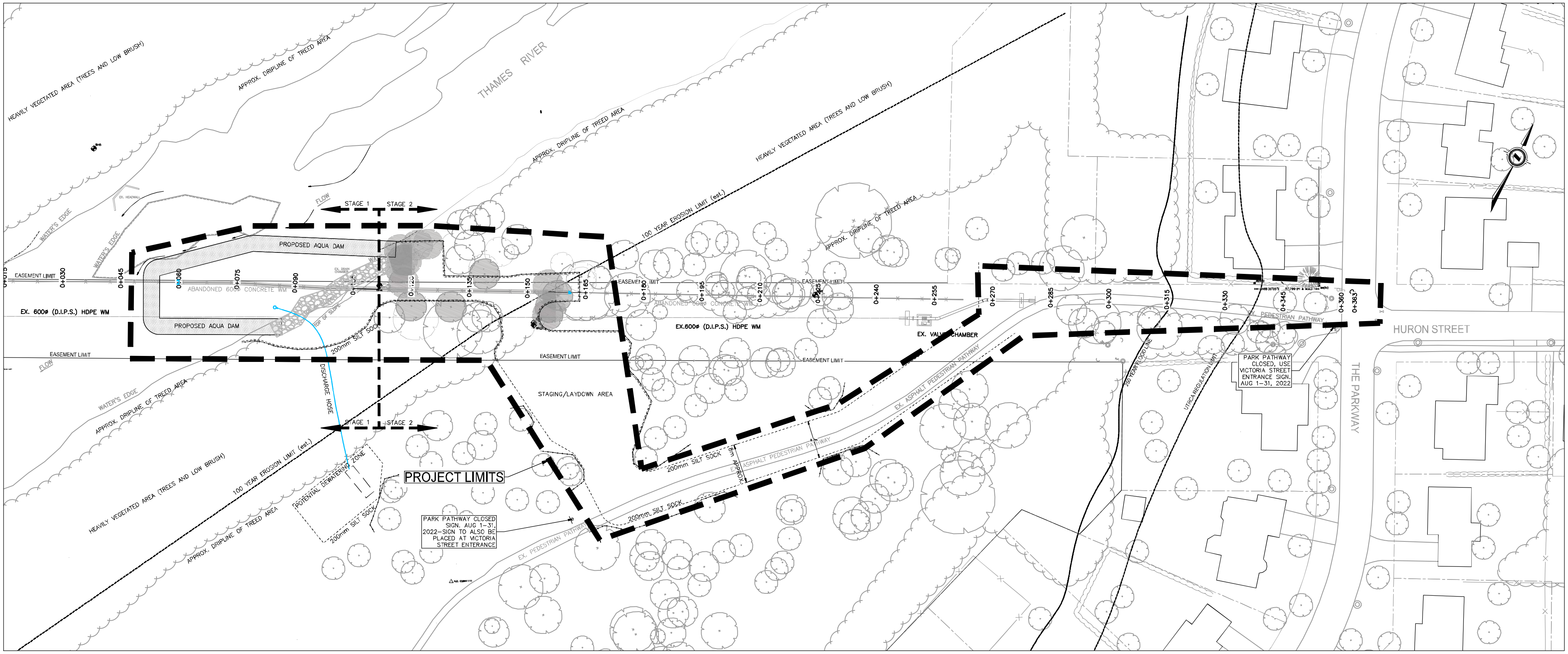
City of London
Huron Street Watermain Remediation
Environmental Impact Study

Figure No.

4

Title

SAR and SOCC Observations



LEGEND

150 WM	EXISTING WATERMAIN
	PROPOSED WATERMAIN CAP
WV FH	EXISTING FIRE HYDRANT AND VALVE
	BENCHMARK 101
	EXISTING TREE
	DENOTES TREES TO BE REMOVED
50 GM	EXISTING BURIED GAS MAIN
BTUC	EXISTING UNDERGROUND TELEPHONE CABLE
HP/SL	EXISTING HYDRO POLE/STREET LIGHT
	EXISTING BELL / TV PEDESTAL
BH No. 1	EXISTING BORE HOLE
251.23	PROPOSED ELEVATION
	SILT SOCK
	TREE PROTECTION FENCING

CONTRACTOR TO KEEP ALL WORK WITHIN DEFINED APPROVED LIMITS, THIS INCLUDES ALL EQUIPMENT AND MATERIALS. CONTRACTOR TO CLEAR LOW LYING SHRUBS AND TRIM TREES AS REQUIRED TO KEEP MINIMAL WORK ZONE REQUIRED TO COMPLETE THE WORK. ALL CLEARING AND GRUBBING TO BE COMPLETED UNDER THE SUPERVISION OF THE CONTRACT ADMIN.

STAGE 1 WORK TO BE COMPLETED IN ITS ENTIRETY BEFORE STARTING STAGE 2 WORKS. THIS INCLUDES ALL WORK IN THE RIVER, REMOVAL OF CHAMBER, AND RE-INSTATEMENT OF EMBANKMENT

EXISTING SERVICES	DRAWING #, SOURCE	DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS		No.	REVISIONS	DATE	CONSULTANT
					DESIGN	MK	1.	ISSUED FOR PRELIMINARY DESIGN	OCT. 20, 2021	STANTEC
					DRAWN BY	MK	2.	ISSUED FOR 60% SUBMISSION	NOV 19, 2021	STANTEC
					CHECKED	SJ	3.			
					APPROVED	--	4.			
					DATE	OCT. 2021				
					1656 30191					

CONSULTANT OR DIVISION
Stantec
Stantec Consulting Ltd.
171 Queens Avenue
London ON Canada
N6A 5J7
Tel. 519.645.2007
Fax. 519.645.6575
www.stantec.com

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London CANADA

SCALE
SCALE - 1 : 500
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TITLE
HURON STREET
WATERMAIN REMEDIATION

HURON STREET
OVERALL SITE ACCESS PLAN

PROJECT No. 165630191
SHEET No. 3 OF 7
PLAN FILE No.

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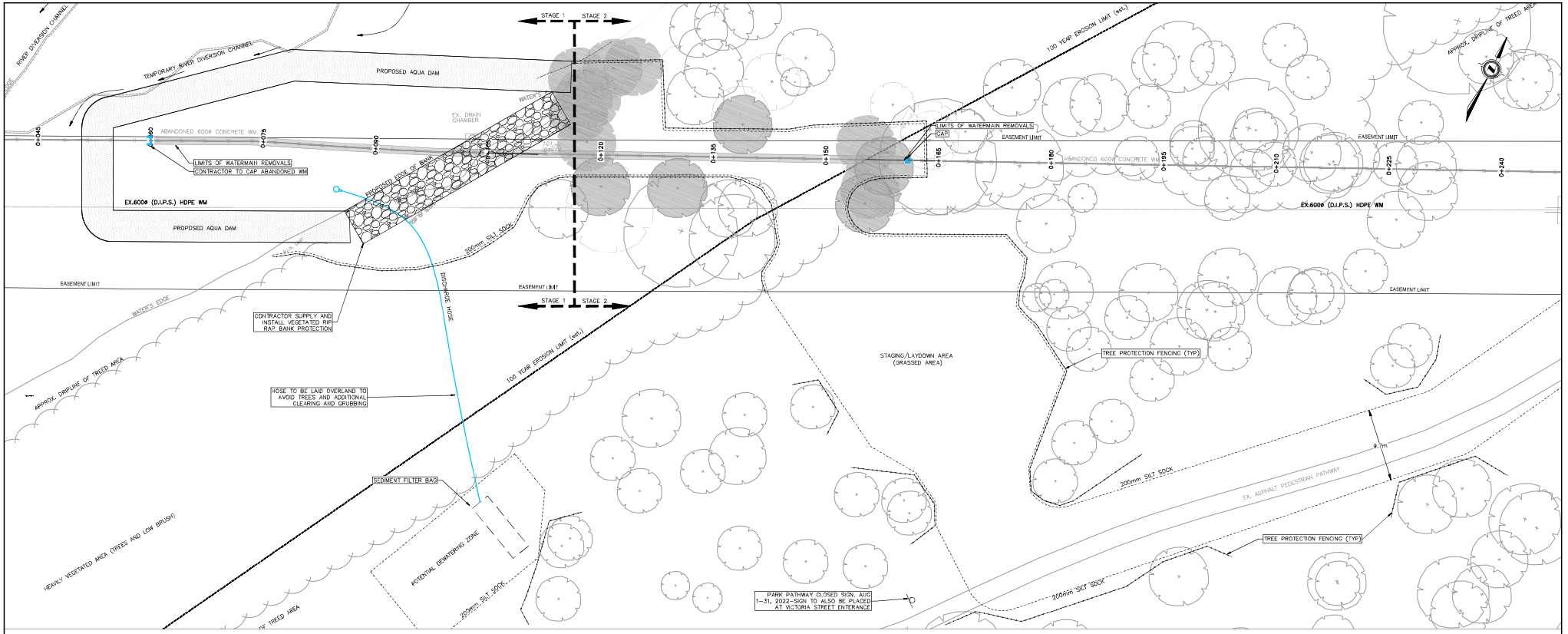

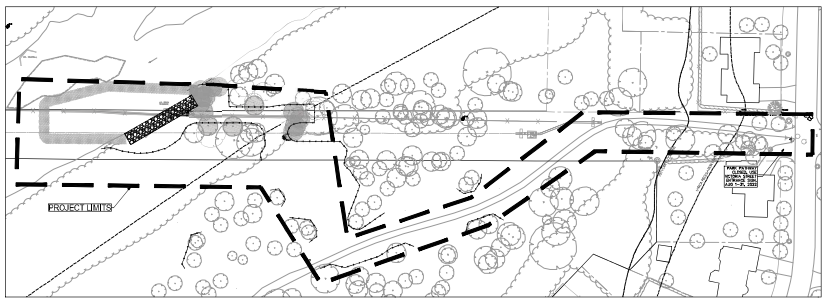

KEY PLAN - SITE ACCESS LOACTION

CONTRACTOR TO KEEP ALL WORK WITHIN DEFINED APPROVED LIMITS, THIS INCLUDES ALL EQUIPMENT AND MATERIALS. CONTRACTOR TO CLEAR LOW LYING SHRUBS AND TRIM TREES AS REQUIRED TO KEEP MINIMAL WORK ZONE REQUIRED TO COMPLETE THE WORK. ALL CLEARING AND GRUBBING TO BE COMPLETED UNDER THE SUPERVISION OF THE CONTRACT ADMIN.

