Guidelines for the preparation of Environmental Impact Studies

City of Guelph

Version 2
April 2020

Foreword & Acknowledgements

This guideline has been developed by the City of Guelph to support and assist in the implementation of the natural heritage system policies contained in the Official Plan, while providing guidance and direction to assist in streamlining the development, submission and review of environmental impact studies.

The City greatly appreciates the contributions of the groups and individuals who took time to provide input and feedback in the development of this guideline. Many thanks are extended to the representatives of City departments, members of the of City's Environmental Advisory Committee (EAC) and River Systems Advisory Committee (RSAC), the Guelph and Wellington Development Association (GWDA), the Grand River Conservation Authority (GRCA) and many other environmental professionals and volunteers who took the time to participate in the preparation of this document.

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1 Introduction

The City of Guelph is committed to protecting its natural heritage and water assets in accordance with the provincial policy statement (PPS) and the City's Official Plan. One of the key mechanisms to implement this commitment is through the environmental impact study (EIS) process. An EIS is typically required when development, as defined in the City's Official Plan, is proposed within or adjacent to a significant, or potentially significant, natural heritage feature or area. An EIS provides a framework for a proponent to address the City's, and other agency's requirements related to the protection of natural heritage and water assets by:

- providing a site-specific assessment of these assets,
- determining how and the extent to which these assets are expected to be impacted by the proposed development (and/or site alteration),
- and identifying site-appropriate mitigation measures to avoid, minimize and/or compensate for negative impacts, including identification of opportunities for restoration and enhancement.

Mitigation

"Mitigation," as it relates to natural heritage conservation, is defined as a three step process, as follows: 1. avoid, 2. minimize, and 3. compensate. In this process, avoiding impacts is always the preferred option, followed by minimizing impacts. Compensation for unavoidable impacts may not be an option for some features or functions, and where it is permitted should only be explored when all options to avoid and minimize have been carefully considered and deemed not feasible.

The role of an EIS

As a planning tool, an EIS can: (a) assist in avoiding or minimizing negative environmental impacts by informing the design, timing and execution of a development proposal, and (b) compensate for unavoidable negative impacts by identifying opportunities for natural heritage enhancement and restoration. Ultimately this is through application of the mitigation hierarchy as outlined above.

As a decision-making tool, an EIS should provide the information required by the City and the Grand River Conservation Authority (GRCA) to determine whether the

proposal complies with the applicable plans, policies and regulations. Ultimately, the EIS assists in informing the decisions made by City staff and Guelph City Council with respect to the nature and extent of the proposed development.

1.1 Purpose of this guideline

The purpose of this guide is to:

- assist proponents in understanding the process involved in the scoping, preparation, submission and completion of an EIS;
- assist consultants in the preparation of acceptable terms of reference and EIS reports by providing an outline of what is expected;
- help consultants address the EIS requirements under the City's current Official Plan framework by providing technical guidance;
- ensure greater consistency in the scope and quality of EIS submitted;
- facilitate the review of EIS Terms of reference and EIS reports by City staff and support the relevant objectives of the GRCA, Province, and Federal government. Although this guide speaks to related policies and legislative requirements from the GRCA, Province and Federal government that need to be considered through the EIS process, this guide does not replace guidance from these jurisdictions, and it is the proponent's responsibility to consult with the appropriate agencies and sources directly.

An overview of the planning documents that establish the requirements for an EIS are provided in Section 2 as well as information on when an EIS is required and who is qualified to prepare an EIS.

Section 3 may be useful for proponents as it describes the submission requirements and the process for completing an EIS.

Section 4 and 5 are intended for environmental consultants and those completing studies and contributing in the preparation of an EIS. These Sections provide specific guidance regarding the expected content of a terms of reference and an EIS. Supplemental technical information is also provided within the various appendices.

2 Planning context and triggers for an EIS

The requirements for an EIS are established through the City's Official Plan and are based on the "no negative impact" test when development or site alterations are proposed within, or adjacent to, certain significant natural heritage features or areas.

Negative impacts, is defined in the City's Official Plan and means:

- in regard to water resources, degradation to the quality and quantity of water, sensitive surface water features and sensitive groundwater features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities.
- in regard to fish habitat, the harmful alteration, disruption or destruction of fish habitat, except where, in conjunction with the appropriate authorities, it has been authorized under the fisheries act, using the guiding principle of no net loss of productive capacity;
- in regard to other natural heritage features and areas, degradation that threatens the health and integrity of the natural features or *ecological functions* for which an area is identified due to single, multiple or successive development or site alteration activities.

The basis for having no negative impact on significant natural heritage features and areas comes from the PPS. The local conservation authority (GRCA) may also require an EIS to support an application for development or site alteration within their regulated areas. The specific policy triggers at the provincial, municipal and agency levels are presented below.

Provincial context

The Province recognizes that the long term protection of natural heritage is an integral component to Ontario's prosperity. The PPS, provides direction for, among other things, use and management of natural heritage and water resources in Ontario. Under section 2 "wise use and management of resources" section of the PPS, there are policies that speak to:

- the long-term protection of natural heritage features and areas, as well as water
- quantity and quality;
- the need for a natural heritage system to be identified;
- the diversity and connectivity of natural heritage systems by maintaining, restoring and, where possible, improving linkages between and among natural heritage features and areas, surface water features and ground water features, and;
- ensuring development is in accordance with provincial and federal requirements related to fish habitat and the habitat of endangered and threatened species.

Notably, Ontario's requirements under the endangered species act, 2007 (ESA) addresses the habitat of provincially endangered and threatened species. Although an EIS is not required as part of the permitting processes related to the ESA, proponents are required to comply with the procedures and regulations under the Act. This process is often undertaken in conjunction with a EIS, and may impact its outcome if such species are confirmed within or adjacent to the study area. Municipalities must ensure that when making planning decisions under the PPS, 2014 that development and site alteration are only permitted in the habitat of endangered species and threatened species where it is in accordance with provincial and federal requirements.

Links to resources regarding species at risk are provided in appendix A.

2.1 City of Guelph Official Plan

The natural heritage system policies are part of the City of Guelph's Official Plan and represent a comprehensive approach for maintaining, restoring and enhancing the natural heritage system.

In 2009, the City completed a natural heritage strategy which provided the technical basis for updating the City's natural heritage data, mapping and policies within the framework of a natural heritage system. This study informed the development of the natural heritage system policies and schedules contained within the Official Plan.

The City's natural heritage system is comprised of significant natural areas, natural areas, and other related components (e.g., wildlife crossings, the urban forest). It also includes a specific section related to environmental study requirements which sets out the minimum requirements for an EIS. The policies for the natural heritage system include requirements that go above and beyond the minimum requirements of the PPS, 2014.

2.2 When is an EIS required?

An EIS is required in the City of Guelph when development is proposed within or adjacent to certain natural heritage features or areas, surface water features and groundwater features, or when it may negatively impact their related hydrological or ecological functions. Under the City's Official Plan, no development or site alteration is permitted within certain natural heritage features and areas (i.e. significant natural areas). However, an EIS is still required for proposed development on lands adjacent to such features and areas, as per table 1 below.

Table 1. When an EIS is required for significant natural areas

Natural heritage features and areas	**Development involves lands within the natural heritage feature or area**	**Development involves adjacent lands**
Significant areas of natural and scientific interest (ANSI)	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 50m (earth science ANSI) or 120m (life science ANSI)
Significant habitat of endangered and threatened species	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 120m
Significant wetlands: provincially and locally significant wetlands	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 120m
Surface water and fish habitat	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 120m
Significant woodlands	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 50m
Significant valleylands	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 50m

Natural heritage features and areas	Development involves lands within the natural heritage feature or area	Development involves adjacent lands
Significant landform	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 50m
Significant wildlife habitat, including ecological linkages	Development is not permitted, see Official Plan for specific requirements	EIS required for development within 50m
Restoration areas	Development is not permitted, see Official Plan for specific requirements	No adjacent lands

Development or site alteration may be permitted within other types of natural heritage features or areas (i.e. natural areas overlay) only if an EIS can demonstrate that the feature or area does not meet the criteria for significance specified in the Official Plan and it is appropriate to remove the feature. For these natural heritage features and areas, an EIS is required for proposed development within or adjacent to the feature or area, as per Table 2 below.

Table 2. When an EIS is required for Natural Areas

Natural heritage features and areas	Development involves lands within the natural heritage feature or area	Development involves adjacent lands
Other Wetlands	EIS required	EIS required for development within 30 m
Cultural Woodlands	EIS required	EIS required for development within 50 m
Habitat for Significant Species	EIS required	EIS required for development within 50 m

According to the Official Plan, an EIS may be required as part of a development application. An EIS may also be required with applications under the City's Site Alteration By-law or Private Tree Protection By-law. As well, municipal projects such as trail, park or municipal infrastructure development may require an EIS, or may follow an Environmental Assessment process that conforms to the City's Official Plan as applicable.

It is important to understand that the City has not been comprehensively surveyed for all flora, fauna or their habitats. Furthermore, natural systems are dynamic and can change over time. As such, when new or updated information becomes available additional natural heritage features and areas may be identified. The natural heritage system policies of the Official Plan will apply to newly identified natural heritage features and areas where these features meet the applicable definitions and criteria contained within the Official Plan.

The mapping of the natural heritage system included in the schedules of the Official Plan is based on the best information available at the time the natural heritage policies in the Official Plan were updated in 2010.

2.3 What qualifications are required to prepare an EIS?

An EIS is to be prepared by a qualified professional, or team of professionals, with relevant environmental expertise. In general, an EIS should be authored, or at least reviewed, by a senior ecologist or comparable professional with more than five years of applied experience conducting environmental impact assessments.

The associated field program is to be completed by professionals qualified in the disciplines relevant to the components of the report to which they are contributing.

For example (but not limited to):

- If the boundary of a wetland, including a provincially significant wetland, requires confirmation, then the assessor must be a wetland evaluator certified by MNRF;
- if ecological land classification (ELC) is being completed or refined, then the assessor should have completed ELC training and obtained a certificate from a recognized training program;
- if bird studies are being completed, then the assessor should be a qualified biologist specializing in avian identification in the field;
- if a tree assessment is being completed, then the assessor must be a certified arborist or registered professional forester.

The main author preparing the EIS must also work in conjunction with other professionals to integrate the information contained in other supporting plans and

studies (i.e., hydrogeological studies, stormwater management plans, geotechnical reports, lot grading and drainage plans, etc.) as required.

2.4 Grand River Conservation Authority (GRCA)

The regulation of development, interference with wetlands and alterations to shorelines and watercourses (O. Reg. 150/06) made under the conservation authorities act, 1990 requires proponents to acquire permission from the GRCA prior to any development or site alteration within or adjacent to river or stream valleys, watercourses, hazardous lands and/or wetlands. Development or site alteration taking place on these lands may require a permit to confirm that the control of flooding, erosion, dynamic beaches, pollution or the conservation of land is not affected. An EIS may be required to satisfy the GRCA's permitting requirements under this regulation; however an EIS completed for the City can fulfill the GRCA requirement as well.

Typically, an EIS developed for the City of Guelph within GRCA regulated areas will be circulated to the GRCA to: (a) address their regulatory requirements, and (b) for their comment and review during the EIS terms of reference and EIS review processes.

The GRCA does not review an EIS for the purpose of implementing the City's Official Plan, but may still provide advice to the City on occasion. Where an EIS is required under GRCA policies and regulations, but is not otherwise required to address City policies, the proponent should contact the GRCA directly regarding the EIS process and requirements.

3 Process for completing an EIS

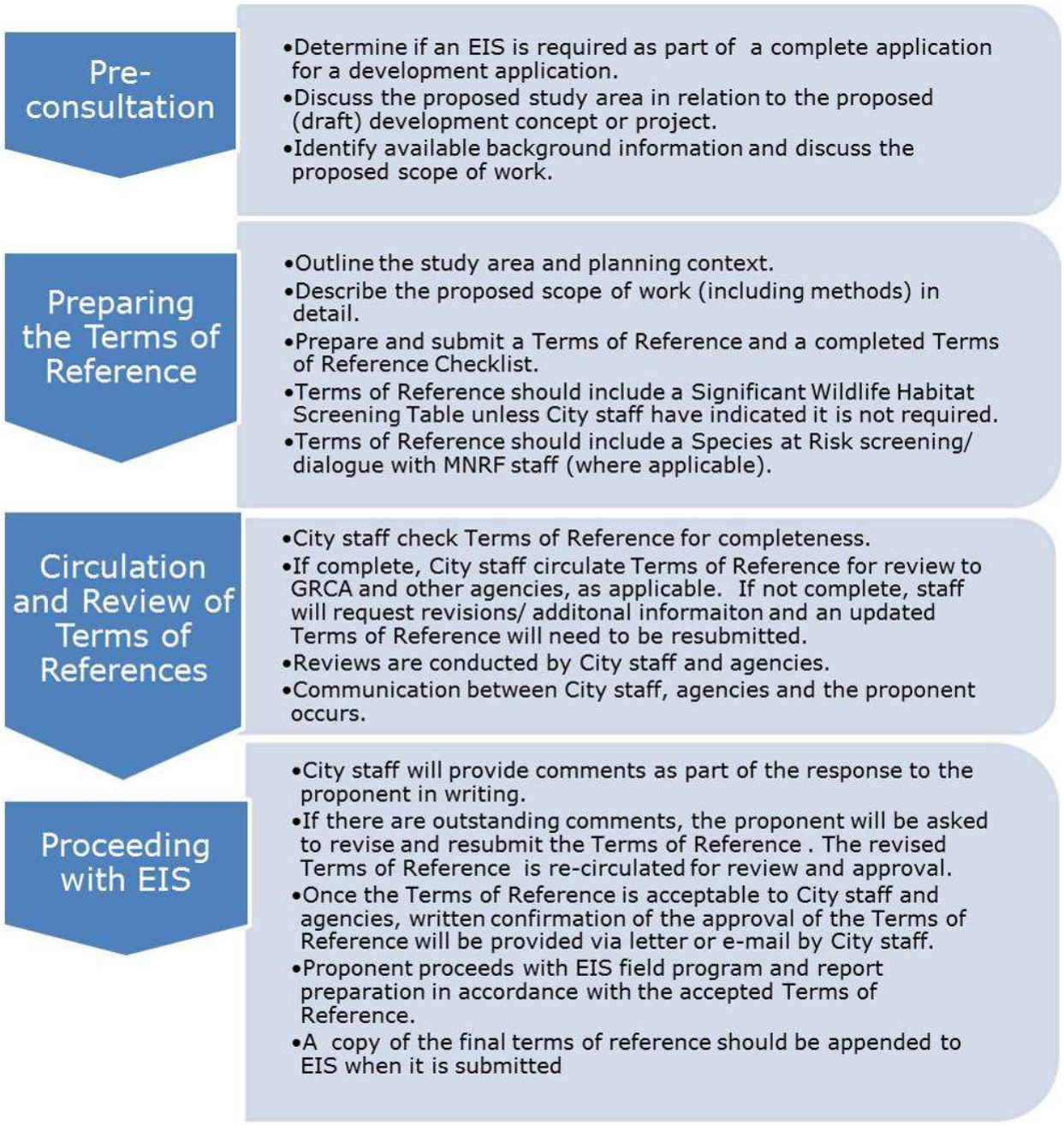
It is recommended that an EIS be started early in the development application process to identify natural heritage features and areas that need to be protected, and potential development constraints (i.e., areas that may not be appropriate for development) associated with these features and areas, prior to the development of a detailed site plan. There are also specific timing windows associated with different types of surveys which, if missed, can delay the planning process. Therefore,

having a terms of reference that has been approved by the City as early in the process as possible is highly recommended.

A terms of reference for an EIS must be submitted to, and approved by City staff prior to the submission of an EIS. The Terms of reference will: establish the extent of the study area, characterize the general nature and extent of the development proposal, briefly summarize the planning context and known triggers for the EIS (e.g., natural heritage designations, GRCA regulatory areas, etc.), outline the proposed approach and methods for undertaking the study, and outline the components to be addressed through the study analyses. Although it is understood that only preliminary information is usually available at the time of terms of reference development, it is expected that the terms of reference clearly outline the proposed report components, study approach and methodology.

Figure 1 outlines the process for submitting a terms of reference. Further details regarding this process are provided in the following sub-sections (3.1, 3.2, 3.3 and 3.4). Appendix B provides an EIS terms of reference Checklist that identifies elements to be addressed. Section 5 of these guidelines provides more information regarding the City's expectations with respect to background review, field assessments, data analyses, monitoring and reporting in an EIS which may also assist in influencing the level of detail included in the terms of reference.

Figure 1. Process for Submitting an EIS terms of reference



3.1 **Pre-consultation**

Within the natural heritage system section of the City's Official Plan, under environmental study requirements, and within the general policies subsection it states that: "The scope of an EIS must be determined in consultation with the City,

the GRCA and applicable Provincial ministry, where one or more of the potentially impacted features or functions fall under their jurisdiction".

Where an EIS is required as part of a complete development application, development of a terms of reference for the EIS is led by the proponent in consultation with the City's environmental Planner, and in advance of developing the EIS.

Telephone or e-mail inquiries for natural heritage information may form part of, but do not constitute, pre-consultation for Planning Act applications. Pre-consultation consists of a formal meeting, such as with the City's Development Review Committee (DRC), between the proponent and City staff to review and discuss a development concept. Environmental planning staff will share information regarding natural heritage policies and regulations that need to be considered, available background reports and/or data, and the scope of the EIS. GRCA and other agencies may take part in pre-consultation where it is recognized that there is a concurrent review process.

Pre-consultation helps ensure that potential natural heritage features and areas, and other potential regulatory constraints, are identified early on, and that the full range of potential constraints to development are considered through the EIS (and the broader planning) process.

Specifically, pre-consultation can help to:

- Establish the extent of the study area and the scope of the EIS;
- Identify critical information and analysis required by the City to make informed decisions related to the City's Natural Heritage System, and its ecological and hydrologic functions;
- Identify requirements for related studies (e.g., hydrogeological, geotechnical, stormwater management)
- Ensure that all existing relevant studies and background information are considered;
- Establish realistic timelines for the preparation and review of an EIS; and,
- Avoid unnecessary field work, addendums and major design changes later in the planning process.

As part of this process, all sources of background information to be considered should be identified, particularly sources and/or data that will require a formal request and take some time to obtain. Some of this information may be found within City documents such as subwatershed plans, environmental management plans, or within other documents including environmental studies completed for adjacent properties, provincial/federal databases, local environmental/naturalist groups and relevant scientific literature. For reference, a list of potentially useful background resources has been included in Appendix A. However, this list is not exhaustive, and the resources listed will not be applicable to every development proposal within the City.

3.2 Components of the terms of reference

Based on feedback received through the pre-consultation meeting (and input from qualified professionals as required), the proponent will prepare a terms of reference. The primary purpose of the terms of reference is to establish the scope of the EIS, since the level of study required can vary depending on the type of development proposed, the site conditions, and the nature of the natural heritage features and areas (and/or regulated features) within and/or adjacent to the subject property.

A checklist to assist in developing a complete terms of reference, is provided in Appendix B. It should be submitted to the City along with the terms of reference, as staff will also refer to this checklist when reviewing submitted terms of references for completeness.

More specific guidance related to the various components that should be considered for inclusion into an EIS terms of reference is provided in Section 4.

3.3 Circulation and review of EIS terms of reference

The City's environmental planner will screen the submitted EIS terms of reference for completeness and, if found to be complete, circulate it to the GRCA, other city staff, and any other applicable agencies and/or advisory committees for review and input. Reviews are conducted and communication between city staff, agencies and the proponent occurs. There may be a need for technical discussions and meetings

with the proponent and/or other agencies during the course of review in part to ensure that other variables relating to servicing, transportation, stormwater management, trails, etc. are appropriately integrated into the study design.

3.4 Approval of EIS terms of reference

The Environmental Planner will consolidate all comments received from internal departments, partner agencies and the advisory committees, and provide a written response to the proponent. Based on the comments received from agencies and the committee(s), staff will determine whether the terms of reference establishes the appropriate scope to address City requirements, or if revisions are required. If there are outstanding comments, the proponent will be asked to revise and resubmit the terms of reference.

Once City staff and other affected agencies (e.g., the GRCA) are satisfied that all comments have been adequately addressed, a letter or email confirming approval of the terms of reference will be provided to the proponent.

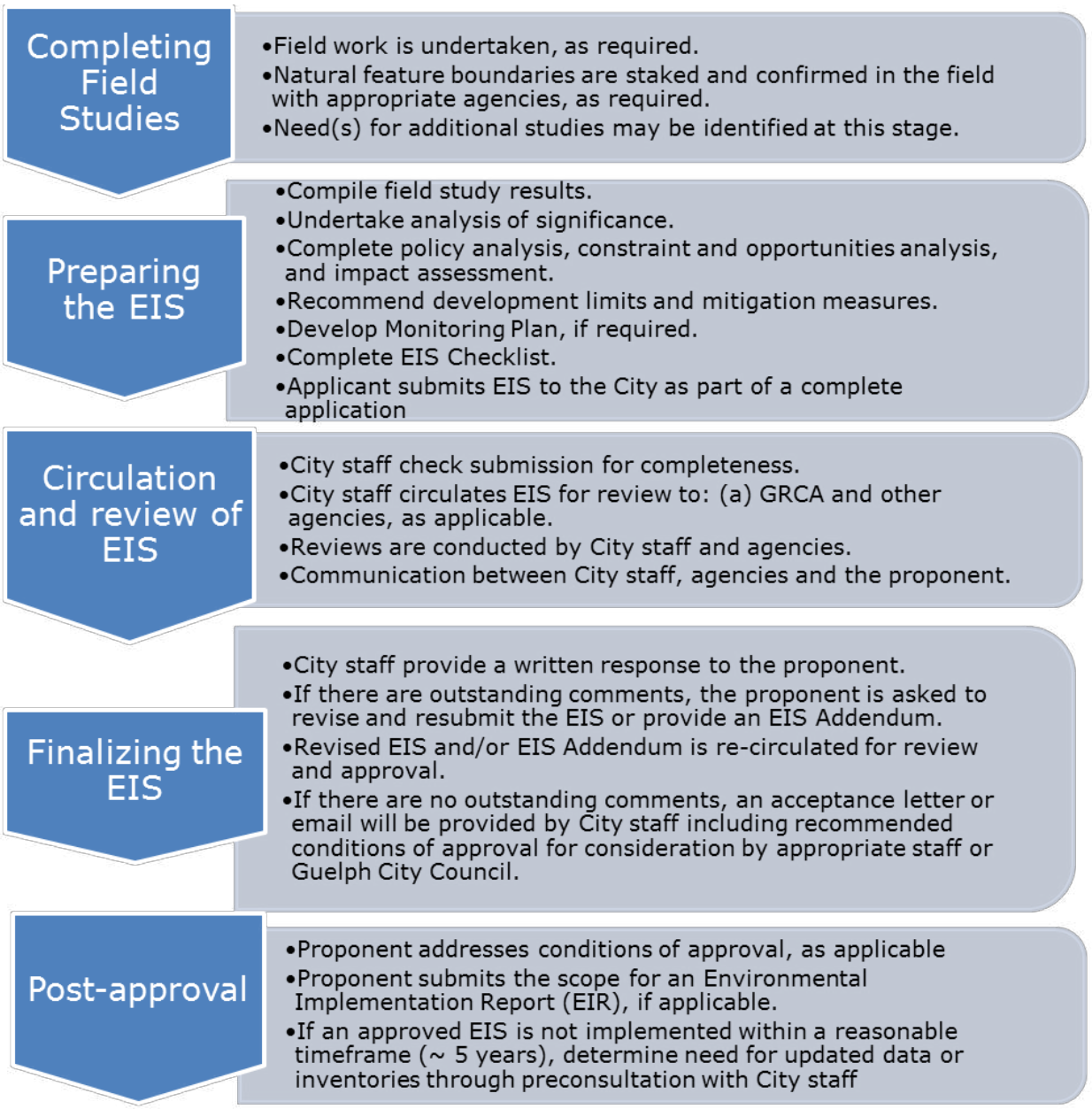
Where an EIS is required under GRCA policies and regulations, but is not otherwise required to address City policies, the proponent should contact the GRCA directly regarding the EIS process and requirements.

Upon the City's approval of the terms of reference, the proponent can complete the required field studies, and prepare and submit the EIS in accordance with the Official Plan policies. An approved terms of reference will outline the work program and provide assurance regarding the scope and nature of studies to be completed. Additional information is provided in Section 3.5 below regarding how to address unforeseen findings during field study.

3.5 Process for preparing and submitting an EIS

A diagram outlining the process for completing and submitting an EIS is shown in Figure 2 below. More details about this process are also provided in Sections 4.1 through 4.5 below.

Figure 2. Process for Preparing and Submitting an EIS



The amount of time needed to complete field studies will depend on the nature of the natural heritage features and areas within the study area, and the extent of current background information available. An EIS may require a multi-season field program targeting the full range of wildlife groups or ecological functions, or may

be scoped to focus on one or two seasons of data collection for only some types of plants, wildlife, or ecological functions. Proponents should engage the City, GRCA and other agencies as applicable (e.g. MNRF, Department of Fisheries and Oceans (DFO)) in order to identify these requirements early in the development process.

Field studies and the confirmation of feature boundaries must be completed (with appropriate personnel in attendance) according to the approved terms of reference, as described in Section 3 of these guidelines. More detailed guidance related to undertaking field studies is provided in Section 5.2 of these guidelines and the supporting appendices.

On occasion, the need for additional field studies may be identified following finalization of the terms of reference. This could happen for several reasons, such as:

- A significant species or significant natural feature or area not previously known to be found in the area is identified during the course of field work;
- changes to a species status (e.g., becomes listed under the *Endangered Species Act, 2007* or *Species at Risk Act, 2002* while the study is in progress), or;
- changes to a natural heritage feature or area's status while the study is in progress (e.g., completion of a wetland evaluation or re-evaluation).

In such cases, City staff will work with the proponent to minimize potential delays. The proponent should contact City staff to discuss any potential changes to the study scope as soon as the information arises. A revised method or approach should be proposed and agreed to by the proponent, the City and any applicable partner agencies prior to any additional field study taking place.

3.6 EIS Submission Requirements

When preparing the EIS, the structure should mirror the approved terms of reference. All of the information gathered needs to be included within the EIS and submitted as a complete document, either in the body of the report or in the appendices.

3.6.1 Report standards

A checklist for EIS submission is included as part of this guide in Appendix C. As part of this checklist, minimum reporting standards have been included to assist in the preparation of the EIS Report. A copy of the completed checklist is to be provided along with the EIS submission to assist in staff's review for completeness. Appendix F includes a recommended table format for reporting plant species which could also be used as a basis for wildlife species lists.

3.6.2 Field data collection and "shelf life"

An EIS must be based on data that is current and collected using established protocols and standards. This includes the field data collected by the proponent as it informs the analysis, recommendations and conclusions that are provided within the EIS.

Field data reflects the site conditions at the time of collection. Over time, conditions on site can change due to a variety of reasons (e.g., vegetation growth, disturbances, and shifts in vegetation community composition). This can affect the accuracy and representativeness of the field data. The "shelf life" of field data can vary depending on the type of data, the site, or the surrounding conditions. The City generally considers field data older than five years to be limited in its accuracy, and will generally request that updated field studies be completed in such cases. Older field data can, and should, still be used as sources of background information for the scoping of a terms of reference and preparation of an EIS.

3.6.3 Digital information

Through the preparation of an EIS, boundaries of natural heritage features and areas may be refined. In order to maintain updated Official Plan and Zoning By-law mapping, spatial data (once finalized through an approved EIS) should be provided to the City in an AutoCAD, ESRI shape file or ESRI geodatabase format. Typical digital mapping data that would be submitted include feature boundaries and buffers, Ecological Land Classification polygons and related metadata, as well as point records of significant species observations.

As part of the submission, a digital PDF version of the EIS report, including all maps, drawings and figures, is to be submitted on a DVD or flash drive or via electronic transfer. Within the digital submission, species lists should be provided in excel spreadsheet format.

3.6.4 Hard copy submission

When submitting the EIS, hard copies will need to be included in addition to the digital submission. Hard copies are provided to the Environmental Planner for distribution to internal City departments and partner agencies. Table 3 outlines the standard number of copies for these groups. The precise number of copies should be confirmed with the City's Environmental Planner prior to submission. Only the minimum number of copies required will be requested.

Table 3. Hard Copy Submissions

Group/ Agency	Number of Copies
City Staff	4
GRCA	2

3.7 Circulation and review of EIS

The EIS is to be submitted to the City as part of a complete development application. Once the submission has been received, staff will check for all of the required studies and reports as per mandatory pre-consultation requirements. Once an application is deemed complete and provided to the Environmental Planner, the EIS will be reviewed. In the event that there is insufficient content or amount of detail within the document, the application will be deemed incomplete, and City staff will provide preliminary comments on issues that need to be addressed. This will be based on the City's Official Plan policies, the EIS checklist and the approved terms of reference.

3.7.1 Peer review

The City may determine that an independent peer review of an EIS is required in some circumstances, such as when technical expertise cannot be provided by City staff. In such cases, the City will arrange for the services of a third party peer reviewer. The cost of a peer review may be shared between the City and the

proponent or may be paid entirely by the proponent and will be determined on a case by case basis.

3.8 Finalizing the EIS

The Environmental Planner will consider the feedback and input from the GRCA, advisory committees and other City staff when making a decision regarding whether to recommend support for an application based on the EIS. The response will include technical comments, explain whether a resubmission is required in order to address any outstanding concerns, and outline the procedure to move forward.

In some cases, an EIS addendum will be adequate to address any outstanding comments and issues. In other cases, a revised EIS may be required. In either case, a cover letter explaining the purpose of the resubmission and including a comments-response matrix is helpful to facilitate the review process. A revised EIS or an EIS addendum should be clearly dated. Revised submissions or addenda will be re-circulated to the appropriate City staff, partner agencies and the advisory committees as applicable.

Once all outstanding comments are addressed, the Environmental Planner will provide the proponents and the City's Development Planner with a letter or email confirming that the EIS is acceptable to the City including the date/version of the final submission. This correspondence may also include conditions of approval recommended by the Environmental Planner that are to be considered by Council when the application proceeds for decision.

This information will be included in the report for the application when it proceeds to Council. In addition, all motions passed by advisory committees will also be provided for Council's consideration in decision-making.

3.9 Post approval

Post approval addenda

Although, normally, the approved EIS is the document that is used as the basis for conditions in the Subdivision or Site Plan Agreement, in some cases a post approval EIS addendum is needed. Post approval addenda to the EIS may be required by the

City for reasons related to the planning process or the changes in the applicable environmental legislation or science, such as:

- The amount of time that has elapsed between initial approval (i.e., draft plan approval of subdivision) and final approval/registration when site plan approval or construction may begin;
- the initial development application may have been red-line revised due to other technical requirements such that the recommended development limits and/or mitigation measures need to be re-considered or amended;
- changes to the status of a species (e.g., it becomes listed under the endangered species act or species at risk act) or of a natural heritage feature or area (e.g., a wetland is evaluated as provincially significant) that potentially impact the development limit and/or recommended mitigation measures;
- a different mitigation practice is proposed in response to new or emerging science, or;
- changes to the development proposal which affect the development limits and /or mitigation plan set as out in the approved EIS.

The purpose and scope of any proposed EIS addendum will be reviewed and approved by City staff. Depending on the extent of the changes, staff may also consider it more appropriate to update the approved EIS.

3.10 Environmental Implementation Report (EIR) requirements

Depending on the nature and complexity of the development application, the City may require the preparation of an Environmental Implementation Report (EIR) as a condition of approval in addition to an EIS. While an EIS typically confirms site-specific conditions and applicable policies/legislation, and recommends an appropriate development limit and mitigation measures based on this information, an EIR is intended to provide more specific direction for implementing these recommendations and assists in the detailed design of the development proposal.

An EIR will typically:

- Describe how all the conditions of approval have been met;
- indicate how municipal infrastructure servicing, including but not limited to trails, stormwater management facilities and the protection of natural heritage

system and the associated ecological and hydrological functions have been addressed;

- provide detail on how the protection of significant natural heritage features and their functions, and the NHS as a whole, have been addressed;
- identify and provide specific direction for any other special requirements to support the protection and/or management of a significant natural feature or area (e.g., management prescriptions, content and layout of educational packages, etc.);
- provide site-specific details for mitigation measures (including restoration/compensation plans);
- provide site-specific guidance for any monitoring plans; and
- provide site-specific details for any landscaping plans, including demarcation and trail design, typically prepared by a full member of the Ontario Association of Landscape Architects (OALA).

4 Components of an EIS terms of reference

4.1 Introduction

The introduction of a terms of reference is intended to provide an overview of the proposal (recognising that it may be subject to changes/refinement as the process moves forward), the subject property and the site context. This should include:

- A description of subject property: the subject property refers to the parcel(s) of land owned by the proponent on which development (and/or site alteration) is being proposed. This should also include all natural features and areas, land covers, existing hard surfaces or buildings on the subject property;
- A description of the type and scale of the development proposal/concept (including whether any servicing, infrastructure upgrades or stormwater facilities are anticipated), recognising that it may be subject to change;
- A description of the historical and present uses of the subject property including any grading/filling activities, brownfield contamination, etc.;
- A description of the study area and the subject property's relationship to the surrounding landscape. The study area typically includes the subject property as well as other lands that need to be considered in relation to natural heritage features and areas, regulated features and/or their functions. This area typically includes natural heritage features but may also vary through a subwatershed study or other municipal studies/ equivalents, and;
- Map(s) of the development location, subject property, adjacent lands and study area, an orthographic map with known natural heritage features/areas overlaid is also recommended. As established through the Official Plan adjacent lands are 50 m to120 m from natural heritage feature boundaries (see Table 1), but may also vary through a sub watershed or other comprehensive study.

4.2 Planning Context

The planning context may be included as a stand alone section, or a subsection of the introduction of a terms of reference and should include:

- Current land uses designation and zoning for the subject property and for the adjacent lands;

- the required development applications/proposal;
- trails that are part of the proposal;
- map(s) of the development location and extent of the area to be studied including Zoning/Land Use ;
- environmental legislative, regulatory and policy requirements that may affect the development proposal.

4.3 **Background Review**

At the terms of reference stage known relevant sources of information including existing studies, plans, databases and other sources should be identified. This information may also be included in the Characterization of the Natural Environment section.

Relevant background sources may include, but are not limited to:

- Current and historical air photos;
- watershed or subwatershed studies;
- secondary plans, master plans and supporting studies;
- EIS and/or EIR information from adjacent lands;
- natural heritage databases;
- data on file with the City, GRCA, MNRF and/or DFO for the study area.

A number of on-line sources are also identified in Appendix A, background resources.

4.4 **Characterizing the natural environment: methodology and data collection**

For the EIS terms of reference, the characterization will generally be based on a preliminary review of available background information, any observations made during preliminary site visits, and information gathered through pre-consultations with other relevant agencies and the City. Based on the available information, the terms of reference will identify the need for field studies to fully characterize the natural heritage features and areas on the subject property, and their ecological functions.

Field study protocols/methods must be identified in the terms of reference to allow for a comprehensive review and discussion at the study design stage.

Proponents must ensure that the recommended survey protocols are: (a) suitable for the type of natural heritage features and areas on site, and (b) are designed to provide the information needed to determine whether a feature is significant (or not) according to the City's Official Plan. Details regarding the field program should also include:

- Proposed timing of work (i.e., season, time of day, weather dependencies);
- proposed level of field effort (i.e., number of visits, field hours, number of searchers);
- map(s) showing proposed locations for species-specific surveys (e.g., amphibian surveys);
- technology being used (i.e. GPS, broadband bat detectors, etc.) to support field assessments;
- spatial extent and level of effort for supporting field studies (i.e. piezometer locations, etc.).

The terms of reference should also identify and describe the approach and methods to be used to assess the natural environment within the study area as it may relate to the subsections below.

4.4.1 **Geology and soils**

The terms of reference should provide a general description of the geology and soils within the study area. This should include a general description of the physiographic region and recognition, where appropriate, and areas identified as significant valleylands and/or significant landform in the City's Official Plan.

The terms of reference should also indicate whether a geotechnical report is being completed. Typically such a report will be required on sites with shallow bedrock, particularly where building foundations and/or underground parking are proposed.

With respect to significant landform, the terms of reference should also indicate whether the study area includes significant landform. Where study areas include significant landform the following should be considered/indicated:

- A Professional Geoscientist, or professional with comparable expertise will be required to confirm feature boundaries;
- whether the EIS will be exploring/considering alternate areas of significant landform and establish the scope of the studies necessary, following the significant landform policies of the Official Plan;
- feature boundaries will need to be confirmed in the field and surveyed;
- hydrological functions attributed to/associated with significant landform also need to be considered and should be identified as part of the scope of study.

4.4.2 **Hydrology and hydrogeology**

The EIS terms of reference and the EIS should identify any known surface water and groundwater features in the study area, and whether or not additional site-specific hydrogeological, hydrologic and/or fluvial geomorphological work is required to supplement existing background information. Such studies may be incorporated into the EIS, but are more typically provided as standalone studies whose findings need to be integrated into the EIS, as appropriate.

Sources of information to consider including: watershed or subwatershed studies (including sub-watershed or wetland catchment boundaries where available), the Grand River source protection plan and assessment report for the Grand River watershed (approved August 16, 2012), Environment Canada - water survey of Canada (real-time hydrometric data).

The use of data loggers to provide continuous/ complete data collection is encouraged to be incorporated into study designs at the terms of reference stage. This type of data gathered through an EIS process can also serve as baseline information for future monitoring studies.

4.4.3 **Aquatic and fish habitat**

The terms of reference should identify any known aquatic and/or fish habitat and confirm if aquatic and/or fish habitat and/or benthic invertebrate assessments are being undertaken by qualified individuals as part of the EIS. Details should also be provided as to the protocols to be used for any proposed assessments, including the anticipated timing and frequency of surveys. Surface water features that may

not directly support fish use, but may contribute indirectly to downstream fish habitat must also be considered.

The terms of reference will largely be based on a preliminary review of available data from the GRCA, MNR and DFO as well as review of DFO's species at risk mapping and the natural heritage information centre (NHIC) database to determine whether the fish habitat may be suitable for species listed under the provincial endangered species act and/or the federal species at risk act. Additional background may also be available through background studies (e.g., subwatershed studies, fisheries management plans, etc.).

The need for additional fish surveys or inventories should be determined based on available information and site conditions including factors such as the proximity of development or grading, nature of the proposed works and the sensitivity of the fish habitat. Additional requirements may be suggested by agencies, including GRCA, in order to address DFO's fisheries protection policies under the fisheries act.

4.4.4 **Terrestrial vegetation (including wetlands)**

The terms of reference should consider the coarse-level ELC included in the ecological land classification developed through the City's natural heritage strategy as a preliminary vegetation classification, and will normally need to identify field studies to refine and update this data, as described in Appendix F. The terms of reference should also identify if any additional plant identification work and if a tree inventory (and any associated tree preservation and/or compensation plans) are required. A detailed summary of the field studies proposed should be included in the terms of reference, this should also consider whether feature based water balances and studies to characterize the hydroperiod of the wetland are required. More information regarding study methods and techniques for ELC and plant surveys can be found in appendix F. More information regarding requirements for tree inventories, preservation and compensation plans can be found in the City's tree technical manual.

If woodland and/or wetland features are present on the subject property, feature boundaries will need to be confirmed in the field and staked by an Ontario land surveyor. If required, the terms of reference should indicate that the staking of

wetland boundaries will be done in consultation with the GRCA and City staff should be provided the opportunity to also attend. This approach is recommended as the GRCA is responsible for wetlands when making decisions under the conservation authorities act, 1990 while the City is responsible for wetlands when making decisions under the Planning Act, 1990 as it relates to the City's Official Plan and the PPS, 2014.

Wildlife and wildlife habitat (including species at risk)

As part of the terms of reference, preliminary wildlife information based on background reviews and pre-consultations should be summarized and used as a basis, in conjunction with knowledge of the general habitat types known to be on the subject property and in the broader study area, for determining what, if any, wildlife studies are required as part of the EIS. As part of these guidelines, a significant wildlife habitat screening table has been developed (see appendix D) as illustrated in Table 3, which should be included in the terms of reference to rationalize the proposed wildlife field program.