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EXISTING SERVICES	DRAWING #, SOURCE	DATE	CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	MK
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CHECKED	SJ
APPROVED	---
DATE	OCT. 2021

1656 30191

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2.5 0 5m

TITLE

HURON STREET

WATERMAIN REMEDIATION

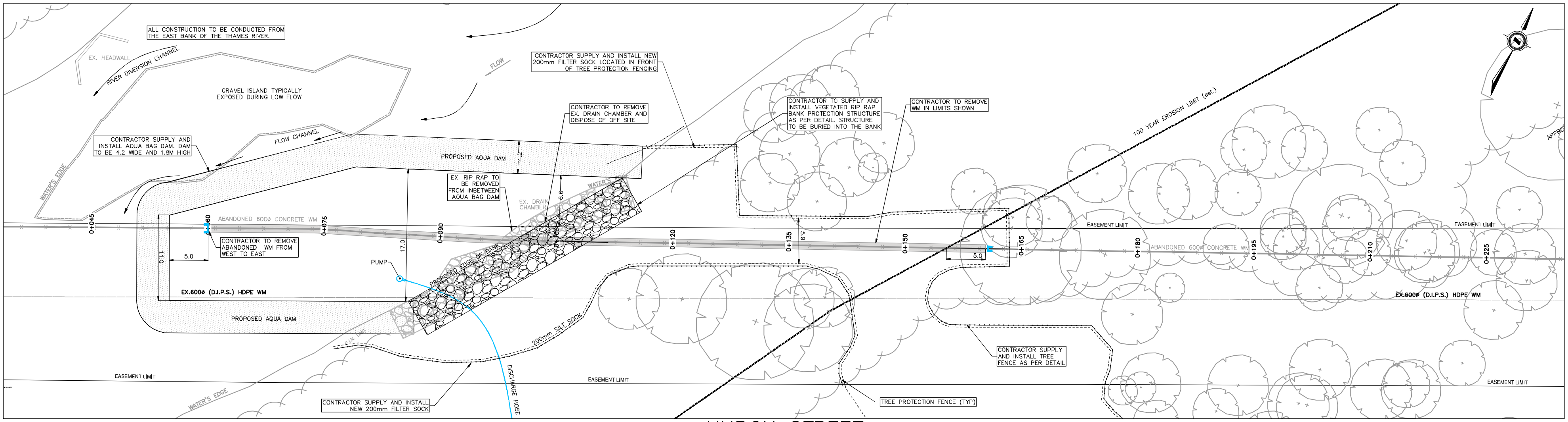
HURON STREET

SITE PLAN

PROJECT No. 165630191

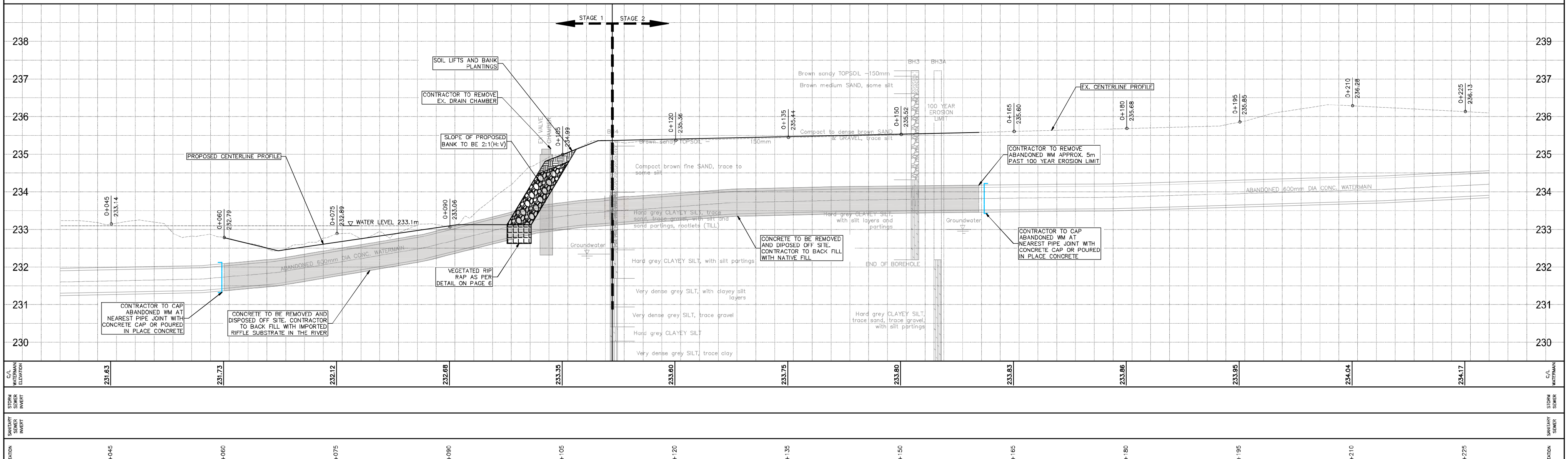
SHEET No. 4 OF 7

PLAN FILE No.



FOR CONTINUATION SEE PAGE 6

HURON STREET



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APPROVED	--
DATE	OCT. 2021
1656 30191	

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2.	ISSUED FOR 60% SUBMISSION	NOV 19, 2021	STANTEC
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4.			

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SCALE
HORIZONTAL–1:250
VERTICAL–1:50

TITLE
HURON STREET
WATERMAIN REMEDIATION

HURON STREET
STA 0+045 – STA 0+225

PROJECT No. 165630191

SHEET No. 5 OF 7

PLAN FILE No.

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APPENDIX B:
Agency Correspondence

Natural Heritage Information Request

165630191

From:	Webb, Jason (MNRF)
To:	Cameron, Melissa
Subject:	FW: Natural Heritage Information Request and Field Program Confirmation for Huron Street Watermain Decommissioning (London, ON)
Date:	Wednesday, March 3, 2021 10:06:21 AM
Attachments:	let_MNRF_nat_her_ir_20210115_fin.pdf

Hello Melissa,

Thank you for providing the attached letter regarding the Huron Street water main decommissioning project in London.

The Ministry of Natural Resources and Forestry has reviewed the letter and can confirm that all S1-S3 provincially tracked species records are accurate and have no supplemental information. Species at Risk records are to be confirmed by MECP.

There are no MNRF evaluated wetlands or ANSI in proximity to the project location.

MNRF has no concerns with the proposed field program for this project.

Let me know if you would like to discuss.

Thanks,

Jason Webb
Management Biologist
Ministry of Natural Resources and Forestry
Aylmer District
226-559-4906
Jason.webb@ontario.ca

From: Cameron, Melissa <Melissa.Cameron@stantec.com>
Sent: January 15, 2021 1:31 PM
To: MNRF.AYL (MNRF) <MNRF.AYL@ontario.ca>
Cc: Eusebi, Daniel <dan.eusebi@stantec.com>; Paul, Jeff <jeff.paul@stantec.com>; Keene, Joe <Joe.Keene@stantec.com>; Lupton, Patricia <plupton@london.ca>; Williamson, Emily <ewilliamson@london.ca>
Subject: Natural Heritage Information Request and Field Program Confirmation for Huron Street Watermain Decommissioning (London, ON)

Dear Management Biologist, Aylmer District MNRF,

Please find attached a letter regarding the Huron Street watermain decommissioning project in London, Ontario. Please don't hesitate to reach out if you have any questions regarding the project and our request for early consultation.

Best regards,

Melissa

Melissa Cameron M.Sc, M.LA, OALA
Ecologist / Landscape Architect

Direct: 519 645-3351
Mobile: 226 971-0042
melissa.cameron@stantec.com

Stantec
600-171 Queens Avenue
London ON N6A 5J7

Stantec Consulting Ltd.
1-70 Southgate Drive, Guelph ON N1G 4P5

January 15, 2021
File: 165630195

Attention: Management Biologist
Ministry of Natural Resources and Forestry, Aylmer District
615 John St. N. Aylmer, ON N5H 2S8
Email: mnrf.ayl@ontario.ca

Dear Management Biologist,

Reference: Natural Heritage Information and Field Program Confirmation Request for the Huron Street Watermain Decommissioning

In 2012 the City of London completed the Huron Watermain Crossing Environmental Assessment (EA). The identified preferred alternative solution was to install a new watermain crossing the Thames River between Huron Street and Philip Aziz Avenue at a lower depth and to continue monitoring of the abandoned concrete watermain in order to determine the timing of next steps. The new watermain was installed in 2016. On-going monitoring the abandon watermain shows continued erosion in the river surrounding the watermain.

The City of London has recently initiated the detailed design for the remediation of the abandoned concrete watermain in the Thames River. This will involve continuing the monitoring program and reviewing the options for remediating the abandoned watermain in the river.

As part of the scope of work for this project, the City of London will be undertaking:

- A Stage 1 Archeological Assessment of the project area
- An update/addendum to the Environmental Impact Study (EIS) undertaken in 2012
- Reviewing alternatives for remediation of the abandoned concrete watermain in the Thames River
- Agency consultation
- Indigenous Community consultation

Stantec Consulting Ltd. (Stantec) has been retained by the City of London to complete the Environmental Impact Study Addendum report and to obtain the required natural environment permits for the removal of the exposed, abandoned watermain extending under the Thames River in the Huron Street road allowance (the Project). The Study Area is shown in **Attachment 1**. The watermain is 600mm diameter reinforced concrete pressure pipe which was constructed in 1958 at a buried depth of 1.8m but became exposed over time. In 2009, an emergency repair was completed which involved placing stone riprap and aggregate over the exposed portion of the watermain and adjacent valve chamber. An EIS was completed in 2012 as part of the Huron Street Crossing EA.

Our work will update the findings of the 2012 EIS/EA to document ecological (terrestrial and aquatic) features in the Study Area, assess the potential impacts to the natural environment of the proposed watermain removal, identify appropriate measures to avoid or mitigate impacts where possible, and facilitate permitting and other authorizations. Based on our current understanding of the work, authorization may be required under the following Acts:

- Species at Risk Act
- Endangered Species Act
- Fisheries Act
- Navigable Waters Act
- Conservation Authorities Act (Section 28)

Due to the complexity of the project, primarily associated with the timing of removal and the potential relocation of SAR mussels, it is the City of London's goal to initiate consultation with relevant agencies early in the process in order to obtain consensus on the appropriate field studies and timing of review and/or permit applications. **The purpose of this letter is to request your input with respect to existing conditions within the Study Area, to provide a proposed field program for your consideration and review, and to identify issues, concerns, or approval requirements that your agency may have.** Stantec has conducted a search of the Natural Heritage Information Center (NHIC) Database (MNRF 2020a), natural heritage data on MNRF's Land Information Ontario (LIO) mapping website (MNRF 2020b), and various species databases; however, we would like to request updates and/or corrections to the information, as available. This information is required to complete our natural heritage review for the project.

TERRESTRIAL AND AQUATIC RESOURCES

A background review was completed to identify species at risk (SAR) or natural areas in the vicinity of the Study Area. The 2012 EIS, NHIC database (MNRF 2020a), Ontario Reptile and Amphibian Atlas (Ontario Nature 2020), Atlas of the Breeding Birds of Ontario (Cadman et al. 2007), Fisheries and Oceans Canada/Upper Thames Valley – Distribution of Fish and Mussel Species at Risk (DFO 2020), and recent Stantec observations identified the potential for 20 SAR to be present in the Study Area (**Table 1**).

Table 1: Recent records of Species at Risk (1990 – present) in the Vicinity of the Study Area

Common Name	Latin Name	Provincial S-rank	SARO Status	SARA Schedule 1
Terrestrial Species				
Monarch[1]	*Danaus plexippus*	S4B, S2N	SC	SC
Eastern Spiny Softshell[1]	*Apalone spinifera*	S3	END	END
Northern Map Turtle[1]	*Graptemys geographica*	S3	SC	SC
Snapping Turtle[2]	*Chelydra serpentina*	S3	SC	SC
Queensnake[2]	*Regina septemvittata*	S2	END	END
Barn Swallow[1]	*Hirundo rustica*	S4B	THR	THR
Chimney Swift[1]	*Chaetura pelagica*	S4B, S4N	THR	THR

Table 1: Recent records of Species at Risk (1990 – present) in the Vicinity of the Study Area

Common Name	Latin Name	Provincial S-rank	SARO Status	SARA Schedule 1
Common Nighthawk[1]	*Chordeiles minor*	S4B	SC	THR
Eastern Wood-pewee[1]	*Contopus virens*	S4B	SC	SC
Red-headed Woodpecker[3]	*Melanerpes erythrocephalus*	S4B	SC	END
Wood Thrush[1]	*Hylocichla mustelina*	S4B	SC	THR
Small-footed Myotis[4]	*Myotis leibii*	S2S3	END	-
Little Brown Myotis[4]	*Myotis lucifugus*	S4	END	END
Northern Myotis[4]	*Myotis septentrionalis*	S3?	END	END
Tri-coloured Bat[4]	*Perimyotis subflavus*	S3?	END	END
Butternut[5]	*Juglans cinerea*	S3?	END	END
Kentucky Coffee-Tree[1]	*Gymnocladus dioicus*	S2	THR	THR
Aquatic Species				
Black Redhorse[6]	*Moxostoma duquesnei*	S2	THR	THR
Silver Shiner[6]	*Notropis photogenis*	S2/S3	THR	THR
Wavy-rayed Lampmussel[1]	*Lampsilis fasciola*	S1	THR	SC

1 Stantec Observation

2 Ontario Reptile and Amphibian Atlas

3 Ontario Breeding Bird Atlas

4 Atlas of the Mammals of Ontario

5 SARO List

6 DFO 2020

Natural heritage mapping on the MNRF's Land Information Ontario Website (MNRF 2020b) did not identify any designated natural features in the vicinity of the Study Area.

We respectfully request confirmation of the above findings and the identification of any additional natural heritage resources information you may have for the Study Area. This information request has also been distributed to UTRCA and MECP.

PROPOSED FIELD PROGRAM

The following site-specific field investigations will be undertaken to update the natural heritage attributes documented in the 2012 EIS in the Study Area:

- Habitat assessment/snag tree inventory for bat species at risk during leaf-off (once, Nov- April)
- Two (2) season flora inventory and vegetation community mapping using Ecological Land Classification (spring and summer)
- Canid survey of known coyote den using trail camera, to confirm activity (May)
- Reptile habitat assessment and basking surveys (five surveys late May to early July), with a focus on Queensnake, Eastern Spiny Softshell and Northern Map Turtle

- Aquatic habitat assessment at low flow conditions (once, July-August), including a description of the following, where appropriate:
  - Flow, channel form, riparian characteristics, anthropogenic and other disturbances, enhancement opportunities, substrate, groundwater indicators
  - Temperature, instream habitat features and structures
- Mussel habitat assessment at crossing and downstream, to confirm presence/absence and identify potential relocation areas (once, July-August)
- Breeding bird surveys (two surveys, late May to early July)
- Incidental wildlife observations and documentation of wildlife evidence (all site visits)
- Documentation of significant wildlife habitat (SWH) using the Ecoregion (7E) Criteria Schedule (summer)

PRELIMINARY SCHEDULE

A preliminary schedule of the proposed field program, as well as subsequent consultation, review and authorization timelines, is provided in Attachment 2. The field program was initiated in Fall 2020 and will continue into mid-summer 2021. Construction is planned for late July-August 2022. We would appreciate your comments on the proposed schedule and advise of any potential delays or constraints to meeting the project construction timeline.

CLOSING

This letter is intended to request any additional or recent information that will inform the permitting process as well as to get feedback on the proposed field studies program developed to complement the existing information collected during the preparation of the original EIS In submitting this for your review, we ask for comments and suggestions that will allow us to finalize the field program and advance the permit packages for regulatory approval

If you have any questions, or wish to discuss the content of the above, please feel free to contact the undersigned.

Regards,

Stantec Consulting Ltd.

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Senior Benthic Ecologist
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Ecologist / Landscape Architect
Phone: 519-645-3351
melissa.cameron@stantec.com

Attachment 1: Figure 1

REFERENCES

Cadman, M. D., D.A. Sutherland, G.G. Beck, D. Lepage, A.R. Couturier. 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. (eds) Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of natural resources, and Ontario Nature, Toronto, xxii + 318pp

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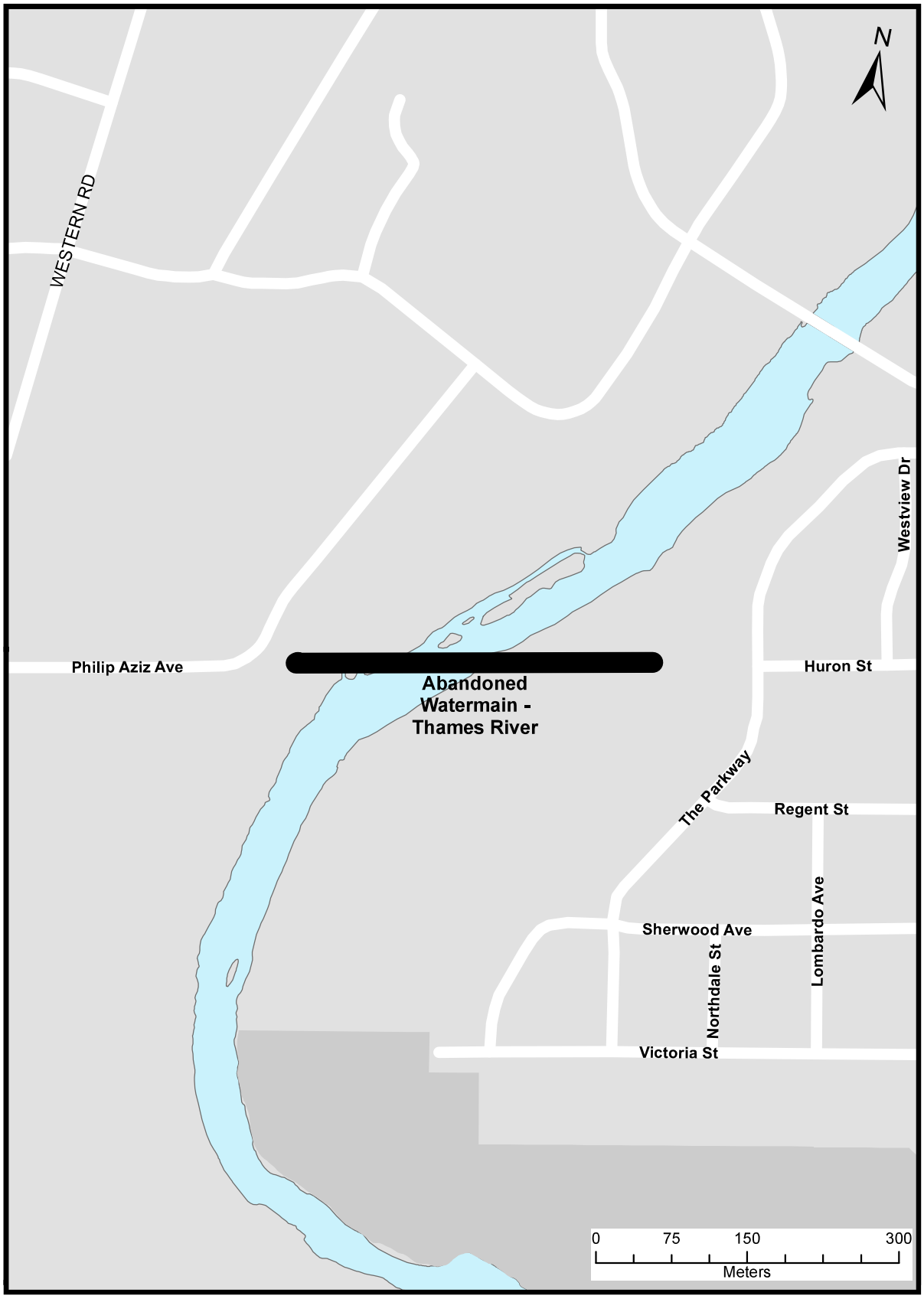
(TEA) Toronto Entomologists' Association. 2020. Ontario Butterfly Atlas [web application]. Toronto, Ontario. Available online: https://www.ontarioinsects.org/atlas/

ATTACHMENT 1:
Figure 1

Appendix A

2022 Huron Street Watermain Remediation - Thames River Crossing

The Parkway to Huron Drive



Scoping Checklist

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Appendix A

Environmental Impact Study
ISSUES SUMMARY CHECKLIST REPORT

Application Title: EIS Addendum Report in support of Huron Street Watermain Decommiss
Date Submitted: January 15, 2021
Proponent: City of London

Qualifications

Primary Consultant: Stantec Consulting Ltd.
Key contact person: Melissa Cameron
Other consultant / field personnel: Stantec Consulting
Hydrogeology / Hydrology: Stantec - Heather Amirault (fluvial geomorphology)
Biological – Flora: Stantec - Brian Miller
Biological – Fauna: Stantec - Melissa Cameron, Mitch Ellah
Other: Fish and Mussels: Stantec - Joe Keene

Context for Background Information

Subwatershed: The Forks
Tributary Fact Sheet Number:
Planning / Policy Area: North London

Technical Advisory Review Team

- ☑ Ecologist Planner:
- ☐ Planner for File:
- ☑ EEPAC:
- ☑ Conservation Authority:
- ☐ Ministry of Natural Resources:
- ☐ Ministry of Municipal Affairs and Housing:
- ☐ Ministry of Agriculture and food:
- ☐ Other Review Groups (e.g., Community Associations , Field Naturalists):

1.0 DESCRIPTION OF THE ENVIRONMENT (FEATURES)

Purpose: To have a clear understanding of the current status of the land, and the proposed "development" or land use change.

1.1 Mapping (Location and Context)

Current Aerial Photography

- ☐ Land Use - Excerpts of the Official Plan for the City of London Ontario Schedules A, B, showing a 5-10 km radius of subject site
- ☐ Terrain setting @ 1:10,000 - 1:15,000 scale showing landscape features, subwatershed divides
- ☑ Existing Environmental Resources showing @1:2,000 - 1:5,000 showing Vegetation, Hydrology, contours, linages.
- ☐ Environmental Plan or Strategy from Subwatershed reports (tributary fact sheet), Community (Area) Plans, or other

1.2 Description of Site, Adjacent lands, Linage with Natural Heritage System

List all supporting studies and reports available to provide background summary (e.g. subwatershed, hydrological, geo-technical, natural heritage etc.).

Check the first box if the information is relevant and required as part of this study. Check the second box if sufficient data is available.