Table 4. Sample table to screen for significant wildlife habitat

Significant wildlife habitat type	**Known or candidate SWH present?**	**Rationale (habitat presence or absence)**	**Field studies required?**
Deer winter congregation areas (as identified by MNR)	Yes	Deer winter congregation area identified by MNR	Yes, winter deer browse surveys proposed see methodology
Waterfowl stopover and staging: aquatic	No	No wetland communities found within study area	No

The surveys required for a particular subject property need to be identified in the terms of reference, and include the anticipated timing and scope of these surveys, along with a map identifying locations of species-specific surveys if applicable. On occasion, it may occur that a survey is identified as being required part way through the completion of field work due to an unexpected observation. Appendix G provides guidance related to the collection and reporting of wildlife data records, as well as a summary of current and potentially applicable techniques and protocols for undertaking wildlife surveys for key groups currently in use in southern Ontario.

In addition, surveys (as applicable) should be completed to identify known or identify and evaluate candidate significant wildlife habitat. Often, wildlife surveys completed as part of the more generalized wildlife assessments will also be used to determine significant wildlife habitat; however, there may be some cases where specialized surveys for specific wildlife habitat types may be required. This screening assessment should be completed using the significant wildlife habitat technical guide, the draft SWH ecoregion 6E criterion schedule, and the natural heritage reference manual for technical guidance. Use of this table will help City staff verify that the proponent has considered the various habitat types.

Species at risk (SAR)

When preparing a terms of reference, the proponents should perform a SAR screening exercise by consulting the NHIC and contacting the MOECP to inquire about any SAR records in the study area.

Proponents should also be aware that because the province has not been surveyed comprehensively for the presence of SAR, the absence of a record is not an appropriate indicator for the absence of a SAR from a geographic area.

Based on the results of a screening, field work may be required to determine the presence of SAR.

The terms of reference should include:

- any information provided by MOECP or other sources regarding the potential for SAR in the study area and recommended field study methods to verify for the presence of this or these species, and
- a statement about how sensitive information regarding the presence/location of Endangered and Threatened Species will be shared with the City (i.e., so that sensitive locational information is not released to the public).

4.4.5 **Natural hazards**

Natural hazard lands often overlap with natural heritage features and areas identified for protection, although the rationale for and approaches used to identify their limits are different. These lands also typically require development setbacks, which are different from buffers to natural heritage features and areas in that their

primary purpose is to minimize the risk of hazards for people and their property related to the protected area (e.g., flooding, erosion), rather than help protect the protected area from the anticipated impacts associated with the development and the people who will be living in it.

The terms of reference should identify if there are known natural hazards on the subject property and in the broader study area based on background information which is typically available from the GRCA terms of reference (and EIS) mapping should also identify the extent of the regulated areas in the study area, which typically extend from 15 m to 120 m from the feature limit.

Proposed development within or adjacent to a natural hazard land may result in the need for one or more of the following:

- staking requirements (e.g., top of bank) with the GRCA and City staff;
- additional technical studies such as flood mapping or modeling, geotechnical reports, slope stability analysis or fluvial/hydro geomorphological studies.

4.4.6 **Connectivity and ecological linkages**

The terms of reference should identify any existing ecological linkages, as identified in the City's Official Plan and applicable subwatershed studies. The terms of reference should also recommend, if deemed necessary, any special field work to assess the wildlife use of existing or potential ecological linkages. In particular, this may include specialized studies to detect wildlife movement (i.e. pit fall traps or infrared cameras).

4.4.7 **Evaluation of significance**

The terms of reference should identify that the evaluation of significance section of the EIS will:

- assess the various natural heritage features and areas against the appropriate policies and guidelines to determine significance;
- assess the various natural heritage features and areas against the appropriate policies and guidelines related to natural hazards; and
- assess the appropriateness of proposed buffers and / or setbacks.

4.5 Opportunities and constraints

The terms of reference should identify that a section including a discussion and analysis regarding opportunities and constraints will be included within the EIS.

4.6 Evaluation of alternative options/measures

The terms of reference should identify that a section including information pertaining to the evaluation of alternative options and measures will be included in the EIS. A discussion regarding mitigation measures (including avoidance, enhancement, restoration, compensation, outreach, education and stewardship) may also be included in this section.

4.7 Impact assessment

The terms of reference should state the intent of this section, identify the types of potential impacts to be considered and describe briefly how they will be assessed. The types of impacts that should be identified include: direct impacts; indirect impacts; induced impacts and cumulative impacts.

Site-based and feature-based water balances to demonstrate no negative impact to the natural heritage features and areas, and their functions, if required, should be identified as being needed in the terms of reference. Potential to cause changes to catchment areas, drainage/infiltration patterns, hydroperiod, flow regimes and other, should be considered when determining if a water balance is necessary in order to inform an impact assessment.

4.8 Monitoring

The terms of reference can confirm that monitoring will be considered and outline the types of considerations that will be applied in the development of monitoring recommendations.

4.9 Recommendations and conclusion

The terms of reference should indicate that recommendations, and related concluding statements are to be provided within the EIS. This should include indicating consideration for EIR recommendations, where applicable.

5 Components of an EIS

This section provides guidance related to the expected format, content and supporting field work to be completed as part of an EIS. For some topics, this guidance is supplemented by appendices that describe recommended methodologies and/or preferred options for undertaking field studies for certain types of field work.

The format of the EIS is expected to mirror the sections below, which are also included in appendix C (the EIS Submission checklist). The expected format of the report itself and associated maps is also provided in appendix C. The required sections, for which additional guidance is provided below.

Notably, not all of the sub-components described under Section 5.4 will necessarily be appropriate or required for every EIS, but this section identifies all the components that need to be considered. Ultimately, the approved terms of reference (see Section 4 of these guidelines) will dictate the scope of work required.

5.1 Introduction

The introduction section is intended to provide an overview of the development proposal, the subject property and the site context. The following should be described within the introduction:

- Subject property: A description of the subject property. This generally includes an overview of vegetation cover and known natural heritage features and areas, hard surfaces or any existing buildings/structures. In addition, historical context should be provided with particular focus on any past filling or grading activities, changes in vegetation cover and/or site contamination.
- Development proposal: In describing the development proposal, the proponent should detail the type and scale of proposed development along with details such as the proposed density and land uses. Related improvements to servicing, infrastructure and stormwater facilities (including infiltration galleries) expected to be required, as well as design features such as trails and/or public amenities being proposed should also be outlined.

- Trails: All development should be planned with consideration for trails, and in particular with the objective of providing trails to reflect the intent of the Guelph trail master plan and the Official Plan. Where trails are incorporated into the proposal, the EIS should include details such as the general alignment, the design standard and the timing of construction. Where trails are located between rear lot lines and protected natural features and areas, consideration should be given to balancing appropriate access and connectivity, and protecting the natural feature/area by, among other things, preventing encroachments into natural features and areas by providing clear delineation of boundaries.
- Site context and study area: A brief description of the subject property in relation to the surrounding landscape with respect to vegetation cover and known natural heritage features and areas in the adjacent lands, land uses and any existing buildings or associated infrastructure. This area is typically includes natural heritage features but may also vary based on a subwatershed study or other municipal studies/ equivalents.

Maps and/or other supporting visuals need to be included showing both the subject property and the broader study area. A current aerial photograph should be included in the introductory map showing information such as roads, lot lines, easements, existing buildings, drainage features, existing foot trails and known natural heritage features and areas including watercourses. Maps should be scaled to include the surrounding lands.

5.2 **Planning context**

The planning context for the development proposal must be established either within the Introduction (for simpler EIS), or in a standalone section following the Introduction (for more complex EIS). The planning context section must:

- Identify the current land use designations and zoning for the subject property and study area;
- identify the Planning Act applications required for the proposed development (e.g., Official Plan amendment, zoning by-law amendment, plan of subdivision);
- include maps of existing and proposed zoning and land uses, and;

- identify environmental legislation, regulations and policies that are applicable to the proposed development, including specific clauses that are relevant to the proposal.

The purpose of this section is to establish the planning framework, and particularly the environmental planning context, within which the EIS will be screened for compliance in the environmental policy analysis section at the end of the EIS. In the city of Guelph documents to be considered include, but are not limited to:

- City of Guelph Official Plan
- City of Guelph Zoning By-Law
- Provincial Policy Statement (2014)
- Natural Heritage Reference Manual (2010)
- Significant Wildlife Habitat Technical Guideline (2000) and Ecoregion 6E Criteria Schedules (MNRF 2015)
- Secondary Plans, if applicable
- Subwatershed Studies, if applicable
- GRCA policies and regulation, if applicable, and
- Federal and Provincial Species at Risk legislation, if applicable.

5.3 **Background review**

The Background Review section may be included within the characterization of the natural environment section (below), or may be a standalone section. Its primary purpose is to identify all the relevant sources of background information for various aspects of the natural environment (i.e., geology, soils, hydrology, hydrogeology, aquatic and fish habitat, terrestrial vegetation, including wetlands, wildlife and wildlife habitat).

Relevant background sources may include, but are not limited to:

- Current and historical air photos;
- watershed or subwatershed studies;
- secondary plans and supporting studies;
- EIS and / or EIR from adjacent lands;
- natural heritage and wildlife databases;

- data on file with the City, GRCA, MNR and / or department of fisheries and oceans (DFO) for the study area.

A number of on-line sources are also identified in appendix a, background resources.

Depending on the nature of the study area and the proposed development, it is also possible that additional technical studies will be required in addition to the EIS. Additional technical studies are typically required when development is proposed within or adjacent to natural heritage features and areas and/or natural hazard lands and may include geotechnical studies, hydrogeologic and hydrologic studies. The key findings from such studies will need to be integrated into the EIS, particularly as they relate to the natural environment. The background review should incorporate relevant information from other related studies.

In addition, professionals with expertise in other disciplines (e.g., surface water, hydrogeology, etc.) may be required to conduct analyses specifically related to mitigating anticipated impacts on the natural environment related to the proposed development. For example:

- A proposed development south of Clair Road that may impact the significant portions of the Paris Galt Moraine (i.e., significant landform as identified in the natural heritage system) will require the expertise of a professional geoscientist or a professional with equivalent expertise;
- a proposed development that may impact a significant wetland will require a pre-construction and post-construction feature-based water balance by a professional engineer or professional hydrogeologist.

5.4 Characterizing the natural environment (including field studies)

The purpose of the characterization section is to (a) describe the methods used to undertake the field studies, and (b) accurately identify and describe all known or candidate natural heritage features and areas on the subject property and, to the extent possible, within the broader study area. This characterization should be based on a synthesis of information/data collected through the background review and field assessments. The field assessment protocols/methods should also be

included in the EIS. Feature boundaries should be confirmed in the field and surveyed by an OLS certified surveyor.

Additional technical guidance related to aquatic, vegetation and wildlife survey protocols is provided in appendix D, appendix E and appendix G respectively.

5.4.1 **Geology and soils**

Based on the terms of reference and background review a description of the surficial and bedrock geology and soils within the study area should be included within the EIS. This description should include information on the physiographic region and recognize, as applicable, areas identified as significant valleylands or significant landform in the City's Official Plan. Findings from any other related studies (i.e. geotechnical) should also be referred to/included.

As part of the EIS, a more detailed assessment of the soils on the subject property may be undertaken based on the scope of the terms of reference. The findings should include a characterization in terms of its composition and drainage properties, with particular attention to the identification of any organic or sandy soils.

Mapping should be included to show the site-specific surficial and bedrock geology, as well as the soil types within the study area. Notable attributes with respect to landforms should be discussed when characterizing the feature(s).

5.4.2 **Significant landform**

With respect to significant landform characterization, details will relate to the applicable attributes of the Paris Galt Moraine including the hummocky topography. This portion of the EIS will:

- Be completed by a professional geoscientist, or professional with comparable expertise to confirm feature boundaries*;*
- identify whether the EIS will be exploring/considering alternate areas of significant landform and establish the scope of the studies necessary, following the significant landform policies of the Official Plan;
- include feature boundaries that were confirmed and surveyed in the field;

- consider and characterize hydrological functions attributed to/associated with significant landform.

When reviewing, and potentially refining or altering the boundaries of significant landform, this analysis should also address the visual representation of earth science elements in relation to the moraine features that comprise the area of significant landform being examined. The identification of moraine elements and consideration of amending the boundaries of lands for protection should consider:

- for upland feature boundaries (e.g. hill tops and steep slope ridges), incorporation of adjacent lowland areas in order to define, identify and incorporate the full visual range of the "positive" elements of the feature;
- lowland feature boundaries (e.g., closed depressions and kettle areas). Incorporate adjacent upland features that enclose the lowland feature may warrant incorporation into boundaries in order to better define the negative of the feature elements.

The intent of this analysis is to ensure that the areas contained within the feature boundaries are an appropriate representation of upland or lowland features and include sufficient context to ensure that they will continue to be recognisable as earth science elements that contribute to the broader physiographic feature that is the Paris Galt Moraine.

5.4.3 **Hydrology and hydrogeology**

The EIS should characterize known surface water and groundwater features in the study area. Although the EIS will not necessarily need to incorporate all findings from a site-specific hydrologic or hydrogeologic study, it at a minimum should include a review or summary of the available hydrologic and hydrogeologic information based on existing background information and outline any key site specific findings based on investigations.

Hydrogeolocial studies are to include the following, as applicable, and findings should be summarized and incorporated into the EIS:

- quaternary and bedrock geology;

- physiographic region and the physiographic features of the study area (site) (a map should be provided of the study area with overlay of physiographic features) and should note/highlight key geological, geomorphological and topographic features for the study area and subject lands (including spatial extent);
- the geological stratigraphic framework for the subject lands should be described in text;
- soil materials, including thicknesses, composition, texture and infiltration capacity. This can appear on boring logs or test pit logs within the hydrologeological report and/or geotechnical report and be integrated with the EIS characterization and analysis;
- hydrogeological conditions preferably for all four seasons (winter, spring, summer and fall), depth to ground water table, groundwater flow directions and gradients, connections to ground water features with consideration to critical times of year related to ecological functions (e.g. for breeding/spawning, thermal refugia, etc.);
- a site specific conceptual hydrogeological model should also be developed based on the best available, published, geological and hydrogeological mapping, supplemented with site-specific hydrogeological information collected (maps should be provided in the EIS and the supporting hydrogeolocial report for the study site and include overlays of surficial geology and bedrock geology);
- surface and groundwater features onsite, within adjacent lands and in the surrounding area, including areas of high water table, water quantity and quality;
- recharge and discharge zones, including seepage areas and springs;
- existing catchment areas, drainage patterns, watercourses and drainage basin boundaries;
- natural hazards (i.e., floodplains and erosion) (including mapping of these natural hazards).
- existing flows (quantity and quality) into and out of the natural features and areas, including rivers, creeks, lakes, ponds, springs, seeps and headwater features;

- hydrogeological features of local aquitards and aquifers (confined, semi-confined and unconfined), including:
  - key features (confined, semi-confined, unconfined);
  - depths;
  - thicknesses;
  - lateral continuity across the study area;
  - vertical hydraulic gradients (where data is available);
  - hydraulic conductivity (either measured or assumed, but assumptions must be stated);
  - Groundwater level trends (1 full year of monitoring) displayed on hydrographs for each monitoring well within the study area;
- Groundwater flow direction (map or text, either is sufficient);
- Groundwater quality results (if available; displayed in a table is sufficient as long as exceedances are noted in the text of the report. If site specific parameters/standards are not being applied, a comparison to Provincial Water Quality Objectives should be completed as a minimum standard);
- Identify surface water features and natural heritage areas in relation to the study area (map should be provided of the study area with overlay of NHS);
- Identify groundwater flux to any surface water or natural heritage features on site;
- Identify Certificates of Property Use (CPU) on title (if applicable);
- Map and/or text that describes Source Water Protection Areas (i.e. WHPAs, IPZs, ICAs) the study area lies within.

If applicable, references to volume control or infiltration targets made in watershed or subwatershed studies should also be included. Alternately, infiltration targets may need to be established for the entire site through the hydrogeological analyses. Identification of this in regards to scope should be established at the EIS TOR stage.

Site-based and feature-based water balances may be required as part of the EIS to help demonstrate no negative impacts to certain natural heritage features and areas, or their functions. Changes to catchment areas, drainage/infiltration

patterns, hydroperiod, flow regimes, etc. should be considered when determining if a water balance is needed. When developing feature-based water balances, consideration should be given to the natural seasonal fluctuations in the amounts of water flowing into a feature, and the period(s) of time which it remains in that system. Prior to undertaking a water balance, the Water Budget Reference Manual (2013) as updated on occasion, prepared for MNRF, should be reviewed. This manual specifically discusses water management rationale and methodologies for water budget analyses.

5.4.4 **Aquatic and fish habitat**

The EIS should characterize the aquatic and fish habitat on the subject property and, relying primarily on background information in the broader study area, include confirming the thermal regime of any known or potential fish habitat. Fish habitat assessments, if required, and benthic invertebrate assessments, should be conducted on surface water features that may directly support fish use, as well as those that contribute indirectly to downstream fish habitat. The scope of fisheries assessment should be established in the EIS TOR.

This fish habitat assessment should include information about the surface water feature(s) and the contributing vegetation, such as:

- flow description (source of flow, seasonality, permanent or intermittent, low flow conditions);
- channel characterization (i.e., width, depth, morphology, substrate, bank stability);
- water quality, including results of benthic invertebrate surveys, as applicable;
- riparian habitat description (e.g., naturalized or anthropogenic, species composition);
- in-stream vegetation and other cover elements (e.g., woody debris, undercut banks, boulders);
- aquatic connections and barriers to aquatic connectivity (e.g., upstream and downstream culverts, fish passages, drainage features, dams, weirs, etc.);and
- fish community/species, including aquatic SAR.

More information on completing aquatic surveys, fish surveys and fish habitat assessments, and benthic invertebrate assessments is provided in appendix E.

Typically, permits are required from MNRF prior to undertaking fish community surveys (i.e., scientific collector's permits). It is the proponent's responsibility to obtain any required permits prior to undertaking fisheries field studies, if required.

5.4.5 Terrestrial vegetation (including wetlands)

Vegetation communities: ecological land classification (ELC)

As part of the City's natural heritage strategy, vegetation across the City was classified to community level using the ELC (Lee et. Al, 1998) system based on 2008 air photos and supplemented with targeted field assessments in some areas. This classification should be refined to ecosite or vegetation type and updated, as required, through field assessments as part of the preparation of the EIS.

More detailed ELC assessments (as described in appendix F) will assist in the assessments of significant woodlands, significant wetlands, habitat of endangered and threatened species, significant wildlife habitat, cultural woodlands, other wetlands, and habitat of significant species (as defined in the City's Official Plan). The scope of proposed terrestrial studies, including ELC, should be established in the EIS TOR.

The results and details of these assessments, including any feature stakings that took place, need to be provided in the EIS (e.g., a description of the dominant species and vegetative structure of each ELC ecosite or vegetation type) and illustrated in a map. Any ELC vegetation types that are considered provincially significant by NHIC should also be noted.

Wetlands

With respect to wetlands, the Provincially Significant Wetlands (PSW) mapping in the Official Plan has been adopted from available MNRF data, while the mapping for Locally Significant Wetlands and Other Wetlands has been adopted from the ELC work done over 2006 and 2008 as part of the City's Natural Heritage Strategy. In some cases, the wetland mapping has been updated (e.g., as the result of a wetland evaluation, or more site-specific studies being completed subsequently),

but in some areas it has not. Therefore, in order for the study area to obtain the most current PSW boundaries, the proponent should access the digital wetland layer by searching for the "Wetland" dataset available through Land Information Ontario (LIO). The LIO website provides instructions on how to request/obtain data and a full listing of data in the Warehouse.

GRCA wetland mapping/regulatory mapping is also available through the GRCA and can be accessed through their website.

The results and details of these assessments, including any feature stakings that took place, need to be provided in the EIS (e.g., description of the wetland communities, a summary of the results of any wetland evaluations or assessments) and illustrated on a map.

Plants (Botanical Assessments)

As part of an EIS, plant surveys are typically completed in conjunction with the ELC assessments, recording the relative abundance of each species and documenting the locations (with a GPS unit) of significant species and/or plant populations. Surveys should be timed, to the greatest extent possible, to visit the site during the time(s) of year when the target plants are easiest to identify. This varies depending on the species group and habitat type (see appendix F).

The EIS should include details about the methods used to complete the plant surveys, including the survey dates and scope of surveys undertaken, including any adjustments to the study scope established in the EIS TOR.

The plant or botanical assessments should be used to generate a list of all identified plants with details on the species' current status at the global, federal, provincial and local levels and whether it was observed as part of the current field studies or reported by a previous study. Significant species should also be linked to the ELC polygon in which they were found in a table and on a map. The results of the botanical assessments are to be summarized in an annotated checklist included in the EIS as a table within the report or as an appendix, a sample format for a summary table is provided in appendix E, table E-4.

For Butternut, which is a federally and provincially endangered tree that occurs in the City of Guelph, the Province has established a specific process for assessment of these trees in cases where they may be impacted by development. It is the proponent's responsibility to ensure that should such species be identified on the subject property, the appropriate assessments are undertaken and permits (if required) are obtained from MOECP.

Trees

As part of the EIS, an inventory and assessment of the trees (of at least 10 cm diameter at breast height (DBH) on the subject property should also be undertaken to address the City's private tree protection by-law. Guidance related to tree inventory, preservation and compensation plans is provided through the City's tree technical manual.

5.4.6 Wildlife and wildlife habitat

As part of an EIS, wildlife assessments are typically required in order to determine presence or absence of provincially endangered and/or threatened species and their habitat, as well as significant wildlife habitat. In the City of Guelph, proponents must also determine presence or absence of habitat for significant species which are not captured by either of the other categories listed above.

Table 5. Using a significant wildlife habitat summary table

Significant wildlife habitat type	SWH present?	Rationale (habitat presence or absence)	Findings of field studies completed
Deer winter congregation areas (as identified by MNR)	Yes	Deer winter congregation area identified by MNR	Yes, winter deer browse surveys proposed see methodology
Waterfowl stopover and staging: aquatic	No	No wetland communities found within study area	No

As part of the EIS, wildlife surveys should be completed (as per the approved terms of reference), and results should be summarized in both text and tabular format. Appendix D and F also include examples of tables (wildlife habitat, plant list, etc.) to assist with organizing and analysing data. Typically tables or lists highlighting

significant species records are included in the EIS (with applicable current species statuses at the global, federal, provincial and local levels), and a complete table of all species identified on the subject property and broader study area (either through field studies and/or background review) is included in the report appendices. Methods used, including a summary of survey dates and protocols used, should also be included in this section of the EIS.

While mapping of the confirmed locations of significant species and/or habitats is desirable for transparency and to facilitate decision-making, there needs to be consideration for the Province's data sensitivity policies which prohibit making the locations of certain SAR public. The EIS should also respect these considerations.

The table in appendix D divides the types of Significant Wildlife Habitat into five categories based on MNRF's significant wildlife habitat technical guide as follows:

1. Seasonal concentration areas;
2. Rare vegetation communities;
3. Specialized habitats for wildlife;
4. Wildlife movement corridors (including ecological linkages); and
5. Habitats for species of conservation concern.

The EIS should discuss the various types of significant wildlife habitat according to these categories and should also consider the local or regional context (where applicable).

In many instances to support the identification of significant wildlife habitat, habitats will need to be classified using ELC to a vegetation type. In combination with the criteria and technical guidance available from MNRF, ELC information should also be used to assist in determining significant wildlife habitat.

The significant wildlife habitat screening table (as provided in appendix D), should be updated in the EIS and used as a summary table to report on the results of field studies.

Although MNRF provides technical guidance related to significant wildlife habitat, and also identifies some types of significant wildlife habitat (e.g., winter concentration areas) the confirmation or designation of significant wildlife habitat is

ultimately under the jurisdiction of the local municipal planning authority. It is, however, the proponent's responsibility to through the EIS process to identify and evaluate for any areas of significant wildlife habitat either (a) identified by MNRF, or (b) that qualify as candidate significant wildlife habitat based on the available technical guidance.

Where a known (as identified by MNRF or previously through studies for the City) or candidate significant wildlife habitat is identified, this analysis should then inform the identification of opportunities and constraints, as described below. Permits are required from MOECP or MNRF for some types of specialized field work that may impact certain SAR (e.g., amphibian trapping) or species listed under the fish and wildlife conservation act, 1997. It is the proponent's responsibility to secure any required permits with MOECP or MNRF directly.

Similar to summarizing and categorizing significant wildlife habitat, the same type of analysis should also be provided for habitats for significant species based on the City's locally significant species list. This list is included in appendix H. A summary table is also encouraged to assist with this analysis.

5.4.7 **Natural hazards**

The EIS analysis needs to address any applicable Official Plan policies and the conservation authorities act, 1997 as they relate to Natural Hazards, including floodplain and special policy areas. Known hazard lands are identified in the City's Official Plan.

Where this results in the need for field work and/or studies, the EIS will incorporate the information and illustrated on a map where appropriate.

GRCA permits and approvals should be pursued by the proponent directly with the GRCA.

5.4.8 **Connectivity and ecological linkages**

Although an EIS is a site-specific study, it is important that local and regional scale connectivity (ecological linkages) and landscape functions are considered through the EIS process to ensure maintenance of the natural heritage system within the

City, and of the protected natural heritage features and areas in the surrounding County.

Ecological linkages, as defined in the City's Official Plan, means "areas identified based on the principles of conservation biology that connect significant natural areas and/or protected habitat for significant species and along which wildlife can forage, genetic interchange can occur, and populations can move from one habitat to another in response to life cycle requirements. Ecological linkages provide or enhance connectivity where it is otherwise lacking, ensuring a systems based approach…. ecological linkages can also include those areas currently performing, or with the potential to perform linkage functions through restoration measures. Although linkages help to maintain and improve the natural heritage system and related ecological functions, they can also serve as habitat in their own right". The location of identified ecological linkages may be modified, or width refined, in accordance with the Official Plan policies through the EIS process. As per these policies, additional ecological linkages may also be identified through site-specific studies undertaken as part of the EIS process.

Based on the results of the wildlife habitat assessments, the EIS should recognize existing ecological linkages and corridors, and their associated functions, and, if appropriate, recommend additional ecological linkage areas that would support the connectivity of the NHS. The EIS may also recommend modifications to the location, and refinements to the width of identified ecological linkages based on the findings of feature specific assessments. Ecological linkages and connections should be confirmed through the EIS building from the assessments of all the other natural features and areas, and their ecological functions, have been completed. Key considerations should include the scale at which the linkage is intended to function, the nature of adjacent land use(s), and the significance, sensitivity and ecological requirements of the species whose movements the linkage is intended to support.

Where ecological linkages are located such that wildlife will need to cross a road, these areas should also be identified as wildlife crossings in accordance with the wildlife crossing policies from the Official Plan. Mitigation measures should be considered within the EIS to minimize the impacts to wildlife, property damage and

human-wildlife conflict, and be implemented through the proposed development (where applicable).

5.5 Evaluation of significance

The evaluation of significance is the step whereby all identified natural heritage features and areas, and associated ecological functions (in the study area, and particularly on the subject property) are assessed against the in effect and applicable policies to confirm whether or not they are considered significant in the City of Guelph. An overview of the applicable source of policies or guidelines and the lead agency responsible for implementation is provided in Table 3.

Table 6. Summary of sources of criteria to determine significance and approval authorities for significant natural areas

Natural heritage features and areas	Source of criteria for significance	Lead agency
Significant areas of natural and scientific interest (ANSI)	PPS and City of Guelph Official Plan	MNRF (ANSI evaluation and boundaries) City of Guelph (no negative impact)
Significant habitat of Endangered and Threatened Species	Endangered Species Act	MNRF
Significant Wetlands (Provincially and Locally Significant)	PPS, Conservation Authorities Act, City of Guelph Official Plan	MNRF (OWES evaluation and complex boundaries) GRCA (boundaries, 0. Reg 150/06) City of Guelph (no negative impacts)
Surface Water and Fish Habitat (cool, cold and warm water)	City of Guelph Official Plan and Fisheries Act	City of Guelph and/or DFO[1]
Significant Woodlands	City of Guelph Official Plan	City of Guelph
Significant Valleylands	City of Guelph Official Plan	City of Guelph[1]
Significant Landform	City of Guelph Official Plan	City of Guelph
Significant Wildlife Habitat (including ecological linkages)	City of Guelph Official Plan	City of Guelph
Restoration Areas	City of Guelph Official Plan	City of Guelph

Table 7. Summary of sources of criteria to determine significance and approval authorities for Natural Areas

Natural heritage features and areas	Source of Criteria for Significance	Lead Agency
Other Wetlands	City of Guelph Official Plan	MNRF (OWES evaluation and complex boundaries) GRCA (boundaries, 0. Reg 150/06)

Natural heritage features and areas	Source of Criteria for Significance	Lead Agency
		City of Guelph (no negative impacts)
Cultural Woodlands	City of Guelph Official Plan	City of Guelph
Habitat for Significant Species	City of Guelph Official Plan	City of Guelph

The EIS should include a discussion of each natural heritage feature and area on the subject property and how it does, or does not, meet the established criteria for significance. In all cases, the most current applicable policies and guidelines should be applied. Depending on the number of features and/or areas under consideration, a summary table may be useful.

5.5.1 Environmental policy analysis

The purpose of the environmental policy analysis section is to ensure that the EIS, including recommended mitigation and monitoring measures, complies with all the applicable environmental policies and legislation, as identified in the planning context section. These policies and legislation include:

- City of Guelph Official Plan (current consolidation);
- City of Guelph zoning by-law;
- Provincial policy statement;
- Secondary plans, if applicable;
- Subwatershed studies, if applicable;
- GRCA policies and regulations, if applicable; and
- Federal and provincial species at risk and/or any other applicable legislation.

This analysis is encouraged to be presented in a table format.

5.5.2 Habitat of endangered and threatened species

Under the Provincial endangered species act, 2007, it is illegal to kill, harm or harass an endangered or threatened species, or to damage or destroy its habitat, except where otherwise exempted, regulated or permitted. It is the responsibility of the proponent to ensure due diligence in order to meet the requirements under the endangered species act, 2007. Questions or points of clarification regarding the endangered species act, 2007 should be directed to MOECP.

Should endangered and/or threatened species and/or their habitats be identified within or adjacent to the development proposal, the City will work with the proponent and MNRF to address and implement requirements under the endangered species act, 2007 *and the* PPS, 2014.

5.6 Opportunities and constraints

The purpose of the opportunities and constraints analysis is to:

- Identify all of the constraints to potential development related to natural heritage features and areas identified for protection, as well as natural hazards, including their respective buffers and setbacks;
- identify opportunities for development on the subject property that work within the limitations of the site specific constraints; and
- identify opportunities for restoration, enhancement and/or stewardship opportunities.

An opportunities and constraints analysis should, ideally, be completed prior to, or at least in conjunction with, the refinement/finalizing of the (draft) development concept plan and included within the EIS. This allows for the exploration of design options that try, to the greatest extent possible, to avoid negative environmental impacts and to identify opportunities to mitigate unavoidable impacts (e.g., through naturalization, habitat restoration, the identification of enhanced or new ecological linkages, etc.) as well as restore or enhance any existing conditions. A comprehensive exploration of opportunities for mitigation is best done with consideration for the proposed concept plan, and exploration of alternatives, as described in the impact assessment and evaluation of alternatives sections below.

Constraints will include all of the natural heritage features and areas identified as significant and/or for protection through the evaluation of significance analysis (described in the section above), plus any applicable buffers, as well any natural hazard features and their associated setbacks as applicable. Key considerations, where applicable, should include:

- Significant natural areas and any associated minimum and/or established buffers, including ecological linkages;

- Natural areas to be protected (if any) and any associated established buffers, and / or natural areas proposed for removal;
- identification of areas of alternate significant landform;
- meander belts for watercourses and setbacks for bank erosion;
- natural hazards and any associated setbacks; and
- fish habitat types (i.e., cold, cool or warm water) and associated buffers, as well as fisheries management zones, if applicable;
- sensitive and/or vulnerable ground water features (e.g. recharge/discharge areas).

The City's Official Plan identifies minimum buffers for some components of the NHS (e.g., significant woodlands, significant wetlands, fish habitat), leaves buffer determination entirely to the discretion of the site-specific environmental study for other components of the NHS (e.g., significant wildlife habitat), and for some components of the NHS does not require a buffer (e.g., ecological linkages, significant landform). The opportunities and constraints analysis is where final buffers should be established (called "established buffers" in the Official Plan) and rationalized for various components of the NHS, as appropriate.

These established buffers should incorporate the minimum buffers (where applicable) and determine an appropriate buffer to protect the natural heritage feature and area from anticipated site-specific impacts associated with the proposed development. Key considerations related to buffer determination should include: natural heritage feature/area sensitivities to development, site-specific biophysical factors (e.g., soils, drainage patterns, slopes, etc.), and proposed adjacent land uses.

Setbacks to natural hazards should be determined with consideration for GRCA's applicable policies, and in consultation with GRCA.

The EIS should include a map delineating the constraints and opportunities at the site-specific scale, including natural heritage feature and area boundaries, as well as their associated buffers, natural hazard boundaries, and their associated setbacks. This should allow for the identification of a consolidated constraint line, which should generally be used to establish the development limit. Notably, there

may be some components associated with development (e.g., stormwater management ponds, trails) that may be permitted in the portions of the buffers and/or setbacks to some features. This should be analysed through the impact assessment prior to finalizing the development proposal.

5.7 Impact assessment

Impact assessment is a formal process used to predict the environmental consequences (positive or negative) of a plan or project prior to its implementation in order to inform decision making. The primary purpose of the impact assessment section is to list and describe all potential and/or anticipated impacts to the protected natural heritage features and areas, and their ecological functions, in the study area related to the proposed development, and consider mitigation options. Generally, a table or matrix is helpful for summarizing each natural heritage feature and area being considered:

- the significant characteristics and functions of that feature/area,
- the anticipated impacts to that feature/function (if any), and
- the mitigation options to avoid, minimize or compensate for these impacts.

As noted in the introduction, avoidance is always the preferred option, followed by minimizing impacts. Compensation will not be an option in most cases. For example, the City's policies do not permit removal and replacement of significant wetlands or significant woodlands. In those situation where it may be an option it should only be considered where neither avoiding nor minimizing impacts are feasible options.

5.7.1 EIS Considerations when assessing impacts

In the EIS, the impact assessment section should start by including a detailed description of the proposed development as it relates to elements of the development that may impact the natural heritage features and areas identified for protection, and/or their ecological functions. These elements generally include:

- The number and types of buildings and the location and size of associated parking areas, with specific mention of basements and/or underground parking being proposed in areas where there is a shallow groundwater table;

- grading – i.e. anticipated fill (amount, depth, and ultimate slope of the fill), include a grading/fill map/drawing for fill placement, and whether a City site alteration permit and/or GRCA permit is required;
- stormwater management (e.g., including the number, size and type of proposed facilities and/or measures, including low impact development measures);
- servicing, particularly servicing to be located within or adjacent to natural heritage features and/or areas identified for protection;
- trails and/or trail connections; and
- post-development use of the lands (e.g., increased use by people and pets);
- lighting and noise.

5.7.2 **Considering impacts to natural heritage features and areas**

In general, the impact assessment should consider potential impacts of the proposed development to the significant natural heritage features and/or areas on the subject property as well as within the broader study area, and their ecological functions, including linkages/connections between them and to hydrologic and hydrogeologic resources in the study area. The impact assessment section of an EIS must identify all stressors, threats and other potential impacts of a development proposal on the natural features and areas in the study area, and particularly on the subject property, as well as their ecological functions. Discipline-specific guidance related to impact assessment is provided below.

- Geology and soils: Specific attention should be paid to sites characterized by shallow soils over bedrock, karst, significant landform, and/or steep slopes, and potential impacts to those features.
- Hydrology and hydrogeology: The impact analysis on hydrology and hydrogeology will need to be integrated between the stormwater report, geotechnical report, hydrogeological report and the EIS. This integration is to address the following as applicable:
    - impacts to existing groundwater users, including:
    - identification of existing users (map should be provided of locations)
    - MECP water well records and their designated uses within the study area (map should be provided of the study area with all WWRs identified);

    - identification of existing groundwater uses within the study area (site). This can be ascertained via the "designated use" within the MECP water well database;
    - potential for interference with other existing water users, including the City's municipal drinking water wells (text supported by a map for complex sites is encouraged)
- impacts to surface water and natural functions of the ecosystem, including but not limited to:
    - an analysis of anticipated changes to site infiltration, surface water features, and/or surface water drainage and/or groundwater inputs to other natural heritage features or areas in the study area. For example, any alterations to watercourses such as channel realignments, dredging or culvert works must be identified.
    - results of site-based and feature-based water balances (if required)
    - reductions or increases to stream baseflow;
    - effects on aquatic habitats;
    - effects on terrestrial resources (natural heritage features);
    - stability of geotechnically sensitive soils such as clays or peats
- If a water balance was completed, the EIS should identify any anticipated changes to groundwater infiltration and/or recharge, and any expected impacts to natural heritage features. The analysis should also take into consideration the changes in water quantity and quality, as well as the associated effects on natural heritage features and functions on the subject property and surrounding lands.
- Aquatic and fish habitats: Potential impacts to any type of fish habitat (i.e., direct or indirect) need to be considered though the EIS. Particular attention should be given to cold or cool water fish habitat, and any aquatic SAR in the area. Changes in fluvial geomorphology such as increase in baseflow, runoff, increase in peak flows, erosion and downcutting of streams are examples that may be considered. Potential impacts to aquatic habitat that are not considered fish habitat should also be considered.

- Terrestrial vegetation: Potential impacts to the natural heritage features and areas should be identified in the EIS. Potential impacts to vegetation communities and significant plant species should be discussed separately. Anticipated impacts to trees (of at least 10 cmDBH) outside the protected natural heritage features and areas should also be addressed in this section in relation to urban forest implications.
- Wildlife and wildlife habitat: potential impacts to wildlife should be described relative to the type of wildlife or wildlife habitat (i.e., birds, amphibians, reptiles, mammals, etc.). Categories of wildlife habitat types that align with those in the significant wildlife habitat table should be used where appropriate, and similar groups may also be used for habitats for significant species.
- Natural hazards: Any potential impacts to natural hazard lands related to the proposed development should be identified, along with mitigation options that are supported by input and/or other reports completed by the appropriate technical expert(s). For example, references to findings of geotechnical studies, hydrogeological studies, flood modelling, erosion analysis, etc. may be appropriate.
- Ecological linkages and connectivity: maintaining and enhancing connectivity within and among protected natural heritage features and areas can be challenging in developed and particularly urban areas. Any potential impacts to identified or recommended, ecological linkages in the City should be identified and options to mitigate those impacts should be discussed.

Impact assessment should include consideration of: direct impacts, indirect impacts, induced impacts and cumulative impacts, as described below.

Impact assessments should consider the magnitude, frequency, timing and duration of potential impacts relative to the sensitivity of natural heritage features and areas, in the following contexts.

5.7.3 **Direct impacts**

Direct impacts are generally defined as those that are directly related to the proposed development plan. These include impacts usually associated with (a) the layout of the proposed development as well as (b) the construction activities

associated with implementation of the proposed development. Options for mitigating these impacts may include (a) exploring alternative layouts and (b) managing construction practices.

The full range of potential impact types should be described and quantified (to the extent feasible) in relation to the potentially affected natural heritage features and areas (and their associated buffers) and /or natural hazards (and their associated setbacks).

5.7.4 **Indirect impacts**

Indirect impacts may be caused by altered uses and activities on the subject property after construction has been completed. For example, changes in site conditions may have an effect on drainage patterns which, over time, may negatively impact a natural heritage feature and area previously relying on those water inputs to sustain itself. Another example would be the introduction of residential lots abutting a protected woodland which may result in encroachments to that woodland edge (e.g., dumping of yard waste) as well impacts to the hydrologic functions of the woodland. Options for mitigating encroachment may include ensuring there is some type of barrier between the rear lot lines and adjacent woodland (e.g., a buffer, a trail, a combination of both). Mitigating impacts to hydrological functions may include re-directing adequate quantities of clean runoff to that feature to maintain existing water balances.

5.7.5 **Induced impacts**

Induced environmental impacts are a type of indirect impact that are generally the consequence of changes in human behaviours in response to the new development. For example, induced impacts may occur due to increased pedestrian and recreational uses of a protected natural area after construction has been completed because it is now more accessible. In particular, the creation of informal trails and the introduction of domesticated animals may both cause disturbances to wildlife and natural heritage features and areas.