1. The Huron Street Watermain Crossing Schedule 'B' Environmental Assessment (EA), Stantec 2012a
2. Huron Street Watermain Crossing Replacement Scoped Environmental Impact Study (Stantec 2012b)
3. Geomorphic Monitoring of Huron Watermain Crossing of the Thames River, 2019-ongoing (Stantec, ongoing)

The current project purpose is to provide an Environmental Impact Study Addendum report and to obtain the required natural environment permits for the removal of a section of exposed, abandoned watermain extending under the Thames River in the Huron Street road allowance between Huron Street and Philip Aziz Drive in the City of London, Ontario (the Project). The Study Area is shown in Attachment 1.

1.2.1 Terrain Setting

☐	☐	Soils (surface and subsurface)
☐	☐	Glacial geomorphology - landform type
☐	☐	Subwatershed
☑	☑	Topographic features
☐	☐	Ground water discharge
☐	☐	Shallow ground water/baseflow
☐	☐	Ground water discharge/aquifer
☐	☐	Aggregate resources

1.2.2 Hydrology

☐	☐	Hydrological catchment boundary and of wetlands + determine the catchment areas of all wetlands
☐	☐	Surface drainage pattern
☑	☑	Watercourses (Permanent, Intermittent)
☐	☐	Stream order (Headwater, 1st, 2nd, 3rd or higher)
☐	☐	Agricultural Drains
☐	☐	Downstream receiving watercourse
☑	☑	Hazard Line (Map 6)

1.2.3 Natural Hazards

☑	☑	100 year Erosion Line
☑	☑	Floodline mapping
☑	☑	Max line mapping – UTRCA mapping + text based regulated areas

1.2.4 Vegetation

☐	☐	Vegetation patch Number
☑	☑	System (Terrestrial, Wetland, Aquatic)
☑	☑	Cover (Open, Shrub, Treed)
☐	☐	Community Type(s)
☑	☑	ELC Community Class (Bluff, Forest, Swamp, Tallgrass Prairie, Savannah & Woodland, Fen, Bog, Marsh, Open Water, Shallow Water) ELC Community Sites
☐	☐	Rare Vegetation Communities

1.2.5 Flora

☑	☐	Flora (Inventory dates, Source)

EIS addendum to include an updated two-season (spring/summer) flora inventory, to be completed in 2021

☑	☐	Rare Flora (National, Provincial, Regional)

To be determined in 2021 field investigations. No rare flora were documented in 2021 EIS.

1.2.6 Fauna

☑ ☐ Fauna (Inventory dates; sources)

Field investigations are proposed as part of the EIS Addendum to update data collected during the 2012 EIS. Proposed studies are included in the sections below and summarized in the Notes Section.

☑ ☐ Breeding Birds (two surveys, late May to early July)
☐ ☐ Migratory Birds
☐ ☐ Amphibians
☑ ☐ Reptiles Basking surveys 5 visits (late May to early July)
☑ ☐ Mammals Canid Survey (May), Bat habitat: leaf off (Nov-April)
☐ ☐ Butterflies
☐ ☐ Odonata
☑ ☐ Other SWH (7E) Criteria Schedule (summer), Incidental Observations
☐ ☐ Partners In Flight (PIF)

☑ ☐ Rare Fauna

1.2.7 Wildlife Habitat + as per MNRF 2015 Criteria, as amended from time to time, and all applicable Official Plan policies and In-force London Plan policies

☑ ☐ Species-At-Risk Regulated Habitat critical habitat mapping

The 2012 EIS identified potential habitat for : Wavy-rayed Lampmussel, Kidneyshell, Rainbow Mussel, Silver Shiner and Black Redhorse habitat downstream of Reach 3; Queensnake;Spiny Softshell turtle;
Additional surveys undertaken in 2021 in support of the EIS Addendum will target SAR bat habitat and SAR trees, as well as for species noted above.

☐ ☐ Winter habitat for deer, wild turkey
☐ ☐ Waterfowl Habitat (wetlands, poorly drained landscape - bottomlands, beaver ponds, seasonally flooded areas, staging areas, feeding areas)
☐ ☐ Colonial Birds Habitat
☐ ☐ Hibernacula
☐ ☐ Habitat for Raptors
☐ ☐ Forests with springs or seeps
Ephemeral ponds

☑ ☐ Wildlife trees (snags, cavities, x-large trees > 65 cm DBH)

☐ ☐ Forest Interior Birds

☐ ☐ Area-sensitive birds

1.2.8 Aquatic Habitat

(SWS Aquatic Resource Management Reports)

☑ ☐ Fish Communities

Proposed field investigations include:
-Aquatic habitat assessment at low flow conditions (once, July-August), including a description of the following, where appropriate: Flow, channel form, riparian characteristics, anthropogenic and other disturbances, enhancement opportunities, substrate, groundwater indicators

☐ ☐ Fish spawning areas

☐ ☐ Fish migration routes

☐ ☐ Thermal refuge for fish

☐ ☐ Benthic inventory

☑ ☐ Substrate

☐ ☐ Riparian habitat (extent and type)

1.2.9 Linkages and Corridors

(The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible. PPS 2.3.3)

- ☑ ☑ Valleylands
- ☑ ☑ Significant Watercourses (Thames River, Stoney Creek, Medway Creek, Dingman Creek, Pottersburg Creek, Wabuno Creek, Mud Creek, Stanton Creek (Drain), Kelly Creek (Drain)

- ☐ ☐ Upland Corridors / species migration routes
- ☐ ☐ Big Picture Cores and Corridors
- ☐ ☐ Linkages between aquatic and terrestrial areas (riparian habitat, runoff)
- ☐ ☐ Groundwater connections
- ☐ ☐ Patch clusters (mosaic of patches in the landscape)

1.3 Social Values

1.3.1 Human Use Values

- ☑ ☑ Recreational linkages for hiking, walking
- ☑ ☑ Nature appreciation, aesthetics
- ☐ ☐ Education, research
- ☐ ☐ Cultural / traditional heritage
- ☑ ☑ Social (parks and open space)
- ☐ ☐ Resources Products (e.g. timber, fish, furbearers, peat)
- ☐ ☐ Aggregate Resources

1.3.2 Land Use - Cultural

- ☐ ☐ Archaeological (pre 1500)
- ☐ ☐ Historical (post 1500 - present)
- ☐ ☐ Adjacent historical and archeological
- ☐ ☐ Future

1.3.3 Land Use - Active

- ☐ ☐ Archaeological (pre 1500)

☐ ☐ Historical (post 1500 - present)

☐ ☐ Adjacent historical and archeological

☐ ☐ Future

1.3.4 Other

A Stage 1 archaeological study is being undertaken as part of the watermain replacement project.

2.0 EVALUATION OF SIGNIFICANCE

Components of the Natural Heritage System
The policies in Section 15.4 apply to recognized and potential components of the natural heritage system as delineated on Schedule 'B' or features that may be considered for inclusion on Schedule 'S'. They also address the protection of environmental quality and ecological function with respect to water quality, fish habitat, groundwater recharge, headwaters and aquifers.

☐ **A component of a Subject Lands Status Report that is required to be included in the EIS is the evaluation of significance of all potential natural heritage features and areas recognized by In-force London Plan policies and/ or Official Plan policies.**

☐ **A component of a Subject Lands Status Report that is required to be included in the EIS is the confirmation and mapping of boundaries of all natural heritage features and areas.**

2.1 Environmentally Significant Areas

☐ Identified Environmentally Significant Areas (ESA)

☐ Name

☐ Potential ESAs - Expansion of an Existing ESA

☐ Name

☐ Potential ESA - Area not associated with an existing ESA

☐ Name

2.2 Wetlands

☐ Provincially Significant Wetlands

☐ Name

☐ Wetlands

☐ Name

☐ Unevaluated Wetlands

2.3 Areas of Natural and Scientific Interest

☐ Provincial Life Science ANSI

☐ Regional Life Science ANSI

- ☐ Earth Science ANSI

2.4 Habitat of Species-At-Risk (SAR)

- ☑ Endangered
- ☑ Threatened
- ☑ Vulnerable / Special Concern

2.5 Woodlands and Vegetation Patches

- ☑ Significant Woodlands
- ☐ Unevaluated Vegetation Patches and/ or other patches > 0.5ha

2.6 Corridors and Linkages

- ☑ River, Stream and Ravine Corridors
- ☐ Upland Corridors
- ☐ Naturalization and Anti-fragmentation Areas

3.0 IDENTIFICATION AND DESCRIPTION OF FUNCTIONS

Ecological Functions the natural processes, products or services that species and non-living environments provide or perform within or between ecosystems and landscapes. Check those functions that will be required to assess for the study (key and supporting functions).

3.1 Biological Functions

- ☑ Habitat (provision of food, shelter for species)
- ☐ Limiting habitat
- ☐ Species life histories (reproduction and dispersal)
- ☐ Habitat guilds
- ☐ Indicator species
- ☐ Keystone species
- ☐ Introduced species
- ☐ Predation / parasitism
- ☐ Population dynamics
- ☐ Vegetation structure, density and diversity
- ☐ Food chain support
- ☐ Productivity
- ☐ Diversity
- ☐ Carbon cycle
- ☐ Energy cycling
- ☐ Succession and disturbance processes
- ☐ Relationships between species and communities

3.2 Hydrological and Wetland Functions

- ☐ Groundwater recharge and discharge (hydrogeology)
- ☐ Water storage and release (fluvial geomorphology)
- ☐ Maintaining water cycles (water balance)
- ☐ Water quality improvement
- ☐ Flood damage reduction
- ☑ Shoreline stabilization / erosion control
- ☐ Sediment trapping
- ☐ Nutrient retention and removal / biochemical cycling
- ☑ Aquatic habitat (fish, macroinvertebrates)

3.3 Landscape Features and Functions

- ☐ Size
- ☑ Connections, corridors and linkages
- ☐ Proximity to other areas / natural heritage features (e.g. woodlands, wetlands, valleylands, water, etc.)
- ☐ Fragmentation

3.4 Functions, Benefits and Values of Importance to Humans

- ☐ Contributing to healthy and productive landscapes
- ☐ Improving air quality by supplying oxygen and absorbing carbon dioxide
- ☐ Converting and storing atmospheric carbon
- ☐ Providing natural resources for economic benefit
- ☑ Providing green space for human activities
- ☐ Aesthetic and quality-of-life benefit
- ☑ Environmental targets and/or environmental management strategies

4.0 ADDITIONAL COMPONENTS AND NOTES

• EIS to show and demonstrate conformity with the Provincial Policy Statement (2020), in-force London Plan (as of Nov. 2019) policies, and current Official Plan policies (1989), Environmental Management Guidelines (2006).