5.7.6 **Cumulative impacts**

Cumulative environmental impacts are the result of incremental impacts of multiple or successive developments. For example, cumulative impacts may occur due to incremental loss of a specific habitat type resulting in the lack of needed habitat variability for ecological functions to persist. An example is when upland meadow habitat (foraging habitat) is adjacent to wetland habitat (breeding habitat) and is incrementally proposed for development resulting in the loss of foraging habitat function. To evaluate cumulative impacts, direction from subwatershed studies must be used in conjunction with knowledge of past planning approvals, present application under review and potential future scenarios.

5.8 **Evaluation of alternative options**

This step involves consideration of the different mitigation options in relation to the identified potential impacts (as described in Section 5.7).

- For example, a road is needed within the proposed development to connect the community to a main arterial; however, the proposed road alignment runs through an ecological linkage intended, among other things, to provide a pathway for amphibian migration in the spring and fall. Options that could be considered include: (a) moving the road so that it does not intersect with the linkage at all, (b) shifting the alignment of the road so that it runs parallel to the linkage, or (c) incorporating specialized amphibian movement culverts into the road.

The alternatives considered should:

- be restricted to what is feasible;
- seek to avoid impacts first, then minimize and, if neither avoidance nor minimizing are feasible, seek to compensate (if it is an option); and
- be undertaken as an iterative process with the planners and other experts on the team to try and achieve a recommended plan that best achieves protection/maintenance of the NHS and still fulfills the various planning, design and servicing requirements associated with the proposed development.

The consideration of alternative options may be combined with the following section that identifies and describes recommended mitigation measures.

5.9 **Recommended mitigation measures**

As stated in the introductions, "mitigation," as it relates to natural heritage conservation, is defined as a three step process as follows: (1) avoid, (2) minimize, and (3) compensate. In this process, avoiding impacts is always the preferred option, followed by minimizing impacts. Compensation for unavoidable impacts may not be an option for some features or functions, and where it is permitted should only be explored when all options for avoiding and minimizing have been carefully considered and deemed not feasible.

The EIS should identify a suite of recommended mitigation measures that:

- address all of the potential impacts identified to protected natural heritage features and areas, and their functions, as part of the impact assessment;
- are appropriate for the site based on the characterization of the natural environment;
- are compliant with the applicable environmental legislation; policies, and guidelines;
- are based on known best practices and/or established technologies; and
- include consideration for enhancements within degraded natural areas, naturalization and/or restoration adjacent to other protected natural features and areas, and opportunities for enhancing the urban forest and integrating low impact development design measures outside the NHS.

The approximate timing, duration and location of the recommended mitigation measures should be provided in the EIS, and may be further refined in an environmental implementation report. The mitigation measures presented in the EIS should tie back to the impact analysis section to provide a complete picture of what can be mitigated and what can not.

Mitigation measures in response to direct and indirect impacts that should be considered include, but are not limited to, the following construction practices:

- Sediment and erosion controls, including adequate measures around wetlands and watercourses;
- minimizing risk through phasing of the development;
- location of fill piles, construction access, machinery storage and temporary access routes outside of natural heritage features and areas, and their buffers;
- temporary dewatering during grading and construction;
- installation and maintenance of tree protection fencing and signage;
- ensuring timing windows for in-water works and/or vegetation removal respect requirements associated with provincial or federal legislation;
- integration of measures to try and get pre-construction infiltration to approximate post-construction infiltration (e.g., low impact development measures);
- implementation of appropriate buffers
- implementation of appropriate setback distances from the crest of steep slopes, and
- installation of wildlife culverts or passages, where appropriate.

Mitigation should also include consideration of enhancement, naturalization and restoration opportunities to improve natural heritage features and areas, and their ecological functions. Considerations should include:

- natural heritage features and areas suitable for enhancement, including buffers (e.g., invasive species removal and replacement with appropriate native plants);
- creation of wetlands, forests, meadows or vegetated riparian zones (e.g., within buffers);
- enhancements to, or the creation of new, ecological linkages; and
- naturalization and/or tree planting in areas on the subject property outside the NHS (e.g., naturalized storm water management facilities).

A compensation plan may be required to offset residual impacts such as tree removal required as part of the proposed development, and may consist of vegetation and/or tree replacement planting plans. The plan(s), if required, should provide details on recommended plant species, caliper, soil volumes and planting locations. Compensation plans are generally done in conjunction with tree inventory

and preservation plans. Details on their preparation are provided in the City's Tree Technical Manual.

Another category of mitigation that is often recommended in response to indirect and induced impacts associated with proposed developments in urban areas is fostering stewardship through outreach, education and engagement. The EIS should identify opportunities to promote environmental stewardship that is appropriate for the proposal. Details for these materials will be determined at the EIR stage. Potential opportunities may include promotion of the City's environmental stewardship webpages and educational signage that focuses on site-specific management issues within adjacent portions of the natural heritage system (e.g. highlights of local natural heritage, existing impacts, prevention of impacts, and stewardship opportunities)

5.10 **Monitoring plan**

Monitoring is a critical piece of the impact assessment process because it allows, at least for some parameters, to verify if the recommended mitigation measures (a) have been implemented and (b) are effectively to be mitigating the anticipated impacts. Monitoring can also identify if new, unanticipated issues have emerged during or following construction.

Environmental monitoring can be divided into three types (i.e., compliance, performance and effectiveness) described below.

- Compliance monitoring is done to ensure that the development has implemented the mitigation measures according to the approved recommendations, plans and specifications. This is typically completed during construction to ensure that natural heritage features and areas, as well as trees/vegetation outside the NHS, identified for protection are protected from sudden damage and degradation. Examples include inspections prior to and during construction to verify if: the right types of silt fencing have been correctly installed and maintained, the correct tree protection measures have been implemented and are being maintained, the proper tree species have been planted in the correct places, etc. A range of compliance monitoring measures that compliment recommended mitigation measures should be identified in the EIS.

- Performance monitoring is medium to long-term monitoring that occurs post-construction to ensure that the implemented mitigation measures are performing as intended. This type of monitoring can be more complex as it requires comprehensive baseline data (for comparative pre-development reference), and may not be possible to link causality to site-specific mitigation measures or even be verified on a site-specific scale. With low impact development measures integrated within private lots, access may also be an issue for monitoring. Nonetheless, targeted site-specific monitoring for parameters that can be measured and linked to site-specific changes should be recommended through the EIS. Examples include:
    - monitoring of protected wetland hydrology to see if the water quantity, quality and timing of hydroperiods is comparable to what it was pre-development;
    - monitoring of encroachments into the protected Significant natural area from adjacent residential lots to see if fencing and/or buffers have been effective at limiting or preventing encroachments;
    - monitoring protected natural heritage features and areas for any changes to their size, shape, species diversity and connectivity to the NHS;
    - monitoring the fish community, benthic macroinvertebrate community and water temperature of a protected watercourse to see if it is comparable to what it was pre-development;
    - monitoring that pre-development ground water quality and quantity are maintained under post-development conditions.

In addition, where an innovative but emerging solution has been proposed, monitoring should be done to evaluate a mitigation measure's effectiveness and to inform the City of its use in other applications.

- Effectiveness monitoring is used to bring all monitoring components assessed into a comprehensive monitoring plan so that it can be used to assess and confirm impact predictions, inform adaptive management on the site, if needed, as well as other mitigation measures recommended elsewhere in the City. This should assess the overall effectiveness of recommended mitigation measures,

identify any unexpected negative impacts, and identify possible adaptive management tools.

The monitoring plan should include details on the timing (before, during or after construction), frequency, and duration of the various monitoring activities. Also, thresholds and contingency measures should be specified where an EIR is being recommended and these details should be established at a preliminary level. Monitoring protocols should be established to standardize the procedures and ensure that findings can be compared from year to year.

5.11 Recommendations and conclusion

When preparing recommendation and conclusions, this section should:

1. summarize all the recommendations presented in the EIS for ease of implementation, with references to earlier sections and/or appendices where details are provided, as appropriate, in a text or table format;
2. provide a general statement as to whether or not the EIS complies with applicable policies and legislation; and
3. include a list of items that are to be completed during the preparation of the environmental implementation report or at a detailed design stage or implemented during/following construction.

6 Appendix A: background resources

City of Guelph

Official Plan, latest consolidation

Natural heritage system

Subwatershed studies (available in pdf format upon request)

Clythe creek subwatershed overview, 1998

Eramosa-blue springs watershed study, 1999

Hanlon creek state of the watershed, 2004

Mill creek subwatershed study, 1996

Torrance creek subwatershed study, 1998

Zoning by-law

Guelph trail master plan

Guelph tree by-law

Tree technical manual

Department of fisheries and oceans (DFO)

Fisheries protection program

Distribution of mussel species at risk

Mussel critical habitat information

Environment Canada

Water resources – real time hydrometric data

Ministry of enivronment conservation and parks

MOECP guideline B-7

MOECP procedure B-7-1

MOECP guideline D-f

MOECP procedures D-5-4 and D-5-5

Ministry of municipal affairs and housing (MMAH)

Provincial policy statement

Ministry of natural resources and forestry (MNRF)

Natural heritage reference manual

Significant wildlife habitat technical manual

Natural heritage information centre

Species at risk

Water budget manual

Ministry of transportation (MTO)

MTO drainage management technical guidelines

Grand river conservation authority (GRCA)

Grand river assessment report (for the grand river source protection plan)

Grand river source protection plan and area

Policies for the administration of the development, interference with wetlands and alterations to shorelines and watercourses

Regulation of development, interference with wetlands and alterations to shorelines and watercourses

GRIN: regulation mapping

Grand river assessment report

Other

Atlas of the breeding birds of Ontario

Geology Ontario

Geological survey of Canada

7 Appendix B: EIS terms of reference submission checklist

7.1 Reporting standard

- Formatted on 8½ by 11 paper, double-sided.
- A title page that includes: the name of the applicant, address of the subject property, lists the principal author of the report, the consulting firm, and the date the report was completed.
- Please ensure that the contact information for the applicant and main report author name are also provided within the report.
- Maps are to be full colour and on 11x17 minimum

7.2 Content

The following is a checklist of all the potential sections that may need to be addressed as part of an EIS. However, depending on the scope and scale of the proposed development and/or site alteration, as well as the nature and extent of natural heritage features and areas to be considered, not all elements will necessarily be required. Components not included in the terms of reference, with a rationale for their exclusion, should be marked as "N/A".

Introduction

- Description of subject property (natural features and areas, land cover, existing hard surfaces or buildings)
- Description of the type and scale of the development proposal (including any required servicing, infrastructure upgrades or stormwater facilities, existing or proposed trails)
- Describe the historical and present uses of the subject property:
    - grading/filling activities
    - brownfield contamination
- Description of the site context / study area and the subject property's relationship to the surrounding landscape
- Include map(s) of the development location, subject property and study area

- Orthographic map with known natural heritage features / areas overlaid

Planning context

- Current land uses designation and zoning for the subject property and for the adjacent lands
- Identify the type of required development applications
- Include map(s) of the development location and extent of the area to be studied including current zoning/land use
- Identify environmental legislative, regulatory and policy requirements that may affect the development proposal, including clauses relevant to the proposal

Background review

- Identify relevant information from existing studies, plans, databases and other sources to be analyzed as part of the EIS (see appendix A for examples)

NOTE: Natural heritage records are generally considered in need of field verification after a period of five years

Characterizing the natural environment: approach and methodology

- Detailed study methods for studying natural heritage features and areas, wildlife habitat and species at risk (including time of year, level of searcher effort, etc.)
- Identify and describe the approach and methods to be used to assess the natural environment of the subject property and the adjacent lands for:
- Geology and soils
- Hydrology and hydrogeology
- Aquatic and fish habitat
- Terrestrial vegetation (including wetlands)
    - Vegetation communities (ecological land classification)
    - Plants
    - Wildlife
    - Natural hazards
    - Connectivity and ecological linkages

- Identify whether there are potential natural heritage features and areas that do not need to be assessed, and provide a rationale for their exclusion
- Include completed "screening for known or candidate wildlife habitat," (see appendix D)
- Include map(s) showing proposed locations for field studies (i.e. points, plots, transects)

Data analysis: approach and methodology

- Evaluation of significance and natural hazards – identify that the following is in scope and any known analysis that will need to be included
    - Assess the various natural heritage features and areas against the appropriate policies and guidelines to determine significance:
    - Assess the various natural heritage features and areas against the appropriate policies and guidelines related to natural hazards:
    - Assessment of appropriate buffers and / or setbacks;
- Natural heritage and natural hazard opportunities and constraints – identify that it is in scope
- Environmental policy analysis (confirmation of policies and legislation to be addressed)
- Impact assessment – identify that the scope includes
    - Direct impacts
    - Indirect impacts
    - Induced impacts
    - Cumulative impacts
- Evaluation of alternative options / measures – establish key analysis points to be addressed in the EIS
- Recommended mitigation measures (including avoidance, enhancement, restoration, compensation, outreach, education and stewardship)

Monitoring

- Monitoring plan (outline of the types of monitoring to be included in the EIS)

Recommendations and conclusion

- Recommendations concluding statement (confirm they are to be provided in the EIS)

8 Appendix C: EIS submission checklist

8.1 Reporting standard

- Formatted on 8½ by 11 paper, double-sided.
- A title page that includes: the name of the applicant, address of the subject property, lists the principal author of the report, the consulting firm, and the date the report was completed.
- Please ensure that the contact information for the applicant and main report author name are also provided within the report.
- Maps are to be full colour and on 11x17 minimum

8.2 Content

The following is a checklist of all the potential sections that may need to be addressed as part of an EIS. This checklist should be used in the context of the approved EIS terms of reference.

Introduction

- Description of subject property (natural features and areas, land cover, existing hard surfaces or buildings)
- Description of the type and scale of the development proposal (including any required servicing, infrastructure upgrades or stormwater facilities, existing or proposed trails)
- Describe the historical and present uses of the subject property including grading/filling activities and brownfield contamination
- Description of the site context / study area and the subject property's relationship to the surrounding landscape
- Include map(s) of the development location, subject property and study area
- Orthographic map with known natural heritage features / areas overlaid

Planning context

- Current land uses designation and zoning for the subject property and for the adjacent lands
- Identify the type of required development applications

- Include map(s) of the development location and extent of the area to be studied including current zoning/land use and what is proposed
- Identify environmental legislative, regulatory and policy requirements that may affect the development proposal, including clauses relevant to the proposal

Background review

- Identify relevant information from existing studies, plans, databases and other sources to be analyzed as part of the EIS
- Identify and incorporate important information from additional technical studies such as: geotechnical, hydrogeologic and hydrologic studies

Characterizing the natural environment:

- Describe the detailed study methods for studying natural heritage features and areas, wildlife habitat and species at risk (including time of year, level of searcher effort, etc.) as well as for delineating feature boundaries
- Identify and describe all known or candidate natural heritage features and areas within the study area, and specify their boundaries.
- Characterize the existing conditions of the following natural heritage components based on a synthesis of information/data collected through the background review and field assessments:
    - geology and soils
    - hydrology and hydrogeology
    - squatic and fish habitat
    - terrestrial vegetation (including wetlands)
    - vegetation communities (ecological land classification)
    - plants
    - wildlife
    - natural hazards
    - connectivity and ecological linkages
- Include map(s) showing locations for field studies (i.e. points, plots, transects), natural heritage features and areas (including their limits), etc.

- Include completed "screening for known or candidate wildlife habitat," (see appendix D) as well as "screening for habitat for significant species"

Data analysis:

Evaluation of significance and natural hazards

- Assess the various natural heritage features and areas against the appropriate policies and guidelines to determine significance:
- Assess the various natural heritage features and areas against the appropriate policies and guidelines related to natural hazards:
- Include an assessment of appropriate buffers and / or setbacks;
- Include a map showing all natural heritage features and area boundaries and buffers/ buffer limits

Opportunities and constraints

- Discuss and depict natural heritage and natural hazard opportunities and constraints
- Identify all of the constraints to potential development related to natural heritage features and areas identified for protection, as well as natural hazards, including their respective buffers and setbacks
- identify opportunities for development on the subject property that work within the limitations of the site specific constraints
- identify opportunities for restoration, enhancement and/or stewardship opportunities
- Depict constraints and opportunities in a figure

Environmental policy analysis

- Include an environmental policy analysis confirming how the proposal meets (or doesn't meet) the applicable policies and legislation as described in the planning context section (see above)

Impact analysis

- Detailed description of the proposed development as it relates to potential impacts to the natural heritage features and areas identified for protection,

and/or their ecological functions. Consider elements such as: built form, grading, stormwater management, servicing, trails and post-development use of the land.

- Include a water balance (or appended/cross reference to a supporting study) with a supporting impact analysis in the EIS when addressing hydrological impacts.
- Include an impact assessment that considers both short-term and long-term impacts, including:
  - Direct impacts
  - Indirect impacts
  - Induced impacts
  - Cumulative impacts
- It is recommended to use a table format to summarize the impact analysis section.

Evaluating options and mitigation

- The evaluation of alternative options / measures describes how impacts can be mitigated through use of best management practices, and innovative measures. The iterative process undertaken by the design team is included in this section.
- Where trails are part of the development, identify and describe the opportunities for alternative trail alignments and approaches
- Summarize preferred alternative(s) for the proposal
- Recommend mitigation measures (including avoidance, enhancement, restoration, compensation, outreach, education and stewardship)

Monitoring

- Include a monitoring plan for performance and effectiveness of mitigation measures. Consider whether adequate baseline information has been collected and provide recommended time frame for monitoring program. Where an EIR is being recommended the monitoring plan will form a starting point for the EIR.

Recommendations and conclusion

- Recommendations and concluding statement

Appendices and attachments

- EIS terms of reference and city approval thereof
- Mapping and figures
- Species lists
- Additional technical studies, as applicable

9 Appendix D: significant wildlife habitat screening table

The following table has been developed based on the categories provided in the MNRF's significant wildlife habitat technical guide (2000) with consideration for the MNRF's SWH ecoregion 6E criterion schedule (2015), and the City of Guelph's biophysical context. These categories shouldbe revised or refined based on subsequent updates to these guidance sources.

Table 8. SWH screening table - seasonal concentration areas

Significant wildlife habitat type	**Known or candidate SWH present within or adjacent to the subject property?**	**Rationale (habitat presence or absence)**	**Field studies required?**
Deer yarding areas (as identified by MNRF)	*No*	*No Area identified by MNRF*	*No*
Deer winter congregation areas (as identified by MNRF)	Yes	Deer winter congregation area identified by MNRF	Yes, winter deer browse surveys proposed see methodology
Colonial bird nesting habitat: tree/shrub; cliff/bank; ground	…		
Waterfowl stopover and staging areas: aquatic; Terrestrial			
Waterfowl over wintering Areas (as identified by MNRF)			
Raptor wintering (feeding and roosting) areas			
Turtle wintering areas			
Reptile (snake) hibernacula			
Bat hibernacula			
Bat maternity colonies			

Table 9. SWH screening table - rare vegetation communities

Significant wildlife habitat type	Known or candidate SWH present within or adjacent to the subject property?	Rationale (habitat presence or absence)	Field studies required?
Alvar			
Prairie			
Savannah			
Rare forest types			
Cliff/ talus			
Rock barrens			
Sand barrens			
Other rare vegetation types, including old growth forest			

Based on the City's Natural heritage strategy, march 2009 report, other known rare vegetation types in the City of Guelph include:

- Buttonbush mineral thicket swamp type (ELC code SWT2-4, NHIC rank S3)
- Silky dogwood mineral thicket swamp type (ELC code SWT2-8, NHIC rank S3S4
- White cedar treed carbonate cliff type (ELC code CLT1-1, NHIC rank S3)

Table 10. SWH screening table – specialized habitats for wildlife

Significant wildlife habitat type	**Known or candidate SWH present within or adjacent to the subject property?**	**Rationale (habitat presence or absence)**	**Field studies required?**
Bald Eagle and Osprey nesting, foraging and perching habitat			
Woodland raptor nesting Habitat			
Amphibian breeding habitat: woodland Wetland (includes bullfrog concentration areas)			
Turtle nesting habitat			
Woodland/specialized raptor nesting			
Bald eagle wintering areas			
seeps and springs			

Table 11. SWH screening table – wildlife movement corridors

Significant wildlife habitat type	**Known or candidate SWH present within or adjacent to the subject property?**	**Rationale (habitat presence or absence)**	**Field studies required?**
Animal movement corridors; Deer movement corridors; Amphibian movement corridors; and, Other wildlife movement corridors			
Ecological linkages	Ecological linkages are identified as part of the City's natural heritage system	refinement may be based on the applicable policies	

Table 12. SWH screening table - habitats for species of conservation concern

Significant wildlife habitat type	Known or candidate SWH present within or adjacent to the subject property?	Rationale (habitat presence or absence)	Field studies required?
Marsh bird breeding habitat			
Woodland area-sensitive breeding habitat			
Open country bird breeding habitat			
Shrub / early successional breeding bird habitat			
Terrestrial crayfish habitat			
Global species of conservation concern (i.e., G1, G2 and G3) as identified by the NHIC			
Federal species of conservation concern (i.e., listed as endangered, threatened or special concern federally)			
Provincial species of conservation concern (i.e., listed as special concern provincially or S1, S2 or S3 by the NHIC)			

10 Appendix E: aquatic and fish survey guidance

This appendix includes guidance related to:

- Fisheries assessments;
- Benthic macroinvertebrate assessments; and
- Mussel assessments.

10.1 Fisheries assessments

When detailed and current (i.e., within five years), fisheries information is not available, and there are watercourses and/or ponds on-site, a fisheries assessment may be required.

Background information

Existing information sources (e.g. fisheries management plans, sub-watershed studies) should be reviewed and referenced prior to the completion of the fisheries assessments. In addition, the MNRF and the GRCA should be contacted to request background information regarding fish community records.

Scoping and assessments

Fisheries assessments may include one or more of the following:

- habitat assessments;
- detailed habitat mapping;
- fisheries inventories; and
- spawning surveys.

The determination of the surveys and inventories required will depend on site conditions and the proposed application. The required surveys will be determined through the EIS Terms or Reference approval process. Notably, fisheries inventories and spawning surveys should not proceed until the appropriate permits have been requested and provided.

Survey methodologies

Surveys, as required through the terms of reference, should be completed using methods detailed in the ontario stream assessment protocol (OSAP), 2010 or as updated. It is recommended that:

- habitat assessments follow the methods outlined in the OSAP manual;
- detailed habitat mapping be completed using the methods and symbols described in the most current DFO/MNRF fisheries protocol; and
- spawning surveys be completed using the appropriate methods and timing for the species of interest.

Timing of surveys

Fisheries inventories should be completed in the spring to ensure any fish usage of intermittent or ephemeral systems is identified. Inventories of permanent features may occur throughout the spring and summer. Habitat assessments and detailed habitat mapping should be completed during snow/ice free conditions. Spawning surveys should be completed during the appropriate timing windows for the species of interest.

10.2 Benthic macroinvertebrate surveys

Benthic invertebrate community sampling is conducted to assess the aquatic ecosystem condition or integrity. Benthic communities are sensitive to changes in water quality and serve as useful indicators as they are relatively sedentary for much of their life cycle.

Background review

A review of and building on any GRCA data from existing benthic monitoring locations within or near the study area, as well as datasets from previous studies in the sub-watershed or watershed areamay be useful.

Scope of surveys

Benthic surveys are typically required when there is potential for a watercourse/waterbody to be directly or indirectly impacted by changes in adjacent land uses associated with development. The benthic invertebrate survey methods used depend on how the data will be used (e.g., statistical comparisons or general

qualitative comparisons). The GRCA should be consulted to determine the survey protocol to be used, as well as to confirm the benthic site collection locations.

Sampling approach

Regardless of what protocol is followed, the "Before/After/Control/Impact" (BACI) experimental design should be considered in the sampling design for an EIS study. This design approach incorporates sampling from stations that may be impacted by the development (i.e., 'test' or 'exposure' sites), and sampling of these sites before and after development has occurred. These exposure sites are compared to 'control' sites located outside of the influence of development (e.g., often upstream, or in adjacent tributaries with similar habitat conditions), during the same time period as the 'test' sites are sampled. The number of years of pre-construction and post-construction monitoring sampling required should be determined in consultation with the City andGRCA. Often, interim sampling is recommended within the construction period, as well as before and after.

10.2.1 Sampling protocols

There are three well-established benthic invertebrate sampling protocols used within the Ontario, as described below, listed from most frequently to least frequently used in EIS studies.

10.2.1.1 Ontario stream assessment protocol (OSAP) (MNRF, 2010)

The Ontario stream assessment protocol (OSAP) (2010), which is a generally accepted standard in Ontario, contains a series of standardized methodologies for identifying sites, evaluating benthic macroinvertebrates, fish communities, physical habitat and water temperatures in wadeable streams. These standardized methods that ensure data repeatability and allows data to be shared, used for multiple purposes and stored in a common database.

The OSAP benthic macroinvertebrate assessment protocol describes several standard tools for assessing benthic macroinvertebrate communities to assess water quality. Information such as physical habitat conditions (depth, velocity, substrates) is also collected in conjunction with the benthic data to aid in interpreting data. The OSAP protocol outlines three sampling methods for

collecting benthics, and can be used in most wadeable streams with flowing water, which are as follows:

1. Rapid macroinvertebrate collection

This module describes a rapid sampling technique for determining if a site contains large-bodied benthic macroinvertebrates (benthos) that are known to be sensitive to most impacts (based on benthos tolerances to organic pollution). Resulting data can be used in reconnaissance surveys as a coarse indicator of water quality conditions.

2. Stationary kick survey

This module describes a stationary kick technique for evaluating the relative abundance of taxonomic groups of benthos from within riffle habitats. This approach can be used to provide a more comprehensive list of taxa than rapid macroinvertebrate collections; however, if estimating relative abundance of taxa in the riffle and pool habitats of a site is critical to the study, the transect travelling kick and sweep survey for macroinvertebrates should be used.

3. Transect travelling kick and sweep

This sampling technique (detailed in the manual) is for determining relative abundance estimates for benthos in the riffle and pool habitats. This approach can be used to estimate composition in a meander sequence by generating a composite sample of pools and riffles. This is also the standard sampling procedure for the Ontario benthic biomonitoring network (OBBN) described below.

10.2.1.2 Ontario benthic biomonitoring network (OBBN) (MOECC, 2007)

The OBBN protocol is a well-accepted protocol used within Ontario, developed in co-ordination with the MOECC. This protocol generally recommends using collection methods that are qualitative in nature, focusing on capturing all microhabitats within a wadeable watercourse/waterbody.

The OBBN Protocol identifies the preferred collection method for wadeable habitats as the travelling kick and sweep method (as described above) using a ”D” frame kicknet. A sampling reach should be long enough to encompass two riffles and one

pool, often extending one meander wavelength, within typical alluvial systems. Therefore, three sub-samples are collected from each habitat within the sampling site for one composite sample.

For non-wadeable habitat, grab sampling, including the use of Ponar Grab, Ekman Dredge, or Coring, can be used. Different sampling designs are required for these habitats, as outlined in the OBBN manual. Sampling methods should be consistent within a habitat class across all stations and areas. Further details on siting sampling sites are outlined in the OSAP protocol found in the manual. environmental effects monitoring (EEM) (Environment Canada, 2010)

This national survey protocol completed by Environment Canada is typically used when monitoring mining, pulp and paper operations, and wastewater treatment plants. It is not normally used for land development related EIS because it is only appropriate where there is a known/fixed discharge location (i.e., waste water treatment plant) and lab fees associated with the EEM protocol are often more expensive based on the number of replicates required. This protocol focuses on quantitative collection methods for benthic organisms within wadeable habitats as a means to more accurately compare between data sets and years.

The EEM Protocol includes several methods of benthics collection, with a focus on quantitative sampling procedures using fixed area collection sampling equipment within wadeable and non-wadeable environments. Several replicates (often five, with minimum of three pooled samples/replicates) are required at each station for quantitative sampling. Further details on siting sampling sites are outlined in the EEM Protocol.

10.2.2 **Timing of Surveys**

Surveys should be completed within the spring and fall, as these seasons capture the most diverse community assemblages. Slightly different communities would be expected within each season, therefore when comparing data between years, the same sampling periods should be repeated. Sampling periods used for collection of any pre-existing benthic data in the watershed or sub-watershed should be repeated.

The timing for spring collection is short, and should occur between spring freshet and peak times for insect emergence when stream conditions allow for safe access. The fall timing window is less restrictive, although benthics will generally be smaller and can be more difficult to identify.

10.2.3 Habitat assessment

Physical stream measurements and in-situ water quality parameters should be completed as part of the benthic collection work. The OBBN field collection sheet, or something comparable, should be completed for all benthic sampling events as part of the habitat assessment.

10.2.4 Sample identification

Samples or replicates can be sub-sampled after collection, using accepted sub-sampling procedures outlined in the OBBN protocols. Benthic identification should be completed by a trained professional, and benthics should be identified to the lowest possible taxonomic level. Samples can be sorted live or preserved, to be sorted at a later date.

10.2.5 Benthic analysis

Various metrics for comparing benthic communities should be tabulated. These include but are not limited to, total invertebrate density, species richness, family richness, percentage of various feeding groups, and percentage of tolerant species. Other indices such as shannon's diversity index and the family biotic or biotic index should also be considered.

Statistical tests, including ANOVA pairwise comparisons can be used if data is collected using the OSAP protocols, but may not be required for an EIS.

10.2.6 Requirements for the EIS

Field standard operating procedures should be included (specifying sampling equipment and protocols appropriate to the study) for pre-construction, during construction and post-construction sampling as part of the Terms of reference and the EIS. The EIS should also include summaries of the aquatic habitat assessments and benthic analyses, and include all raw data, field notes, and representative photos of sites and, if possible, specimens. Analyses should include a summary of

benthic results and comparisons between stations. Benthic sampling may be considered as a monitoring method to assess impacts even if not used as part of the EIS.

10.3 **Mussel surveys**

There are no known records of SAR, or other mussels, in Guelph's Speed or Eramosa Rivers, however freshwater mussels lack mobility and are often found below the substrate surface, therefore their presence in the aquatic environment can be overlooked. In terms of good practice, proponents with projects adjacent to these rivers should always contact the DFO to screen for records of potential mussels and mussel habitat.

Mussels may be directly impacted by works when physical alterations of aquatic habitat or dewatering is required, or may be indirectly impacted by sedimentation accumulation due to the absence of erosion and sedimentation controls. If the potential for a SAR mussel is present within the study area, and impacts are possible, a detection and/or salvage survey may be required. For mussels that are not Species at Risk, the general practice is to remove any mussels encountered within an area being directly impacted as part of fish rescue efforts at the time of construction. A formal mussel salvage survey is not typically required, however, (as with all matters related to SAR) this should be confirmed with MNRF. Mussel salvage may also form part of a mitigation plan where works are proposed in water courses/habitat.

Determining the presence of Species at Risk (SAR) mussels

DFO's Distribution of SAR Mussel mapping, which is available online, should be consulted to determine if a SAR is likely to be found within the watercourse reaches within the project area and vicinity. If such records are found, a follow up discussion with DFO staff is needed.

If a mussel detection survey is deemed necessary, permits under the species at risk act, 2002 and/or the endangered species act, 2007 (as applicable) will be required prior to initiating this work. Methods involved in mussel detection surveys are

outlined in detail in the "protocol for the detection and relocation of freshwater mussel species at risk in ontario-great lakes area, 2008".

Mussel salvage and relocation surveys

Mussel salvage and relocation surveys will typically be required when the project may result in negative impacts (direct and/or indirect) to the aquatic environment, and where there is some probability that mussel species at risk may be directly impacted as a result. SARA and/or ESA permits are required to undertake a mussel salvage and relocation. Details of the Survey Relocation Protocols can be found in the "protocol for the detection and relocation of freshwater mussel species at risk in ontario-great lakes area, 2008".

Identifying critical habitat for freshwater mussels

Critical habitat information for mussels can be downloaded from an on-line geodatabase.

11 Appendix F: ecological land classification and plant survey guidance

This appendix includes guidance related to:

- Ecological land classification (i.e., vegetation community classification in southern ontario), and
- Botanical surveys

11.1 Ecological land classification (ELC)

Description

ELC is a tool developed by the MNRF to provide consistent description, identification, classification and mapping of ecological land units in Southern Ontario. ELC is completed based on the available field manual, which includes five data cards used to gather and summarize information. Each distinct ecological community is outlined as a unique polygon.

The ELC system establishes a hierarchy of four levels whereby the more information one is able to collect, the more detailed the assessment can be. The hierarchy, from most coarse to most refined level, consists of:

- Community class (e.g., Forest);
- Community series (e.g., Deciduous Forest);
- Ecosite (e.g., Dry-fresh sugar maple deciduous forest);
- Vegetation type (e.g., dry-fresh sugar maple-beech deciduous forest type).

In Guelph, ELC communities should be identified to "vegetation type" or "ecosite" based on the field manual. Notably, some communities, particularly those classified as "cultural", cannot be classified to vegetation type.

Biophysical data is collected and recorded on the data cards for each polygon (community). ELC should be performed by personnel certified in ELC who are familiar with the vegetation types and plant species found in southern Ontario. The types of data cards available through the ELC system are described briefly in Table 13 below. While the data cards for stand and soil characteristics, plant species, and community description and classification are typically used, the

management/disturbance and wildlife data cards are not required for ELC and some ecologists may use alternate data collection sheets for these purposes.

Table 13. Summary of ELC Table E-1, description of data collected on ELC data cards

Data card category	Information collected
Stand & soil characteristics	Tree tally (for forested communities) Stand composition Soil assessment (including texture, depths to mottles and gley, depths to organics and bedrock, moisture regime) Community profile diagram
Plant species list	Plant list (vascular plants) indicating the layer(s) in which they occur and abundance
Community description & classification	Polygon description including system, site, substrate, topographic feature, history, cover, plant form and community Stand description including the dominant plants in each vegetation layer Community classification including Vegetation Type
Management/disturbance	i.e. non-native species, trails, browse, logging etc.
Wildlife	incidental wildlife species observations

Timing

Normally site visits at three different times over the growing season (i.e., spring, early summer, late summer) are required to gather the information necessary for a comprehensive ELC assessment (see Table 14). However, for some habitat types or for habitats where recent background information is available, all three may not be required. The number of visits will depend on the types of habitats present in the study area and the scope of the work required. While mostinformation can be collected in one visit, particularly during the spring or summer, more than one visit is typically required to accurately describe the vegetation present on site. Repeat field visits also allow for confirmation of species that could not be fully identified during earlier visits.

Table 14. Summary of ELC timing windows for flora surveys in Ontario

Time	Flora type	Flora and habitats of focus
Spring (April – June)	Spring ephemerals	Forest habitats

Time	Flora type	Flora and habitats of focus
Early summer (June – August)	Peak season flora	All
Late summer (August – September)	Late flowering flora	Wetland, alvar and prairie habitats Goldenrod and aster species

Scope

Depending on the nature of the project and/or the habitats on site, the extent of ELC surveys may be scoped in the following ways:

- Number of visits (e.g., it may be acceptable to complete only one survey for a dense pine plantation with little to no understory);
- number of prism sweeps and soil augers in each community (e.g., in unforested communities prism sweeps may be omitted; multiple soil augers may not be necessary if in depth geotechnical work is being completed on site);
- minimum polygon size (i.e., small vegetation communities smaller than 0.5 ha are typically considered inclusions within larger polygons and are not described individually). Minimum size for polygon description may be increased or decreased beyond the standard 0.5ha depending on the size of the site and the level of detail required for the study. However, in the City of Guelph, particularly for wetlands, it may be appropriate to use 0.2 ha as the lower threshold because of the "other wetlands" category which captures wetlands between 0.2 and 0.5 ha;
- which ELC data cards need to be completed (e.g., it may be determined that it is not necessary to complete the Management/disturbance assessment).

Components typically required in an EIS and outline in TOR

- A description of the methodology used to assess ELC (e.g., timing and extent of surveys, data cards used, etc.);

- a written description of each ELC vegetation type/Ecosite identified, outlining the dominant plant species within the overstorey, shrub layer, and ground flora of each ELC vegetation type;
- The location and "element ranking" of each provincially significant ELC vegetation type identified (see NHIC website);
- A summary of disturbances in each ELC vegetation type, including the descriptions of intensity and extent of invasive species; and
- Copies of completed data cards in the appendices.

11.2 **Plant surveys**

Description

A botanical (or plant) inventory is completed as part of the ELC system. For each vegetation type/ecosite a list of vascular plant species should be compiled with corresponding relative abundance values for each vegetation layer (canopy, sub-canopy, understory, ground layer). Prior to undertaking field work, the MNRF's natural heritage information centre (NHIC) website should be consulted to determine if there are any records of significant plant species from the study area. When significant species (species at risk, provincially and/or locally significant), or populations thereof, are identified in the field, their location should be recorded with a GPS and/or marked on an aerial photograph. The abundance and distribution of each significant floral species should be noted (i.e., is the population widespread and scattered, or localized to a few "clumps" or single ELC polygon).

Plant specimens may be collected if it is not possible to confirm the species in the field, as long as it is not a species at rish or one of very few specimens (<10 individuals) of aspecies growing in the area. If a specimen cannot be collected, it should be photographed for later identification.

Floral surveys should be completed by personnel with strong plant identification skills, and difficult to identify species (e.g., some graminoids, *Crataegus* spp.) of collected specimens should be verified by experts if needed.
If previous site-specific inventories have been undertaken, this information should be incorporated into the vascular plant list, with notations clearly indicating which species were directly observed and which were reported by others.

Timing

In order to compile a comprehensive species list, typically floral surveys at three distinct times of the growing season (as shown in Table 15) are needed to capture species that flower at different times of the year to facilitate identification. However, for some habitat types or for habitats where recent background information is available, all three may not be required. The number of visits will depend on the types of habitats present in the study area, and the scope of the work required. Repeat field visits can also allow confirmation of species that could not be identified at earlier stages.

Table 15. Summary of ELC timing windows for flora surveys in southern Ontario

Time	Flora type	Flora and habitats of focus
Spring (April/May – June)	Spring ephemerals	Forest habitats
Early summer (June – August)	Peak season flora	All
Late summer (August – September)	Late flowering flora	Wetland, alvar and prairie habitats Goldenrod and aster species

Scope

Depending on the nature of the project and/or the habitats on site, the timing and frequency of surveys required to complete flora surveys may be scoped (e.g., it may be acceptable to complete only one survey for a dense pine plantation with little to no understory). Notably, if there are records for rare or significant species, additional time may be required to verify for the presence/absence of specific species (e.g., SAR, regionally rare species, species endemic to certain areas or habitat types).

Components typically required in an EIS and outlined in the TOR

- A description of the methodology used to assess the flora (e.g., timing and extent of surveys, data cards used, etc.).

- Mapped locations of significant species (e.g., national, provincial, or regional, see below) or at least an indication of which ELC polygon(s) were found (subject to restrictions on publication when required by MNRF for the protection of SAR)
- One (or more) summary table of all significant species observed along with their current global, federal, provincial and regional/local status and the ELC polygon(s) in which they were observeds
    - In Guelph, the regionally/locally significant plant list for Guelph should be used as the reference for regional/local significance (see appendix H)
- An appendix list of vascular plant species observed or reported on the site, including scientific and common names, with an indication of the relative abundance of each species on the property (e.g., common, uncommon, rare) should be included in the EIS. An example summary table is shown in Table 16.

Table 16. Sample Flora Table

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Coefficient of Wetness (CW)	Weediness	GRank	SRank	COSSARO	COSEWIC	SARA Schedule	Wellington County	City of Guelph	ELC Polygon
FOBIS	FOBIS	OLDHAM ET AL	OLDHAM ET AL	OLDHAM ET AL	NHIC	NHIC	SARO List	SARA Registry	SARA Registry	Frank and Anderson	See Appendix H	Include a column for each site-specific ELC polygon and report plants found in that polygon

12 Appendix G: wildlife survey guidance

12.1 **Overview**

Wildlife surveys in southern Ontario typically include targeted surveys for breeding birds and breeding amphibians, as well as targeted or incidental surveys for reptiles, and incidental surveys for mammals and insects. The overall number and type of wildlife surveys will vary depending on: the study area; wildlife habitat potential; and potential for species at risk.

The following provides guidance related to the collection and reporting of wildlife data records, as well as a summary of current and potentially applicable techniques and protocols for undertaking wildlife surveys for these key taxanomic groups currently in use in southern Ontario.