Field investigations are proposed as part of the EIS Addendum to update data collected during the 2012 EIS. Proposed studies include:

• Habitat assessment/snag tree inventory for bat species at risk during leaf-off (once, Nov- April)
• Canid survey of known coyote den using trail camera, to confirm activity (May)
• Reptile habitat assessment and basking surveys (five surveys late May to early July), with a focus on Queensnake, Eastern Spiny Softshell and Northern Map Turtle
• Breeding bird surveys (two surveys, late May to early July)
• Incidental wildlife observations and documentation of wildlife evidence (all site visits)
• Documentation of significant wildlife habitat (SWH) using the Ecoregion (7E) Criteria Schedule (summer)
• Aquatic habitat assessment at low flow conditions (once, July-August), including a description of the following, where appropriate: Flow, channel form, riparian characteristics, anthropogenic and other disturbances, enhancement opportunities, substrate, groundwater indicators
• Temperature, instream habitat features and structures
• Mussel habitat assessment at crossing and downstream, to confirm presence/absence and identify potential relocation areas (once, July-August)

UTRCA
(Confidential)

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Appendix C:
Habitat Suitability Screening Assessment for SAR and SOCC

Appendix C-1: Habitat Potential in the Study Area for Threatened or Endangered Species, Huron Street Watermain

Species	Habitat Preference	Habitat Potential
BIRDS		
Barn Swallow	Nest on walls or ledges of barns and other human-made structures such as bridges, culverts or other buildings; forages in open areas for flying insects (COSEWIC 2011).	**Suitable Habitat Absent.** Barn Swallow nests were not observed within the Study Area. Not recorded during breeding bird surveys.
Cerulean Warbler	The Cerulean Warbler is found in mature deciduous forest with large trees and an open understory (COSEWIC 2010a). They can be found in moist lowland forest or drier upland forest (COSEWIC 2010a).	**Suitable Habitat Absent.** Suitable mature deciduous forest with large trees and an open understory are absent from the Study Area. Used as migration habitat only.
Chimney Swift	Chimney Swift use chimneys for roosting and breeding, as well as walls, rafters, or gables of buildings and, less frequently, natural structures such as hollow trees, tree cavities and cracks in cliffs (Cadman et al., 2007).	**Suitable Habitat Absent.** Suitable chimneys or large hollow trees were absent from the Study Area. Not recorded during breeding bird surveys.
Eastern Meadowlark	Meadows, hayfields and pastures; also, other open, sparsely treed habitat types including mown lawn (COSEWIC 2011). Prefers large (~5 ha), low-lying wet grasslands with abundant litter (COSEWIC 2011).	**Suitable Habitat Absent.** Suitable large grassland habitat was absent from the Study Area. Not recorded during breeding bird surveys.
MAMMALS		
Small-footed Myotis	Small-footed myotis hibernate in caves and abandoned mines in winter, and roost under rocks, in rock outcrops, buildings, under bridges, or in caves, mines, or hollow trees in the spring and summer (MNRF 2017).	**Suitable Habitat Present.** Candidate maternity roost trees were identified within suitable ELC communities (see **Figure 4, Appendix A**).
Little Brown Myotis	Trees, buildings and bridges for roosting; trees for nesting; caves and mines for hibernation (COSEWIC 2013).	**Suitable Habitat Present.** Candidate maternity roost trees were identified within suitable ELC communities (see **Figure 4, Appendix A**).
Northern Myotis	Caves provide overwintering habitat (COSEWIC 2013). Rarely uses human-made structures for roosting (COSEWIC 2013).	**Suitable Habitat Present.** Candidate maternity roost trees were identified within suitable ELC communities (see **Figure 4, Appendix A**).
Tri-colored Bat	The Tri-coloured Bat roosts in colonies in tree cavities (COSEWIC 2013b) in a wide variety of deciduous and coniferous forest stands. Little is known about the effect of stand composition on maternity roost selection for this species, but it is strongly associated with forest watercourses and streamside vegetation (COSEWIC 2013).	**Suitable Habitat Present.** Candidate maternity roost trees were identified within suitable ELC communities (see **Figure 4, Appendix A**).

Appendix C-1: Habitat Potential in the Study Area for Threatened or Endangered Species, Huron Street Watermain

Species	Habitat Preference	Habitat Potential
REPTILES		
Spiny Softshell	The Spiny Softshell is usually found in rivers and lakes, but occasionally inhabits smaller waterbodies such as streams and roadside ditches (COSEWIC 2016). The primary habitat requirement is access to open terrestrial sand or gravel sites for nesting, soft mud substrate for burrowing, basking sites and an abundance of crayfish and other prey items (COSEWIC 2016). The Spiny Softshell rarely travels far from aquatic habitats (COSEWIC 2016).	**Suitable - Habitat and Species Present** **Redacted** **Confirmed - Redacted**
Queensnake	The Queensnake is an aquatic snake found in rocky, gravelly, or slate stream-bed substrates, with a swift to moderate current and woodland surroundings (COSEWIC, 2010b). The Queensnake is very rare in the province and is restricted to relatively small sections of a few rivers and wetlands in southwestern Ontario. In addition, the habitat of this species is highly specialized and it is rarely found more than 3 m from water. Wood (1949) noted the following three conditions necessary to support a large population of Queensnakes: permanent area of water, flowing or still, with a temperature at or above 18.3C throughout most of the active season; abundant cover, such as flat rocks submerged and/or on the bank; and an abundance of crayfish.	**Suitable Habitat Present.** Suitable rocky, gravelly, or slate stream-bed substrates were present in Thames River within the Study Area.
PLANTS		
Butternut	The Butternut is a medium-sized tree that is commonly found in a variety of habitats including woodlands and hedgerows (COSEWIC 2017). Butternut is intolerant of shade and occurs singly or in small groups with a variety of associates (COSEWIC 2017).	**Suitable Habitat and Species Absent.** Suitable woodlands and hedgerows were present in the Study Area. However, no individuals were observed during the botanical survey.
Eastern False Rue-anemone	False rue-anemone grows in mature forests with rich soils in floodplains. It is often patchy, found growing on shaded banks of streams, in rich deciduous forests (Voss, 1985). Often found in close proximity to streams in shady areas within Maple-Beech forests on gradual slopes; it is not found on steep slopes or in open, highly disturbed sites. The Ontario population is limited to the Carolinian Zone in mixed hardwood Carolinian forests dominated by Sugar Maple (COSEWIC, 2005a).	**Species Absent. Redacted**

Appendix C-1: Habitat Potential in the Study Area for Threatened or Endangered Species, Huron Street Watermain

Species	Habitat Preference	Habitat Potential
Kentucky Coffee-Tree	The Kentucky Coffee-tree occurs naturally only in southwestern Ontario; it is found in deep rich soils, often with other broadleaf trees (Farrar, 1995). It is shade-intolerant, and therefore grows along the edges of woodlots or relies on canopy openings in forests and woodlots (MECP 2019).	**Species Absent.** Suitable woodlands and hedgerows were present in the Study Area. However, no individuals were observed during the botanical survey.
AQUATIC SPECIES		
Black Redhorse	Black Redhorse generally inhabit moderately sized, cool, clear streams, preferring pool areas in the summer and overwintering in deep pools (COSEWIC 2005b).	**Suitable Habitat Present.** The Thames River is identified as critical habitat and has the potential to be found as per Department of Fisheries and Oceans Canada (DFO) aquatic species at risk mapping (DFO 2021).
Silver Shiner	Preferred habitat for the Silver Shiner is moderately fast-flowing sections of larger streams. This species is restricted to the tributaries of Lakes St. Clair (Thames River), Erie (Grand River) and Ontario (Bronte Creek) in Southwestern Ontario. It has been recently reported in Sixteen Mile Creek, another tributary of Lake Ontario (COSSARO 2011).	**Suitable Habitat Present.** The Thames River is identified as critical habitat and has the potential to be found as per DFO aquatic species at risk mapping (DFO 2021).
Wavy-rayed Lampmussel	The Wavy-rayed lampmussel is most abundant in small to medium-sized streams and rivers with steady flows in gravel or sand substrates. In and around riffle areas are preferred and are invariably found at sites that support a great diversity of other mussel species. Habitats in Great Lakes waters heavily infested with Zebra Mussels can no longer support the Wavy-rayed lampmussel (COSEWIC 2010).	**Suitable Habitat Present.** The Thames River is identified as occupied habitat as per DFO aquatic species at risk mapping (DFO 2021). **Confirmed Redacted**

REFERENCES

Cadman, M. D., D.A. Sutherland, G.G. Beck, D. Lepage, A.R. Couturier. 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. (eds) Bird Studies Canada, Environment Conada, Ontario Field Ornithologists, Ontario . Ministry of natural resources, and Ontario Nature, Toronto, xxii + 134pp

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Appendix D:
Plant List And Wildlife List

VASCULAR PLANT LIST - Huron Watermain - London, Ontario

Plant Species Observed May and July 2021

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
PTERIDOPHYTES (Ferns and Fern Allies)						
Matteuccia struthiopteris	Ostrich Fern	S5			5	0
GYMNOSPERMS (Conifers)						
Thuja occidentalis	Eastern White Cedar	S5			4	-3
Tsuga canadensis	Eastern Hemlock	S5			7	3
ANGIOSPERMS (Dicots)						
Acer ginnala	Amur Maple	SNA				5
Acer negundo	Manitoba Maple	S5			0	0
Acer platanoides	Norway Maple	SNA				5
Acer saccharum	Sugar Maple	S5			4	3
Achillea millefolium	Common Yarrow	SNA				3
Aegopodium podagraria	Goutweed	SNA				0
Ageratina altissima	White Snakeroot	S5			5	3
Alliaria petiolata	Garlic Mustard	SNA				0
Ambrosia trifida	Great Ragweed	S5			0	0
Angelica atropurpurea	Purple-stemmed Angelica	S5			6	-5
Apocynum androsaemifolium	Spreading Dogbane	S5			3	5
Arctium minus	Common Burdock	SNA				3
Asclepias syriaca	Common Milkweed	S5			0	5
Berberis vulgaris	Common Barberry	SNA				3
Campanula rapunculoides	Creeping Bellflower	SNA				5
Catalpa speciosa	Northern Catalpa	SNA				3
Celtis occidentalis	Common Hackberry	S4			8	0
Centaurea stoebe	Spotted Knapweed	SNA				5
Cirsium arvense	Canada Thistle	SNA				3
Cirsium vulgare	Bull Thistle	SNA				3
Clematis virginiana	Virginia Clematis	S5			3	0
Cornus sericea	Red-osier Dogwood	S5			2	-3
Daucus carota	Wild Carrot	SNA				5
Dianthus armeria	Deptford Pink	SNA				5
Dipsacus fullonum	Common Teasel	SNA				3
Erigeron annuus	Annual Fleabane	S5			0	3
Euonymus europaeus	European Euonymus	SNA				5
Euonymus fortunei	Climbing Euonymus	SNA				5