Wildlife data records

Data records for all searches should be presented in tabular form and included as an appendix in the EIS. They should include:

1. Date
2. Total time spent searching; start time and finish time
3. Location of observation (e.g., Transect number, plot number, point number, GPS coordinates, ELC polygon)
4. Approximate number of individuals observed
5. Weather conditions; temperature; wind speeds
6. Habitat type and/or ELC community
7. Rarity ranking; provincial/national/local status
8. Breeding information, sex of species and approximate age class (i.e. adult/juvenile)
9. Name of field study participants

Survey techniques

Area search: birds, amphibian, mammals, reptiles

Area searches are intensive searches to identify and locate all targeted species within a given property. Study area wide searches should be considered in

circumstances where a wide variety of habitat types are expected and thought should be given to ensure that all potential vegetation communities are searched to obtain a representative sample of the wildlife utilizing the habitat(s) within and/or adjacent to the subject property.

On properties with prior agricultural or anthropogenic influences, a targeted approach may be more appropriate.

Standardized area search: birds, amphibians, crustaceans

Standardized area searches are searches from fixed sampling plot locations that have been established in potentially suitable habitat for target species. In circumstances where this survey technique is applied, plots must be established in representative and unique vegetation communities. These plots remain in fixed locations within and between years. This technique is typically most appropriate where surveys will be completed to monitor changes over multiple years.

Line transects: birds, reptiles, crustaceans

Line transects are a form of sampling that involves searching for wildlife along pre-determined routes. Transects should be randomly placed and should generally run through representative habitats (i.e., not along roads or habitat edges). Line transects are recommended in large areas of uniform habitat. In cases where wildlife is assumed to be randomly distributed and sample sizes are sufficient, line transects may also be used to estimate density and abundance of wildlife populations.

The data collected should include the specific transect where the observation occurred, the observer's position along the transect, and the distance from the transect.

Behavioural studies: birds, amphibians, mammals, reptiles

Behaviour studies consist of observations made over a period of time to determine how wildlife is using a particular area or feature (e.g., deer corridor). For these studies, specific vantage points must be identified and observations should coincide with the timing of significant seasonal events (e.g., migration movements).

Point counts: birds, amphibians

Point count assessments consist of observations performed at systematically placed points throughout an area. Standardized protocols which identify the time of year or day that the surveys can be completed, and the length of time that each point is surveyed, are typically provided to ensure that the data collected is representative of the conditions at the site.

Incidental observations: birds, amphibians, mammals, reptiles, insects, crustaceans

Incidental wildlife observations consist of observations made during the completion of other surveys that are not necessarily targeting the species observed, but are collected during the course of field surveys targeting other speciesd or areas. Information recorded from incidental observations can include the species observed and level of evidence observed (e.g., tracks, scat, singing male, nesting, etc.). Where rare or significant species are observed, the location of the observation should also be recorded (i.e. marked on a field map, GPS coordinates recorded, etc.).

12.2 Survey Protocols

Key considerations when selecting a survey protocol:

- Seasonality
- Time of day
- Searcher effort
- Study design and replicatability

The following are examples of established and accepted methods for various taxa.

12.2.1 Birds:

Ontario breeding bird atlas protocol

Under the Ontario breeding bird atlas (OBBA) guide for participants, two rounds of breeding bird surveys in southern Ontario should be completed between May 24th and July 10th of each year. If unseasonably warm or cold conditions are encountered in the spring, survey dates may need to be adjusted.

Surveys must be completed between dawn and five hours after dawn and should only be completed in conditions that are favourable for surveying birds. This generally consists of good visibility with no precipitation and little to no wind (wind conditions should be classified as a 3 or less on the beaufort wind scale). It is also recommended that the first round and second round of surveys be completed a minimum of one week apart as this allows the surveyor to distinguish between possible and probable breeders.

Species codes, habitat codes, breeding codes and levels of breeding evidence codes are all provided under this protocol and should be used to record data collected from these surveys.

Detailed information pertaining to this protocol is available in the OBBA guide for participants.

Marsh birds: marsh monitoring program

For projects with potentially suitable habitat for marsh breeding birds, it is recommended that surveys for these species be completed using the protocol provided in the marsh monitoring program participant's handbook for surveying marsh birds. Focal species for this program include American Bittern, American Coot, Black Rail, Common Moorhen, King Rail, Least bittern, Pied-billed Grebe, Sora, Virginia Rail and Yellow Rail. Habitat for these species typically consists of large flooded cat-tail marshes.

Under this protocol two rounds of surveys should be completed between May 20th and July 5th a minimum of 10 days apart. If unseasonably warm or cold conditions are encountered in the spring, survey dates may need to be adjusted.

Surveys can either be completed in the morning or evening. Morning surveys can begin 30 minutes before sunrise and end no later than 10 am. Evening surveys can begin four hours before sunset and end no later than sunset. Surveys should only be completed in conditions that are favourable for surveying birds. This generally consists of good visibility, warm temperatures (a minimum of 16 C°), no precipitation and little or no wind (3 or less on the Beaufort Wind Scale). Survey stations must be established prior to or during the survey, and each station must

be surveyed for 15 minutes using the marsh bird broadcast audio file, which can be obtained by registering for the marsh monitoring program with bird studies canada, and an appropriate audio source that will broadcast the calls so that they can be heard well at a distance of 100 m.

Detailed information pertaining to this protocol is available in the marsh monitoring program participant's handbook for surveying marsh birds.

Raptor nests

For projects with potentially suitable habitat for nesting raptors (i.e., forests) it is recommended that nest surveys for these species be completed in the early spring between March 23rd and April 23rd prior to "leaf out". Surveys should consist of a thorough investigation of potentially suitable habitat searching for active or inactive stick nests and evidence of raptor activity.

Where an active raptor nests are encountered, the species utilizing the nest, its location and overall conditions should be recorded. Activity in the general proximity to the nest should be avoided to the extent possible to ensure that the nest is not disturbed and may need to incorporate feeding or foraging territories depending on the species. The location and a general description of inactive stick nests should also be recorded and mapped.

Detailed information on raptors and their nests is available in forest raptors & their nests in central ontario: a guide to stick nests & their users.

12.2.2 **Amphibians:**

Frogs and toads

For projects with potentially suitable habitat for amphibians, it is recommended that surveys for these species be completed using the protocol provided in the marsh monitoring program participant's handbook for surveying amphibians.

Under this protocol, three rounds of surveys should be completed between the following dates at least 15 days apart:

Round 1: April 15th – April 30th when night-time air temperatures exceed 5°C;

Round 2: May 15th – May 30th when night-time air temperatures exceed 10°C; and

Round 3: June 15th – June 30th when night-time air temperatures exceed 17°C.

These dates are provided only as a guideline, as air temperature and lack of wind are the most important variables to pay attention to when deciding when to conduct surveys. If unseasonably warm or cold conditions are encountered in the spring, survey dates may need to be adjusted.

Surveys can begin half hour after sunset and end before midnight. Each station is surveyed for three minutes. Surveys should only be completed in conditions that are favourable for surveying amphibians. This consists of nights that are damp, foggy or have light rain falling. Persistent or heavy rainfall and nights with strong winds (3 or less on the Beaufort Wind Scale) are to be avoided.

Detailed information pertaining to this protocol is available in the Marsh Monitoring Program Participant's Handbook for Surveying Amphibians.

Salamanders

For projects with potentially suitable habitat for salamanders, it is recommended that surveys for these species be performed in the early spring between late-March to mid-April, ideally immediately following snow melt and/or the first spring rains. Surveys can consist of one or more of the following three techniques:

1. Visual surveys of potentially suitable habitat can be completed in the evenings during the period specified above as this is when the majority of salamanders are most likely to be active. A visual inspection of the habitat, including carefully overturning and replacing potential cover can be completed as part of this survey. Visual inspections of vernal pools is also recommended. Egg mass surveys can also be completed during daylight hours. Note: Egg mass surveys have limited ability to confirm presence/absence of species as not all salamander eggs are visible in ponds.
2. Fine mesh dipnets can be used to catch amphibians at all stages of development in aquatic habitat. Capture occurs by sweeping or churning the water. Correspondence with MNRF prior to survey commencement recommended as permits for these surveys may be required.

3. Pitfall or funnel traps, often in association with drift fences, are the most common way of trapping terrestrial amphibians. Traps should be checked daily, before noon to minimize mortality. Correspondence with MNRF prior to survey commencement is required as permits for these surveys will need to be obtained.

Detailed information pertaining to these protocols is available in the wildlife monitoring programs and inventory techniques for ontario.

12.2.3 **Mammals**

Survey techniques for bats and deer, the two mammals most likely to need species-specific surveys in Guelph, have been provided below. Notably, the approach taken should be confirmed with MNRF and MOECP prior to proceeding, particularly for bats, as several bat species are listed as provincially endangered.

Bats

Criteria from the significant wildlife habitat technical guide (MNRF 2000) in conjunction with methods found in the appendices of bat and bat habitats: guidelines for wind power project can be used to evaluate the significance of bat maternity colonies and more recent guidance from MNRF guelph district for bat habitat.

In order to confirm the presence of bats, surveys to identify potentially suitable habitat for these species (i.e., old buildings, barns or cavity trees) should be completed prior to June.

To identify potential maternity roots in woodlots the following steps should be taken:

- The ecological land classification system should be used to determine if mixed forest or deciduous forests are present at the site;
- if these communities are present, the density of snag and cavity trees that are greater than 25 cm DBHwill need to be calculated using the methodology provided in the bat and bat habitats: guidelines for wind power projects; and
- if snag/cavity tree density greater than 10 snags greater than 25 cm dbh per hectare, the site is considered a candidate for maternity colony roots;

- If candidate trees or buildings are identified in conjucnction with SAR additional input from MNRF may be required.

If potential bat habitat is present at the site that may be negatively impacted by the proposed works, exit surveys should be completed to confirm if bats are present at the site. If bats are present, acoustic monitoring may be required to identify the bat species present. MNRF Guelph District should be contacted to obtain additional guidance on bat studies for SWH, MECP staff should be contacted with respect to SAR as mist netting or other methods may be required.

Deer

Surveys to survey for white-tailed deer can be completed by recording incidental observations, recording pellet group counts and/or surveying wildlife transects.

If the purpose of the study is to confirm the presence or boundary of a winter deer yard, a survey of the habitat will be required. Correspondence with the MNRF will be required in order to confirm survey protocols and details on the evaluation of winter deer yards. Some information pertaining to the habitat specifications of winter deer yards is available in the Forest Management Guidelines for the provisions of white-tailed deer habitat.

If the purpose of the study is to confirm the presence of deer migration corridors, transects can be completed in order to evaluate the use of habitat in relation to a study area. If the corridor crosses a road, deer mortality data can also be requested from the City.

More information pertaining to protocols that can be used to monitor deer populations is available in the wildlife monitoring programs and inventory techniques for Ontario.

12.2.4 **Reptiles**

Snakes

For projects with potentially suitable habitat for reptiles, it is recommended that visual surveys be completed by overturning all objects that provide cover (i.e., large branches, logs, rocks, etc.). Once the area beneath these objects has been

thoroughly searched, the objects should be returned, to the extent possible, to their original positions.

Snakes (and skinks) are most likely to be observed under cover objects in the morning after cool evenings when they seek out there area to try and maintain their body temperatures. This technique is likely to be most successful in the spring and fall, when temperatures in the evenings are typically much cooler than daytime temperatures. Artificial cover boards can be installed as part of this survey protocol, however it is important to realize that it may take for the cover board to become utilized as habitats.

Due to their cryptic nature, potential snake hibernacula can be difficult to locate. Snake hibernacula can be found in a variety of natural and artificial settings including, but not limited to: old building foundations, rock piles, beneath logs, and chimney crayfish burrows. Potential hibernacula should be identified during site visits and can be monitored in the early spring to try to confirm any activity.

Roadside surveys can also be used to detect snakes in the spring and fall when they are most likely to be encountered in sunny but cool weather basking on roads or roadsides, which are warmer than the surrounding habitat.

More information pertaining to protocols that can be used to monitor snakes is available in the wildlife monitoring programs and inventory Techniques for Ontario and from MNRF Guelph District in regards to methods targeting milksnake.

Turtles

For projects with potentially suitable habitat for turtles can be completed through visual surveys of the ponds or wetlands at the site. Searching for basking turtles is the most effective method of confirming their presence within suitable habitat.

In open water wetlands, surveys can be completed from the shoreline using binoculars to scan the perimeter of the shoreline and potential basking sites. If required, the surveyor should access the wetland from different locations or walk the shoreline to ensure all suitable habitat is surveyed. Basking sites should be surveyed from the sunlit side as this is the site that the turtles are most likely to be located. In wetlands that lack large pools of open water, basking turtles may be

dispersed throughout the wetland. These habitats should be surveyed using evenly spaced transects or aerial surveys to cover all areas of the wetland.

Surveys for basking turtles will likely be most successful if completed in the early spring when water temperatures are still cooler than air temperatures and vegetation is less obstructive to viewing turtles than later in the spring, summer or fall.

Ideally surveys should be completed between 8 am and 5 pm on sunny days when the air temperature is at least 10 °C. Surveys can also be carried on partially cloudy or overcast days but only when air temperatures are greater than 15 °C, and greater than water temperatures. Surveys on the first warm, sunny day after several days of inclement weather will generally be more productive than surveys after several days of warm, sunny weather.

Surveying roads with sandy or gravely shoulders near wetlands during the late May to early July nesting season may also be undertaken as turtles could be nesting during this time and may also identify movement areas for turtles from wintering sites to nesting areas.

More information pertaining to protocols that can be used to monitor turtles is available in the wildlife monitoring programs and inventory techniques for ontario and the occurrence survey protocol for blanding’s turtle in ontario.

13 Appendix H: locally significant species list (2012)

The locally significant species lists for plants and wildlife included below are required in order to identify locally significant species to ensure consideration of habitat protection in order to suppor the full range of biodiversity within the City.

13.1 Significant plant list

Table 17. Significant plant list - trees

Scientific name (FOIBIS)	Common name
Acer nigrum	Black Maple
Carya ovata var. ovata	Shagbark Hickory
Castanea dentata	American Chestnut
Juglans cinerea	Butternut
Sorbus americana	American Mountain-ash

Table 18. Significant plant list - shrubs

Scientific name (FOIBIS)	Common name
Amelanchier stolonifera	Running Serviceberry
Arctostaphylos uva-ursi	Bearberry
Betula pumila	Swamp Birch
Ceanothus americanus	New Jersey Tea
Celtis occidentalis	Common Hackberry
Cephalanthus occidentalis	Common Buttonbush
Cornus rugosa	Round-leaved Dogwood
Epigaea repens	Trailing Arbutus
Euonymus atropurpurea var. atropurpurea	Burning Bush
Hamamelis virginiana	American Witch-hazel
Juniperus horizontalis	Creeping Juniper
Kalmia polifolia	Pale Laurel
Myrica gale	Sweet Gale
Prunus americana	American Plum
Prunus pumila var. pumila	Sand Cherry
Rhus aromatica	Fragrant Sumac
Ribes hirtellum	Smooth Gooseberry
Rubus canadensis	Smooth Blackberry
Salix cordata	Sand Dune Willow
Saxifraga virginiensis	Early Saxifrage
Shepherdia canadensis	Canada Buffalo-berry

Table 19. Significant plant list - vines

Scientific name (FOIBIS)	Common name
Adlumia fungosa	Climbing Fumitory
Amphicarpaea bracteata	Hog-peanut

Table 20. Significant plant list – aquatic plants

Scientific name (FOIBIS)	Common name
Alisma gramineum	Narrow-leaf Water-plantain
Brasenia schreberi	Watershield
Elodea nuttallii	Nuttall Waterweed
Najas flexilis	Slender Naiad
Najas gracillima	Thread-like Naiad
Nuphar advena	Yellow Pond-lily
Potamogeton alpinus	Northern Pondweed
Potamogeton amplifolius	Large-leaf Pondweed
Potamogeton epihydrus	Ribbon-leaf Pondweed
Potamogeton hillii	Hill's Pondweed
Potamogeton illinoensis	Illinois Pondweed
Potamogeton richardsonii	Redheadgrass
Sagittaria cristata	Crested Arrowhead
Sagittaria cuneata	Wapatum Arrowhead
Sagittaria graminea var. graminea	Grassleaf Arrowhead
Sagittaria rigida	Sessile-fruited Arrowhead

Table 21. Significant plant list - ferns and allies

Scientific name (FOIBIS)	Common name
Asplenium platyneuron	Ebony Spleenwort
Asplenium rhizophyllum	Walking-fern
Asplenium trichomanes ssp. quadrivalens	Maidenhair Spleenwort
Asplenium trichomanes-ramosum	Green Spleenwort
Botrychium dissectum	Cutleaf Grape-fern
Botrychium matricariifolium	Daisy-leaf Moonwort
Botrychium multifidum	Leathery Grape-fern
Botrychium oneidense	Blunt-lobe Grape-fern
Botrychium rugulosum	Rugulose Grapefern
Botrychium simplex	Least Moonwort
Cryptogramma stelleri	Fragile Rockbrake
Dennstaedtia punctilobula	Hay-scented Fern
Diplazium pycnocarpon	Glade Fern
Dryopteris clintoniana	Clinton Wood Fern
Dryopteris filix-mas	Male Fern
Dryopteris goldiana	Goldie's Wood Fern
Lycopodiella inundata	Northern Bog Clubmoss

Scientific name (FOIBIS)	Common name
Lycopodium clavatum	Running Pine
Lycopodium complanatum	Trailing Clubmoss
Lycopodium digitatum	Fan Clubmoss
Lycopodium tristachyum	Deep-root Clubmoss
Ophioglossum pusillum	Adder's Tongue Fern
Osmunda claytoniana	Interrupted Fern
Pellaea glabella ssp. glabella	Smooth Cliff-brake
Polypodium virginianum	Rock Polypody
Triglochin maritimum	Common Bog Arrow-grass
Triglochin palustre	Marsh Arrow-grass

Table 22. Significant plant list - gramonoid

Scientific name (FOIBIS)	Common name
Agrostis perennans	Perenial Bentgrass
Andropogon virginicus	Broom-sedge
Bromus kalmii	Wild Chess
Bromus pubescens	Canada Brome
Carex atherodes	Awned Sedge
Carex backii	Rocky Mountain Sedge
Carex brevior	Fescue Sedge
Carex careyana	Carey's Sedge
Carex castanea	Chestnut-colored Sedge
Carex chordorrhiza	Creeping Sedge
Carex crawfordii	Crawford Sedge
Carex cryptolepis	Northeastern Sedge
Carex echinata ssp. echinata	Little Prickly Sedge
Carex emoryi	Emory's Sedge
Carex exilis	Coast Sedge
Carex formosa	Handsome Sedge
Carex garberi	Elk Sedge
Carex gracilescens	Slender Sedge
Carex gynocrates	Northern Bog Sedge
Carex jamesii	Nebraska Sedge
Carex laxiculmis var. copulata	Spreading Sedge
Carex laxiculmis var. laxiculmis	Loose-stemmed Sedge
Carex laevivaginata	Smooth-sheathed Sedge
Carex leptonervia	Finely-nerved Sedge
Carex livida	Livid Sedge
Carex lupulina	Hop Sedge
Carex oligosperma	Few-seeded Sedge
Carex pallescens	Pale Sedge
Carex pauciflora	Few-flowered Sedge
Carex richardsonii	Richardson Sedge