VASCULAR PLANT LIST - Huron Watermain - London, Ontario

Plant Species Observed May and July 2021

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
Eutrochium maculatum	Spotted Joe Pye Weed	S5			3	-5
Fagus grandifolia	American Beech	S4			6	3
Fraxinus americana	White Ash	S4			4	3
Fraxinus pennsylvanica	Red Ash	S4			3	-3
Galium aparine	Cleavers	S5			4	3
Galium mollugo	Smooth Bedstraw	SNA				5
Galium palustre	Common Marsh Bedstraw	S5			5	-5
Glechoma hederacea	Ground-ivy	SNA				3
Hackelia virginiana	Virginia Stickseed	S5			5	3
Hedera helix	English Ivy	SNA				3
Heliopsis helianthoides	False Sunflower	S4S5			3	3
Hesperis matronalis	Dame's Rocket	SNA				3
Hypericum punctatum	Spotted St. John's-wort	S5			5	0
Impatiens capensis	Spotted Jewelweed	S5			4	-3
Impatiens glandulifera	Purple Jewelweed	SNA				-3
Impatiens pallida	Pale Jewelweed	S4			7	-3
Juglans nigra	Black Walnut	S4?			5	3
Kolkwitzia amabilis	Beautybush	SNA				5
Laportea canadensis	Canada Wood Nettle	S5			6	-3
Lapsana communis	Common Nipplewort	SNA				3
Leonurus cardiaca	Common Motherwort	SNA				5
Leucanthemum vulgare	Oxeye Daisy	SNA				5
Ligustrum vulgare	European Privet	SNA				3
Lonicera maackii	Maack's Honeysuckle	SNA				5
Lysimachia nummularia	Creeping Yellow Loosestrife	SNA				-3
Lythrum salicaria	Purple Loosestrife	SNA				-5
Matricaria discoidea	Pineappleweed	SNA				3
Medicago lupulina	Black Medick	SNA				3
Melilotus albus	White Sweet-clover	SNA				3
Monarda fistulosa	Wild Bergamot	S5			6	3
Morus alba	White Mulberry	SNA				0
Nepeta cataria	Catnip	SNA				3
Oxalis dillenii	Slender Yellow Wood-sorrel	SNA				3
Parthenocissus vitacea	Thicket Creeper	S5			4	3
Pastinaca sativa	Wild Parsnip	SNA				5

VASCULAR PLANT LIST - Huron Watermain - London, Ontario

Plant Species Observed May and July 2021

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
Persicaria virginiana	Virginia Smartweed	S4			6	0
Physocarpus opulifolius	Eastern Ninebark	S5			5	-3
Plantago major	Common Plantain	SNA				3
Platanus occidentalis	Sycamore	S4			8	-3
Populus deltoides	Eastern Cottonwood	S5			4	0
Prunella vulgaris	Common Self-heal	S5			0	0
Prunus virginiana	Chokecherry	S5			2	3
Quercus macrocarpa	Bur Oak	S5			5	3
Ranunculus acris	Common Buttercup	SNA				0
Rhamnus cathartica	European Buckthorn	SNA				0
Rhus typhina	Staghorn Sumac	S5			1	3
Rubus idaeus	Red Raspberry	S5			2	3
Rudbeckia laciniata	Cut-leaved Coneflower	S5			7	-3
Rumex crispus	Curled Dock	SNA				0
Rumex obtusifolius	Bitter Dock	SNA				-3
Sanicula odorata	Clustered Sanicle	S5			6	0
Salix alba	White Willow	SNA				-3
Saponaria officinalis	Bouncing-bet	SNA				3
Scrophularia marilandica	Carpenter's Figwort	S4			7	3
Solanum dulcamara	Bittersweet Nightshade	SNA				0
Solidago canadensis	Canada Goldenrod	S5			1	3
Acer x freemanii	(Acer rubrum X Acer saccharinum)	SNA			6	-5
Sonchus arvensis	Field Sow-thistle	SNA				3
Sorbus aucuparia	European Mountain-ash	SNA				5
Symphyotrichum lanceolatum	Panicled Aster	S5			3	-3
Symphyotrichum lateriflorum	Calico Aster	S5			3	0
Taraxacum officinale	Common Dandelion	SNA				3
Thalictrum pubescens	Tall Meadow-rue	S5			5	-3
Tilia americana	Basswood	S5			4	3
Trifolium pratense	Red Clover	SNA				3
Urtica dioica	Stinging Nettle	SNA				0
Verbena urticifolia	White Vervain	S5			4	0
Viburnum opulus var. opulus	Cranberry Viburnum	SNA				-3
Viola sp.	Violet species	S5				
Vitis riparia	Riverbank Grape	S5			0	0

VASCULAR PLANT LIST - Huron Watermain - London, Ontario

Plant Species Observed May and July 2021

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
Zizia aurea	Golden Alexanders	S5			7	0
ANGIOSPERMS (Monocots)						
Allium sativum	Cultivated Garlic	SNA				5
Bromus inermis	Smooth Brome	SNA				5
Carex lacustris	Lake Sedge	S5			5	-5
Dactylis glomerata	Orchard Grass	SNA				3
Elymus virginicus	Virginia Wildrye	S5			5	-3
Erythronium albidum	White Trout-lily	S4			8	3
Iris pseudacorus	Yellow Iris	SNA				-5
Juncus tenuis	Path Rush	S5			0	0
Maianthemum racemosum	Large False Solomon's Seal	S5			4	3
Phalaris arundinacea	Reed Canarygrass	S5			0	-3
Phleum pratense	Common Timothy	SNA				3
Poa pratensis	Kentucky Bluegrass	S5			0	3

FLORISTIC SUMMARY	TOTAL
Total Species	114
Native Species	57
Introduced (exotic) species	57
Species at Risk in Ontario (END, THR or SC)	0
Rare in Ontario (S1, S2 or S3)	0
Uncommon to common in Ontario (S4)	11
Common to very common in Ontario (S5)	46
Highly sensitive plant species with C value greater than 7	3
Wetland Plant Species (-5, -4 or -3)	25

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	Area Search- Eastern side	Area Search- Western side
BUTTERFLIES							
Monarch	*Danaus plexippus*	S4B, S2N	G4	SC	SC		
AMPHIBIANS							
American Toad	*Anaxyrus americanus*	S5	G5				
Northern Green Frog	*Lithobates clamitans*	S5	G5				
Northern Leopard Frog	*Lithobates pipiens*	S5	G5	NAR	NAR		
REPTILES							
Snapping Turtle	*Chelydra serpentina*	S3	G5	SC	SC		
Northern Map Turtle	*Graptemys geographica*	S3	G5	SC	SC		
Eastern Spiny Softshell	*Apalone spinifera spinifera*	S3	G5	END	END		
BIRDS							
Canada Goose	*Branta canadensis*	S5	G5			PO	
Mallard	*Anas platyrhynchos*	S5	G5			CO	
Mourning Dove	*Zenaida macroura*	S5	G5			PO	PO
Ruby-throated Hummingbird	*Archilochus colubris*	S5B	G5			PO	
Killdeer	*Charadrius vociferus*	S5B, S5N	G5			PO	
Belted Kingfisher	*Megaceryle alcyon*	S4B	G5			OB	
Red-bellied Woodpecker	*Melanerpes carolinus*	S4	G5			PO	
Downy Woodpecker	*Dryobates pubescens*	S5	G5			PR	PO
Northern Flicker	*Colaptes auratus*	S4B	G5			OB	PO
Eastern Wood-Pewee	*Contopus virens*	S4B	G5	SC	SC	OB	
Warbling Vireo	*Vireo gilvus*	S5B	G5			PO	PR
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5			PO	
Black-capped Chickadee	*Poecile atricapillus*	S5	G5			CO	
Brown Creeper	*Certhia americana*	S5B	G5				PO
House Wren	*Troglodytes aedon*	S5B	G5			PO	
Carolina Wren	*Thryothorus ludovicianus*	S4	G5			PO	PO
American Robin	*Turdus migratorius*	S5B	G5			PR	PR
Gray Catbird	*Dumetella carolinensis*	S4B	G5			PO	PR
European Starling	*Sturnus vulgaris*	SNA	G5				PR
American Goldfinch	*Spinus tristis*	S5B	G5			PR	PR
Song Sparrow	*Melospiza melodia*	S5B	G5			PO	PR
Baltimore Oriole	*Icterus galbula*	S4B	G5				PO
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5			PR	PR
Brown-headed Cowbird	*Molothrus ater*	S4B	G5				PO
Common Grackle	*Quiscalus quiscula*	S5B	G5			PO	
American Redstart	*Setophaga ruticilla*	S5B	G5			PO	PR
Yellow Warbler	*Setophaga petechia*	S5B	G5			PO	PR
Northern Cardinal	*Cardinalis cardinalis*	S5	G5			PR	PR
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S4B	G5			PR	
MAMMALS							
Striped Skunk	*Mephitis mephitis*	S5	G5				

SUMMARY

Total Odonata:	*0*
Total Butterflies:	*1*
Total Other Arthropods:	*0*
Total Amphibians:	***3***
Total Reptiles:	*3*
Total Birds:	*29*
Total Breeding Birds:	*27*
Total Mammals:	*1*

SIGNIFICANT SPECIES

Federal:	*5*
Provincial:	*5*

Explanation of Status and Acronymns

SARO: Species at Risk in Ontario
SARA: federal Species at Risk Act
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SNR: Unranked
SNA: Not applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species
S#B- Breeding status rank
S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank
G5: Very common globally; demonstrably secure
T: Denotes that the rank applies to a subspecies or variety
END: Endangered
THR: Threatened
SC: Special Concern
NAR: Not At Risk

Breeding Bird Evidence Codes

CO: Confirmed
PR: Probable
PO: Possible
OB: Observed (no breeding evidence)

Appendix E:
Aquatic Habitat Assessment Photographic Record

Photo 1: View of the watermain crossing from the east bank; SW aspect; Date: August 4, 2021.

Photo 2: View of the watermain crossing from the east bank; SW aspect; Date: August 4, 2021

Photo 3: Partially exposed geotextile mat approximately 5 m from the east bank; Date: August 4, 2021.

Photo 4: Pool located downstream of the watermain along the east bank; Date: August 4, 2021.

Photo 5: Run upstream of the watermain crossing from the east bank; N aspect; Date: August 4, 2021.

Photo 6: Manhole cover on the east bank; W aspect; Date: April 23, 2021.

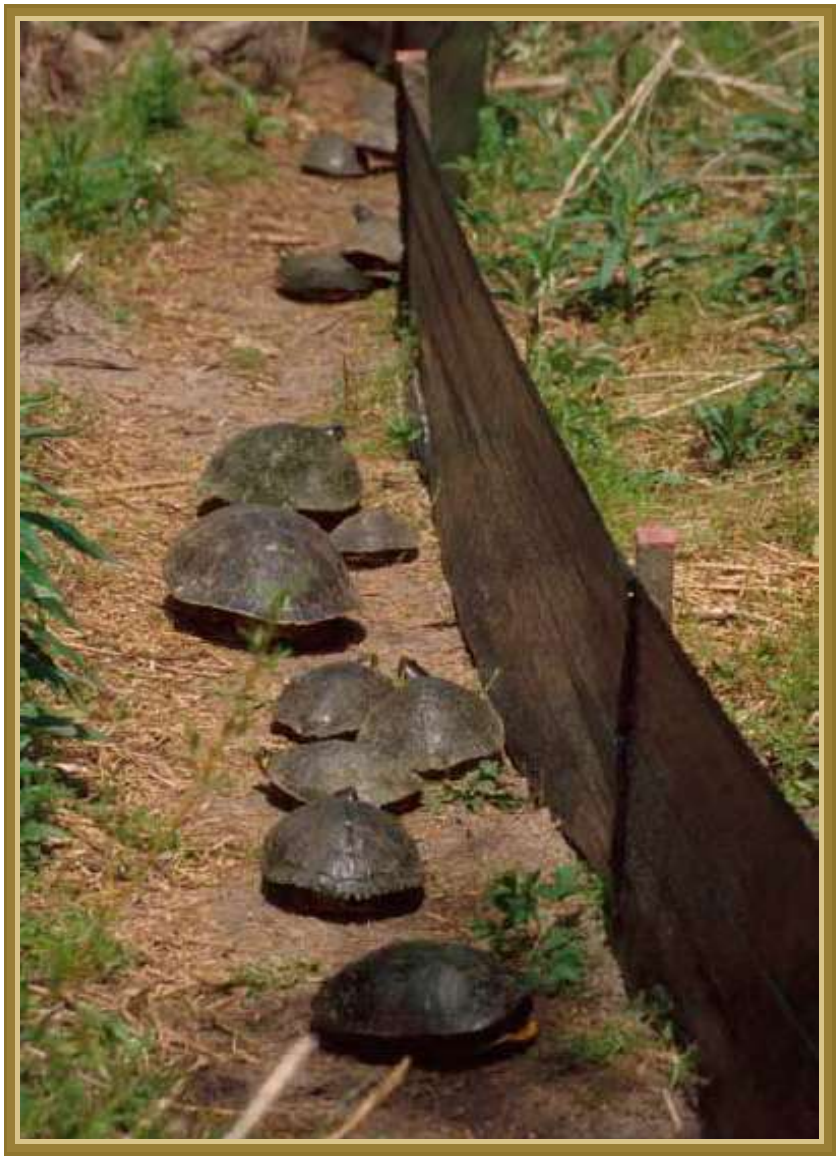
Appendix F:
Exclusion Fencing BMP

SPECIES AT RISK BRANCH
BEST PRACTICES TECHNICAL NOTE

REPTILE AND AMPHIBIAN EXCLUSION FENCING

Version 1.1

July 2013



Ministry of Natural Resources

Ontario

July 2013

Ontario Ministry of Natural Resources
Species at Risk Branch

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Cover illustration: Photograph by Matthew J. Aresco, Conservation Director, Nokuse Plantation

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This document presents information as of the point in time of publication and is meant to be updated through time as improved information becomes available.

Cette publication hautement spécialisée, Reptile and Amphibian Exclusion Fencing Best Practices n'est disponible qu'en anglais en vertu du Règlement 671/92 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec le ministère des Richesses naturelles au Pamela Wesley,705-755-5217.

Document History

Revision Number	Revision Date	Summary of Changes	Originated	Reviewed	Authorized
1.1	**June, 2013**	**Pre-publishing edits**	**June, 2013**	**June, 2013**	**June, 2013**

REPTILE AND AMPHIBIAN EXCLUSION FENCING - BEST PRACTICES -

The purpose of this guidance document is to provide an overview of proven design and installation techniques for reptile and amphibian exclusion fencing. Though this document points to site and species-specific design requirements, it is important to recognize that every situation is different. This guidance is not meant to replace site-specific advice obtained from local MNR staff or experienced exclusion fencing contractors. Moreover, exclusion fences are only effective when well planned, properly constructed, and maintained.

Exclusion fencing seeks to eliminate access to specific areas where activities that could harm animals are occurring (e.g. active aggregate operations, construction sites, and roads). The selection and installation of exclusion fencing can present some challenges, particularly if multiple species are being excluded. For example, some reptiles and amphibians are able to dig under fencing while others can climb over. Some may also take advantage of burrows dug by other animals. To maintain effectiveness, the bottom of the fence should be buried or secured firmly to the ground and minimum height recommendations (Table 1) are considered.

Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass underneath or between openings. Landscape features such as topography and substrate need to be considered as they may constrain fencing design.

Including plans for fencing in advance of a project can increase efficiency and fence effectiveness. For example, long-term road projects that will include a permanent sound barrier could design the sound barrier such that it also meets the specifications of the required exclusion fence.

EFFECTIVE FENCE CHARACTERISTICS

The fence burial and height recommendations listed in Table 1 below have been compiled from scientific literature, established management practices, and practitioner best advice. These are general recommendations and at times other specifications may be more appropriate. For instance, in areas where the substrate does not permit fence burial, weighing down the fence with heavy items (e.g. sand bags) or backfilling may be acceptable. Where needed, speak with your local MNR staff or experienced exclusion fencing contractor to develop site-specific plans.

If multiple species are being excluded from the same area, and the species-specific fencing specifications differ, the uppermost minimum height and greatest depth recommendation should be used (Table 1). If you are excluding both Blanding's Turtle and Gray Ratsnake, for example, the exclusion fence should be a minimum of 2 m tall (see Gray Ratsnake section below for additional details).

Exclusion fences should be installed prior to emergence from hibernation. A survey of the enclosed/secluded area should be conducted immediately following fence installation to ensure that no individuals have been trapped on the wrong side of the fence.

Table 1. Recommended burial depth and height requirements of exclusion fencing for reptiles and amphibians. Recommended height is the height of the fence after it has been installed including the buried components and any installed overhangs or extended lips.

SPECIES	RECOMMENDED DEPTH OF FENCE BURIED (cm) *	RECOMMENDED HEIGHT OF FENCE (cm) **
Turtles – general	10 – 20	60
Eastern Musk Turtle, Wood Turtle	10 – 20	50
Massasauga, Eastern Hog-nosed Snake, Butler's Gartersnake, Queensnake	10 – 20	60
Gray Ratsnake & Eastern Foxsnake	10 – 20	200
Fowler's Toad	10 – 20	50
Snakes - general	10 – 20	100
Common Five-lined Skink	10 – 20	unknown
Salamanders	10 – 20	30

*** does not include the 10 cm horizontal lip that should extend outward an additional 10 – 20 cm (see Figure 2)**
**** the height of fencing has been provided as an approximate. Fencing materials may in fact not be available in proportions that would allow for these precise measurements. It is most effective, if the height and burial depth recommendations are met.**

DURATION OF ACTIVITIES & DEGREE OF ANTICIPATED DISTURBANCE

The type of disturbance, the proximity to disturbance, and the planned fence longevity are factors that influence which type of exclusion fence is most effective. For short-term activities (i.e. 1 to 6 months) such as minor road repairs, a light-duty geotextile fence is appropriate. Longer term or permanent fencing projects, however, require more durable materials such as – heavy-duty geotextile, wood, concrete, woven-wire, sheet metal, vinyl panels, or galvanized mesh.

GEOTEXTILE FENCES

Geotextile fences (e.g. silt fences) come in many types and qualities. They can be very effective for the temporary exclusion of reptiles and amphibians. For the purposes of this document, temporary use ranges from a few months up to 2-3 years. Winter weather is generally damaging to geotextile materials and the cost of maintenance over the long-term should be considered during the planning phase. Depending upon the quality, geotextile can be resistant to UV degradation and the bio-chemical soil environment.

Light-duty Geotextile Fencing:

Light-duty geotextile fencing is made of nylon material and is typically purchased with wooden stakes pre-attached at 2 m to 3 m intervals (Plate 1). It can also come without pre-attached stakes. Light-duty geotextiles are largely intended for projects with shorter durations of only a few months in duration and up to one season.

Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.

To use light-duty geotextile fencing:

- Fencing fabric is effective if attached to wooden, heavy plastic or metal stakes using heavy-duty wire staples or tie-wire (Figure 2).
- Secure the fence on posts that are placed at 2 m to 3 m apart. If using the greater recommended distance between posts, additional maintenance may be required to maintain effectiveness.
- Securely drive the stakes into the ground to a recommended depth of 30 cm. The fencing fabric should be buried to the recommended specifications in Table 1 and back-filled with soil.
- For snakes, supporting posts should be staked on the activity side (e.g. on the side facing the aggregate stock pile or the road - Figure 2).
- Light-duty geotextile fences are not effective where rocks or other hard surfaces prevent proper anchoring of fence posts and burial of the fence fabric.
- Light-duty geotextile fences are not effective where a large amount of concentrated run-off is likely or to cross streams, ditches or waterways without specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice and recommendations.
- See general best practices section below for additional details.

Generally, light-duty geotextile fences are not effective if they exceed 1 metre in height unless purposely manufactured for greater height (e.g. stakes placed at closer intervals or cross braces). If greater height is required consider using heavy duty geotextile, hardware cloth or other fencing materials.

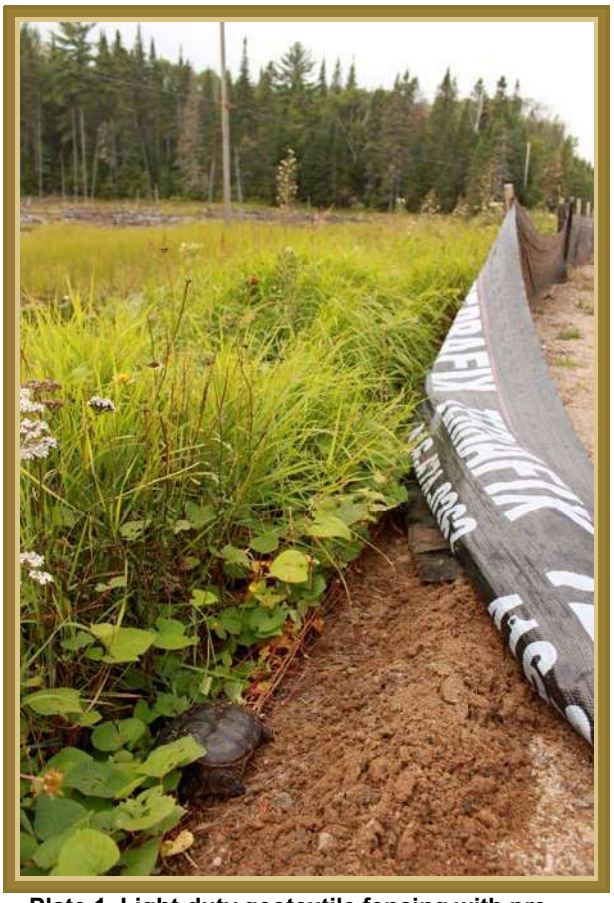

Plate 1. Light-duty geotextile fencing with pre-attached wooden stakes used to exclude turtles from a road as seen on a regular maintenance check (photo credit: Brad Steinberg).

Heavy-duty Geotextile Fencing:

Heavy-duty geotextile fencing is typically constructed of a thick felt-like fabric. It may also be called ‘double row’ or ‘trenched’ fencing. For support, this fencing uses a woven wire fence (e.g. chain link) or some other structure (Plate 2). It is recommended that a minimum density of 270R or equivalent woven geotextile fabric is used.

Heavy-duty geotextile material can be effective for up to 2 or 3 years with proper maintenance. This type of fencing can be damaged by small mammals chewing through or torn by heavy debris (e.g. tree branches). Therefore, it may be best suited to turtles, which are less likely to take advantage of holes or tears in the fabric. If

used to exclude snakes or other animals, more maintenance may be required.

Heavy-duty geotextile fencing:

- The wire fence should be installed on the activity side to prevent animals from leveraging and climbing into the exclusion area while allowing the animal to escape if they find themselves on the wrong side (Figure 2).
- Geotextile fences across streams, ditches or waterways should have case-specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice.
- See light-duty geotextile section above and general best practices below for additional details.

Plate 2. Example of a heavy-duty geotextile fencing used to exclude snake species (photo credit: Jeremy Rouse).