Scientific name (FOIBIS)	Common name
Carex sartwellii	Sartwell's Sedge
Carex schweinitzii	Schweinitz's Sedge
Carex sterilis	Sterile Sedge
Carex sychnocephala	Many-headed Sedge
Carex tenuiflora	Sparse-flowered Sedge
Carex tetanica	Rigid Sedge
Carex trichocarpa	Hairy-fruited Sedge
Carex vaginata	Sheathed Sedge
Carex woodii	Pretty Sedge
Dichanthelium villosissimum var. villosissimum	White-hair Witchgrass
Eleocharis intermedia	Matted Spikerush
Eleocharis robbinsii	Robbins Spikerush
Elymus canadensis	Canada Wild-rye
Elymus riparius	River-bank Wild-rye
Elymus villosus	Slender Wild-rye
Equisetum laevigatum	Smooth Scouring-rush
Equisetum palustre	Marsh Horsetail
Equisetum pratense	Meadow Horsetail
Equisetum sylvaticum	Woodland Horsetail
Equisetum variegatum ssp. variegatum	Variegated Horsetail
Eragrostis frankii	Frank's Love-grass
Eriophorum gracile	Slender Cotton-grass
Eriophorum tenellum	Rough Cotton-grass
Festuca occidentalis	Western Fescue
Glyceria borealis	Small Floating Manna-grass
Hierochloe odorata ssp. odorata	Holy Grass
Juncus acuminatus	Sharp-fruit Rush
Juncus brevicaudatus	Narrow-panicled Rush
Juncus pelocarpus	Brown-fruited Rush
Koeleria macrantha	June Grass
Melica smithii	Smith Melic Grass
Muhlenbergia sylvatica var. sylvatica	Woodland Satin Grass
Panicum philadelphicum	Tuckerman's Panicgrass (Philadelphia Panic Grass)
Panicum rigidulum	Redtop Panic Grass
Parnassia glauca	Carolina Grass-of-parnassus
Rhynchospora capillacea	Capillary Beakrush
Scheuchzeria palustris	Pod Grass
Schizachyrium scoparium	Little Bluestem
Schoenoplectus smithii	Smith's Club-rush
Schoenoplectus subterminalis	Swaying Club-rush
Sisyrinchium mucronatum	Michaux Blue-eyed-grass
Sparganium angustifolium	Many-stalked Bur-reed

Scientific name (FOIBIS)	Common name
Sparganium natans	Small Bur-reed
Spartina pectinata	Fresh Water Cordgrass
Sporobolus cryptandrus	Sand Dropseed
Sporobolus neglectus	Small Dropseed
Sporobolus vaginiflorus	Sheathed Dropseed
Torreyochloa pallida var. fernaldii	Fernald's Manna Grass
Trichophorum alpinum	Hudson Bay Bulrush
Trichophorum caespitosum	Tufted Leafless-bulrush

Table 23. Significant plant list - forbes

Scientific name (FOIBIS)	Common name
Amerorchis rotundifolia	Round-leaved Orchis
Andromeda polifolia var. glaucophylla	Bog Rosemary
Arabis hirsuta var. pycnocarpa	Hairy Rock Cress
Arceuthobium pusillum	Dwarf Mistletoe
Arethusa bulbosa	Dragon's Mouth
Asclepias exaltata	Poke Milkweed
Asclepias tuberosa	Butterfly Milkweed
Astragalus canadensis	Canadian Milkvetch
Aureolaria flava	Yellow False-foxglove
Cakile edentula	American Sea-rocket
Calopogon tuberosus	Tuberose Grass-pink
Calypso bulbosa	Calypso
Calystegia spithamaea ssp. spithamaea	Low Bindweed
Campanula rotundifolia	American Harebell
Campanulastrum americanum	Tall Bellflower
Cardamine bulbosa	Bulbous Bitter-cress
Cardamine douglassii	Purple Cress
Cardamine pratensis var. angustifolia	Cuckoo Flower
Chamerion angustifolium ssp. angustifolium	Fireweed
Chimaphila umbellata ssp. cisatlantica	Common Wintergreen
Chrysosplenium americanum	American Golden-saxifrage
Clematis occidentalis var. occidentalis	Purple Clematis
Coeloglossum viride var. virescens	Long-bract Green Orchis
Collinsonia canadensis	Canada Horse-balm
Conioselinum chinense	Hemlock Parsley
Corallorhiza maculata	Spotted Coralroot
Corallorhiza striata	Striped Coralroot
Corydalis aurea ssp. aurea	Golden Corydalis
Cuscuta campestris (C. pentagona var. pentagona)	Field Dodder
Cypripedium acaule	Pink Lady's-slipper

Scientific name (FOIBIS)	Common name
Cypripedium arietinum	Ram's-head Lady's-slipper
Dalibarda repens	Robin Runaway
Dasiphora floribunda	Shrubby Cinquefoil
Decodon verticillatus	Hairy Swamp Loosestife
Dracocephalum parviflorum	American Dragonhead
Drosera linearis	Slender-leaved Sundew
Epilobium strictum	Downy Willow-herb
Erigenia bulbosa	Harbinger-of-spring
Erythronium albidum	White Trout Lily
Eupatorium purpureum var. purpureum (Eutrochium purpureum)	Sweet Joe-pye-weed
Floerkea proserpinacoides	False Mermaid-weed
Galearis spectabilis	Showy Orchis
Galium labradoricum	Bog Bedstraw
Gentiana rubricaulis	Great Lakes Gentian
Gentianopsis crinita	Fringed Gentian
Geum laciniatum	Rough Avens
Goodyera oblongifolia	Giant Rattlesnake-plantain
Halenia deflexa ssp. deflexa	Spurred Gentian
Helenium autumnale	Common Sneezeweed
Helianthus decapetalus	Thin-leaved Sunflower
Hieracium gronovii	Hairy Hawkweed
Hydrophyllum canadense	Canada Waterleaf
Hypericum ascyron	Great St. John's-wort
Hypericum boreale	Northern St. John's-wort
Hypericum ellipticum	Pale St. John's-wort
Hypericum prolificum	Shrubby St. John's-wort
Impatiens pallida	Pale Jewel-weed
Jeffersonia diphylla	Twinleaf
Lespedeza hirta	Hairy Bushclover
Lilium michiganense	Michigan Lily
Lilium philadelphicum	Wood Lily
Lindera benzoin	Spicebush
Listera convallarioides	Broad-leaved Twayblade
Listera cordata	Heartleaf Twayblade
Lithospermum latifolium	Broad-leaved Gromwell
Lobelia kalmii	Kalm's Lobelia
Lobelia spicata	Pale-spiked Lobelia
Lonicera villosa	Mountain Fly-honeysuckle
Lupinus perennis ssp. perennis	Wild Lupine
Malaxis brachypoda	White Adder's Mouth
Malaxis unifolia	Green Adder's Mouth
Menispermum canadense	Canada Moonseed
Menyanthes trifoliata	Bog Buckbean

Scientific name (FOIBIS)	Common name
Monarda didyma	Oswego Tea
Moneses uniflora	One-flower Wintergreen
Myosotis verna	Spring Forget-me-not
Nuttallanthus canadensis	Toadflax
Osmorhiza berterii	Sweet-cicely
Panax quinquefolius	American Ginseng
Panax trifolius	Dwarf Ginseng
Phlox subulata ssp. subulata	Pink Phlox
Pilea fontana	Spring Clearweed
Pilea pumila	Canada Clearweed
Pinguicula vulgaris	Butterwort
Platanthera dilatata	Tall White Bog Orchid
Platanthera lacera	Green-fringed Orchid
Platanthera macrophylla	Goldie's Round-leaved Orchid
Platanthera obtusata	Blunt-leaved Orchid
Platanthera orbiculata	Large Round-leaved Orchid
Platanthera psycodes	Small Purple-fringed Orchid
Pogonia ophioglossoides	Rose Pogonia
Polygala paucifolia	Gay-wing Milkwort
Polygala senega	Seneca Snakeroot
Polygonatum biflorum	Giant Solomon's Seal
Polygonum erectum	Erect Knotweed
Polymnia canadensis	White-flower Leafcup
Primula mistassinica	Bird's-eye Primrose
Pyrola chlorantha	Greenish-flowered Wintergreen
Ranunculus fascicularis	Early Buttercup
Ranunculus flabellaris	Yellow Water-crowfoot
Ranunculus gmelinii	Small Yellow Water Buttercup
Rudbeckia laciniata	Cut-leaved Coneflower
Solidago arguta var. arguta	Sharp-leaved Goldenrod
Solidago bicolor	White Goldenrod
Solidago patula	Rough-leaved Goldenrod
Solidago squarrosa	Squarrose Goldenrod
Spiraea tomentosa	Hardhack Spiraea
Spiranthes casei	Case's Ladies'-tresses
Spiranthes lucida	Shining Ladies'-tresses
Spiranthes magnicamporum	Great Plains Ladies'-tresses
Spiranthes romanzoffiana	Hooded Ladies'-tresses
Stellaria borealis ssp. borealis	Northern Chickweed
Symphyotrichum cordifolium	Heart-leaved Aster
Symphyotrichum ontarione	Ontario Aster
Symphyotrichum oolentangiense var. oolentangiense	Sky-blue Aster
Symplocarpus foetidus	Skunk Cabbage

Scientific name (FOIBIS)	Common name
Taenidia integerrima	Yellow Pimpernell
Thalictrum thalictroides	Rue-anemone
Thaspium barbinode	Hairy-jointed Meadow Parsnip
Tofieldia glutinosa ssp. brevistyla	Sticky False-asphodel
Triadenum virginicum	Marsh St.John's-wort
Trillium cernuum	Nodding Trillium
Utricularia cornuta	Horned Bladderwort
Utricularia gibba	Humped Bladderwort
Utricularia minor	Lesser Bladderwort
Vaccinium corymbosum	Highbush Blueberry
Vaccinium pallidum	Early Lowbush Blueberry
Valeriana uliginosa	Marsh Valerian
Verbena simplex	Narrow-leaved Vervain
Verbena stricta	Hoary Vervain
Viola adunca	Sand Violet
Zigadenus elegans ssp. glaucus	White Camas
Zizania palustris	Northern Wild Rice
Zizia aurea	Common Alexanders

13.2 **Significant wildlife list**

Table 24. Significant wildlife list – amphibians and reptiles

Common name	**Scientific name**
American Bullfrog	Rana catesbeiana
Blanding's Turtle	Emydoidea blandingii
Blue-spotted Salamander	Ambystoma laterale
Blue-spotted Salamander and Jefferson Salamander hybrids (e.g. diploid, triploid and tetraploid hybrid forms)	'Silvery Salamander' A. laterale – [2] jeffersonianum 'Tremblay's Salamander' A. [2] laterale-jefforsonianum
Butler's Gartersnake	Thamnophis butleri
Dekay's Brownsnake	Storeria dekayi
Eastern Ribbonsnake	Thamnophis sauritus
Five-lined Skink (Great Lakes/St. Lawrence pop.)	Eumeces fasciatus
Four-toed Salamander	Hemidactylium scutatum
Jefferson Salamander	Ambystoma jeffersonianum
Massasauga	Sistrurus catenatus
Milksnake	Lampropeltis triangulum
Mink Frog	Rana septentrionalis
Mudpuppy	Necturus maculosus
Northern Map Turtle	Graptemys geographica
Northern Watersnake	Nerodia sipedon sipedon
Pickerel Frog	Rana palustris
Red-bellied Snake	Storeria occipitomaculata
Red-spotted Newt	Notophthalmus viridescens viridescens
Ring-necked Snake	Diadophis punctatus
Smooth Greensnake	Opheodrys vernalis
Snapping Turtle	Chelydra serpentina
Spotted Salamander	Ambystoma maculatum
Spotted Turtle	Clemmys guttata
Unidentified members of the Jefferson Salamander Complex (i.e. no genetic analysis undertaken)	
Western Chorus Frog (Great Lakes/St. Lawrence - Canadian Shield pop.)	Pseudacris triseriata

Table 25. Significant wildlife list - birds

Common name	Scientific name
Acadian Flycatcher	Empidonax virescens
American Bittern	Botaurus lentiginosus
American Coot	Fulica americana
American Kestrel	Falco sparverius
American Redstart	Setophaga ruticilla
American Wigeon	Anas americana
Bald Eagle	Haliaeetus leucocephalus
Baltimore Oriole	Icterus galbula
Bank Swallow	Riparia riparia
Barn Swallow	Hirundo rustica
Barred Owl	Strix varia
Bay-breasted Warbler	Dendroica castanea
Belted Kingfisher	Ceryle alcyon
Black Tern	Chlidonias niger
Black-and-white Warbler	Mniotilta varia
Black-billed Cuckoo	Coccyzus erythropthalmus
Blackburnian Warbler	Dendroica fusca
Black-crowned Night-Heron	Nycticorax nycticorax
Black-throated Blue Warbler	Dendroica caerulescens
Black-throated Green Warbler	Dendroica virens
Blue-gray Gnatcatcher	Polioptila caerulea
Blue-headed Vireo	Vireo solitarius
Blue-winged Warbler	Vermivora cyanoptera
Blue-winged Warbler hybrid(s) "Brewster's Warbler" "Lawrence's Warbler"	Vermivora chrysoptera x V. cyanoptera (shows dominant traits) Vermivora chrysoptera x V. cyanoptera (shows recessive traits)
Bobolink	Dolichonyx oryzivorus
Brewer's Blackbird	Euphagus cyanocephalus
Broad-winged Hawk	Buteo lineatus
Brown Creeper	Certhia americana
Brown Thrasher	Toxostoma rufum
Canada Warbler	Wilsonia canadensis
Canvasback	Aythya valisineria
Carolina Wren	Thryothorus ludovicianus
Caspian Tern	Sterna caspia
Cerulean Warbler	Dendroica cerulea
Chimney Swift	Chaetura pelagica
Cliff Swallow	Petrochelidon pyrrhonota
Common Loon	Gavia immer
Common Merganser	Mergus merganser
Common Moorhen	Gallinula chloropus
Common Nighthawk	Chordeiles minor

Common name	Scientific name
Common Raven	Corvus corax
Cooper's Hawk	Accipiter cooperi
Dark-eyed Junco	Junco hyemalis
Double-crested Cormorant	Phalacrocorax auritus
Eastern Kingbird	Tyrannus tyrannus
Eastern Meadowlark	Sturnella magna
Eastern Towhee	Pipilo erythrophthalmus
Eastern Wood-Pewee	Contopus virens
Evening Grosbeak	Coccothraustes vespertinus
Field Sparrow	Spizella pusilla
Gadwall	Anas strepera
Golden-winged Warbler	Vermivora chrysoptera
Grasshopper Sparrow	Ammodramus savannarum
Great Blue Heron	Ardea herodias
Great Egret	Casmerodius albus
Green Heron	Butorides virescens
Green-winged Teal	Anas crecca
Hairy Woodpecker	Picoides villosus
Henslow's Sparrow	Ammodramus henslowii
Hermit Thrush	Catharus guttatus
Herring Gull	Larus argentatus
Hooded Warbler	Wilsonia citrina
Le Conte's Sparrow	Ammodramus leconteii
Least Bittern	Ixobrychus exilis
Least Flycatcher	Empidonax minimus
Lesser Scaup	Aythya affinis
Lincoln's Sparrow	Melospiza lincolnii
Loggerhead Shrike	Lanius ludovicianus
Long-eared Owl	Asio otus
Louisiana Waterthrush	Seiurus motacilla
Magnolia Warbler	Dendroica magnolia
Merlin	Falco columbarius
Northern Bobwhite	Colinus virginianus
Northern Flicker	Colaptes auratus
Northern Goshawk	Accipiter gentilis
Northern Harrier	Circus cyaneus
Northern Mockingbird	Mimus polyglottos
Northern Parula	Parula americana
Northern Pintail	Anas acuta
Northern Saw-whet Owl	Aegolius acadicus
Northern Shoveler	Anas clypeata
Olive-sided Flycatcher	Contopus cooperi
Orchard Oriole	Icterus spurius
Ovenbird	Seiurus aurocapillus

Common name	Scientific name
Pileated Woodpecker	Dryocopus pileatus
Pine Siskin	Carduelis pinus
Pine Warbler	Dendroica pinus
Prairie Warbler	Dendroica discolor
Prothonotary Warbler	Protonotaria citrea
Red Crossbill	Loxia curvirostra
Red-bellied Woodpecker	Melanerpes carolinus
Red-breasted Merganser	Mergus serrator
Red-breasted Nuthatch	Sitta canadensis
Redhead	Aythya americana
Red-headed Woodpecker	Melanerpes erythrocephalus
Red-necked Grebe	Podiceps grisegena
Red-shouldered Hawk	Buteo platypterus
Ring-billed Gull	Larus delawarensis
Ring-necked Duck	Aythya collaris
Rose-breasted Grosbeak	Pheucticus ludovicianus
Ruby-crowned Kinglet	Regulus calendula
Ruddy Duck	Oxyura jamaicensis
Sandhill Crane (Greater Sandhill Crane)	Grus canadensis
Savannah Sparrow	Passerculus sandwichensis
Scarlet Tanager	Piranga olivacea
Sedge Wren	Cistothorus platensis
Sharp-shinned Hawk	Accipiter striatus
Short-eared Owl	Asio flammeus
Swainson's Thrush	Catharus ustulatus
Tennessee Warbler	Vermivora peregrina
Trumpeter Swan	Cygnus buccinator
Tufted Titmouse	Baeolophus bicolor
Upland Sandpiper	Bartramia longicauda
Veery	Catharus fuscescens
Vesper Sparrow	Pooecetes gramineus
Western Meadowlark	Sturnella neglecta
Whip-poor-will	Caprimulgus vociferus
White-winged Crossbill	Loxia leucoptera
Willow Flycatcher	Empidonax traillii
Wilson's Phalarope	Phalaropus tricolor
Winter Wren	Troglodytes troglodytes
Wood Thrush	Hylocichla mustelina
Yellow-bellied Flycatcher	Empidonax flaviventris
Yellow-bellied Sapsucker	Sphyrapicus varius
Yellow-billed Cuckoo	Coccyzus americanus
Yellow-breasted Chat	Icteria virens
Yellow-throated Vireo	Vireo flavifrons

Table 26. Significant wildlife list - butterflies and moths

Common name	Scientific name
Black Dash	Euphyes conspicua
Common Sootywing	Pholisora catullus
Delaware Skipper	Anatrytone logan
Dion Skipper	Euphyes dion
Early Hairstreak	Erora laeta
Giant Swallowtail	Papilio cresphontes
Gorgone Crescentspot	Chlosyne gorgone
Gray Hairstreak	Strymon melinus
Grey Copper	Lycaena xanthoides
Hackberry Emperor	Asterocampa celtis
Hickory Hairstreak	Satyrium caryaevorum
Juniper Hairstreak	Callophrys gryneus
Little Glassywing	Pompeius verna
Monarch	Danaus plexippus
Mottled Duskywing	Erynnis martialis
Mulberry Wing	Poanes massasoit
Pepper and Salt Skipper	Amblyscirtes hegon
Purplish Copper	Lycaena helloides
Sleepy Duskywing	Erynnis brizo
Southern Cloudywing	Thorybes bathyllus
Tawny Emperor	Asterocampa clyton
West Virginia White	Pieris virginiensis

Table 27. Significant wildlife list - dragonflies and damselflies

Common name	Scientific name
Wild Indigo Duskywing	Erynnis baptisiae
Belted Whiteface	Leucorrhinia proxima
Black Meadowhawk	Sympetrum danae
Brush-tipped Emerald	Somatochlora walshii
Chalk-fronted Corporal	Ladona (Libellula) julia
Crimson-ringed Whiteface	Leucorrhinia glacialis
Eastern Amberwing	Perithemis tenera
Ebony Boghaunter	Williamsonia fletcheri
Elfin Skimmer	Nannothemis bella
Frosted Whiteface	Leucorrhinia frigida
Halloween Pennant	Celithemis eponina
Hudsonian Whiteface	Leucorrhinia hudsonica
Painted Skimmer	Libellula semifasciata
Saffron-bordered Meadowhawk	Sympetrum costiferum
Slaty Skimmer	Libellula incesta
Variegated Meadowhawk	Sympetrum corruptum
Williamson's Emerald	Somatochlora williamsoni

Table 28. Significant wildlife list - mammals

Common name	Scientific name
American Badger	Taxidea taxus
Black Bear	Ursus americanus
Bobcat	Lynx rufus
Eastern Pipistrelle	Pipistrellus subflavus
Grey Fox	Urocyon cinereoargenteus
Hairy-tailed Mole	Parascalops breweri
Least Weasel	Mustela nivalis
Long-tailed Weasel	Mustela frenata
Lynx	Lynx canadensis
Northern Flying Squirrel	Glaucomys sabrinus
Northern Long-eared Bat	Myotis septentrionalis
Puma (Mountain Lion)	Puma concolor couguar
Pygmy Shrew	Sorex hoyi
River Otter	Lutra canadensis
Small-footed Bat	Myotis leibii
Snowshoe Hare	Lepus americanus
Southern Bog Lemming	Synaptomys cooperi
Southern Flying Squirrel	Glaucomys volans
Southern Red-backed Vole	Clethrionomys gapperi
Water Shrew	Sorex palustris
Woodland Jumping Mouse	Napaeozapus insignis
Woodland Vole	Microtus pinetorum