HARDWARE CLOTH FENCES

Hardware cloth (also known as galvanized mesh or Birdscreen) is durable, cost effective and useful for excluding reptiles and amphibians. The fence should be made of heavy galvanized hardware cloth with a ¼ inch mesh. For fences intended to exclude small snakes, a ⅛ inch mesh may be more effective. In contrast, fencing intended to exclude turtle species can have a larger mesh size (e.g. ½ inch). Larger mesh may have a longer lifespan as it is constructed from a thicker material compared to smaller mesh sizes.

To use hardware cloth fencing:

- Secure the fence on posts placed a recommended 2.5 m apart with the stakes on the activity side (Figure 2).
- Pull the mesh taught and staple or secure with screws and a metal stripping to prevent the mesh from being ripped when pressure is applied.
- Installing a top rail or folding the mesh over a taut smooth wire reduces tearing (Plates 3 and 4).
- An outward facing lip installed on the species side ensures that snakes and amphibians are unable to climb or jump over the fence (Figure 2; Plate 4)
- Tears can be mended with 18-gauge galvanized wire.
- See general best practices section below for additional details.

Plate 3. Example of a galvanized mesh fencing used for the long-term exclusion of snakes and turtles from the adjacent highway (photo credit: Megan Bonenfant).

Plate 4. Long-term to permanent exclusion fencing using galvanized mesh with over-hanging lip to prevent animals from climbing or jumping over (photo credit: Megan Bonenfant).

WOOD LATH SNOW FENCING

In certain circumstances, wood lath snow fencing can be effective at excluding turtles. This fencing is typically constructed from soft wood slats that have been woven together with 13-gauge wire and is then attached to steel fence posts which have been driven into the ground.

Wood lath fencing is cost effective and can easily be laid down during the winter to prevent damage. The durability of the material, however, is not meant for very long-term use (e.g. more than 3 years), unless regular maintenance occurs.

To use wood lath snow fencing:

- The fencing should be attached to heavy plastic or metal stakes using heavy-duty wire staples or tie-wire.
- The stakes are recommended to be placed at 2 to 3 m intervals and securely driven into the ground 30 cm or more.
- Wood lath snow fencing across streams, ditches or waterways should have case-specific modifications.
- Wood lath snow fencing lends itself well to being combined with other types of material to ensure complete exclusion.
- See general best practices section below for additional details.

Plate 5. Example of a wood lath snow fencing used to exclude turtles (photo credit: Karine Beriault).

EXCLUSION FENCING FOR GRAY RATSNAKE AND EASTERN FOXSNAKE

Gray Ratsnake and Eastern Foxsnake are the largest snakes in Ontario - reaching nearly 2 m in length. They are also excellent climbers. For this reason, fencing intended to exclude either of these species has additional recommended design specifications.

- The fence should be at least 2 m high.
- The material on the species side (Figure 2) should be smooth to prevent the snakes from climbing into the excluded area.
- Stakes should be on the activity side of the fence (Figure 2).
- Due to the increase in fence height, it is valuable to decrease the distance between posts or install diagonal braces.
- See general best practices section below for additional details.

CONCRETE, SHEET METAL & VINYL WALLS

Concrete, metal or vinyl walls can stand alone or be combined with woven wire or chain link fences. They are durable, require minimal maintenance and are effective in excluding target species from high risk areas and guiding them to crossing structures or other desired locations (Plates 6 and 7). This fence type is comprised of a continuous vertical face of concrete, metal or vinyl sheeting with no gaps. Concrete walls can be installed as either pre-cast sections or pour directly in place.

Plate 6. Stand-alone continuous concrete wall used to exclude salamander species installed as pre-cast forms (photo credit: Steven Roorda).

Plate 7. Pre-formed vinyl sheeting fence intended to exclude salamanders for a construction site (photo credit: Herpetosure Ltd.)

The wall height depends upon the target species, but they are usually between 45 and 60 cm tall and buried 25 cm. Concrete, metal or vinyl exclusion fencing is most appropriate for salamanders, skinks, small snakes, and small turtles. For large turtle species, a chain link fence can be installed directly on top of the concrete wall for complete exclusion.

HABITAT CONNECTIVITY

Habitat connectivity is the connectedness between patches of suitable habitat or the degree to which the landscape facilitates animal movement. Exclusion fencing installed along roads or other large projects can effectively reduce or eliminate habitat connectivity for animals. In these scenarios, exclusion fencing should be considered with eco-passages in order to maintain connectivity. Fencing in isolation should be viewed as a temporary method to reduce mortality until species movement can be restored. Where eco-passages are not feasible they should be identified for consideration with any future road work or development to improve connectivity.

During the installation of fencing with an eco-passage, it is important that the fencing sits flush with the passage to ensure that

there are no gaps where animals can squeeze through.

Plate 7. A wood turtle travelling through a dry eco-passage. Ecopassages such as this help to ensure the long-term connectivity of seasonal habitat for this and other reptile and amphibian species (photo credit: Amy Mui).

GENERAL BEST PRACTICES:

- To deter digging, bury the fence 10 cm down with an additional 10 cm horizontal lip (Figure 2).
- Backfill and compact soil along the entire length on both sides of the fence (Figure 2).
- Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside (speak with MNR for survey advice).
- Exclusion fencing intended to exclude snakes should have the stakes installed on the activity side (opposite the normal requirement for sediment control fencing) to prevent snakes from using the stakes to maneuver over the fencing.
- For snakes and toads, the fence should have an overhanging lip on the species side (Figure 2).
- Fences should be inspected after spring thaw and at regular intervals throughout the active season, especially following heavy rain events. This is particularly important for geotextile fences. Any damage that affects the integrity of the fence (e.g. tears, loose edges, collapses, etc.) should be fixed promptly.
- Tall or woody vegetation on the species side of the fence should be managed if there is a risk that it may enable the animals to climb over. This is most important during spring and fall. Proceed cautiously to not harm animals protected plant species during vegetation removal.
- When installing an eco-passage, fencing or exclusion walls should be used as a guiding system to direct animals to passage openings.
- Natural screens such as trees or shrubs can help to reduce road access and can be combined with fencing to provide protection of individuals from predation.
- Install fences with a turn-around at the ends furthest from the wetland habitat and at any access areas to assist in redirecting animals away from any fence openings (Figure 1).
- Curving the ends of the fencing inward (i.e. away from the road or construction site) may help to reduce access to these locations. The ends may also be tied off to natural features on the landscape such as trees or rock cuts.

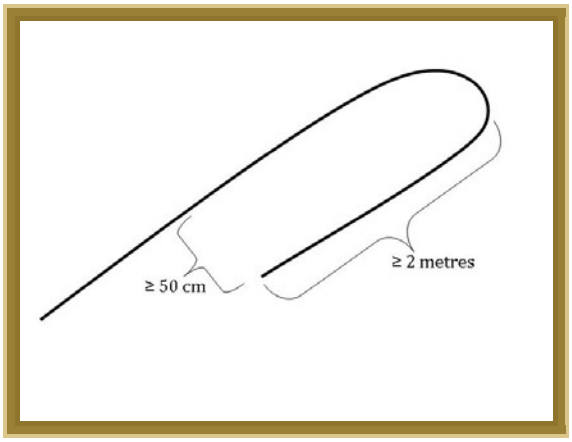

Figure 1. Diagram of the ends of the fence designed to curve inward in order to direct animals away from the area of exclusion.

WATER MOVEMENT & DRAINAGE

- In areas where surface water run-off may erode a soil-based backfill, consider using rocks or sand bags. Ensure these materials cannot be used by animals to climb over the fence.
- Where possible, minimize the number of water crossings: when necessary, it should occur where flow is minimal.
- Fence posts in waterways or areas prone to seasonal flooding should be driven rather than dug – unless following established best practices.
- Fencing should be placed above the high water mark anticipated for high water events such as spring freshet or periods of heavy or continuous rainfall.

TOPOGRAPHY:

- Fence posts should be closer together in undulating topography.
- Fences installed on slopes have a different effective height depending upon whether the animal will be approaching from the up or down slope. The fence height can be adjusted accordingly.

Improvements or questions regarding exclusion fencing can be brought to the local MNR Species at Risk Biologist or other MNR staff.

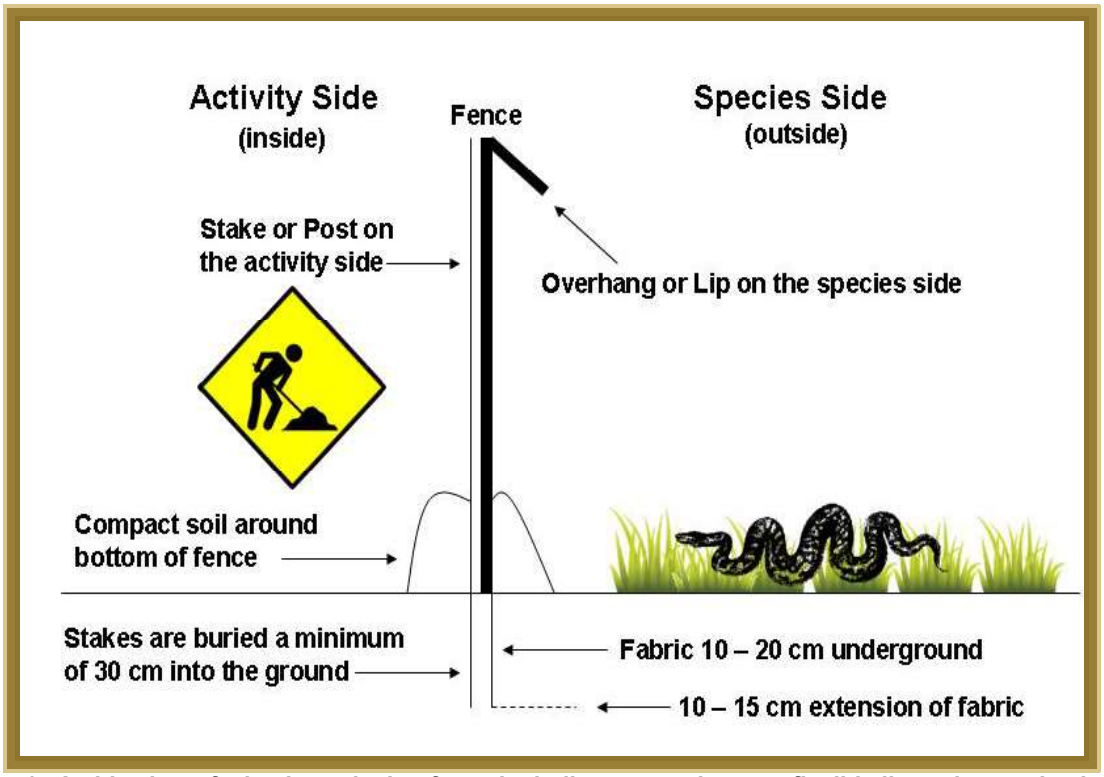

Figure 1. A side view of a basic exclusion fence including an overhang or flexible lip to deter animals from climbing or jumping over the fence. Placement of the stake on the Activity Side or on the inside of excluded area is also illustrated. This is particularly important for snake species which may use the stakes to maneuver over the fence.

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For additional information:

Visit the species at risk website at
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