



REGIONAL MUNICIPALITY OF WATERLOO PUBLIC INPUT MEETING OF THE PLANNING AND WORKS COMMITTEE AGENDA

Tuesday, March 8, 2011
9:00 a.m.
Region Council Chamber
150 Frederick Street, Kitchener, Ontario

- 1. DECLARATIONS OF PECUNIARY INTEREST UNDER THE MUNICIPAL CONFLICT OF INTEREST ACT**

- 2. REPORT –PLANNING, HOUSING AND COMMUNITY SERVICES**
 - a) [P-11-022](#), Public Meeting for the Greenlands Network Implementation Guideline to the Regional Official Plan 1
Staff Presentation

- 3. DELEGATIONS**

- 4. ADJOURN**



REGION OF WATERLOO

**Planning, Housing and Community Services
Community Planning**

TO: Chair Jim Wideman and Members of the Planning and Works Committee

DATE: March 8, 2011 **FILE CODE:** D23-40/Greenlands

**SUBJECT: PUBLIC MEETING FOR GREENLANDS NETWORK IMPLEMENTATION
GUIDELINE TO THE REGIONAL OFFICIAL PLAN**

RECOMMENDATION:

For information.

SUMMARY:

The Greenlands Network Implementation Guideline to the Regional Official Plan (ROP) is intended to provide guidance to development applicants, the Ecological and Environmental Advisory Committee (EEAC), and agency staff¹ in the preparation and review of applications for development and site alteration which affect the Greenlands Network. The Greenlands Network consists of environmental features and the linkages among them which are designated in the Regional Official Plan and Area Municipal official plans. Implementation Guidelines provide detailed guidance in the application of ROP policies which direct that the elements of the Greenlands Network be maintained, enhanced, or wherever feasible, restored. Such guidelines must be the subject of a public process which receives input from affected government agencies and members of the public.

The First Draft of the Greenlands Network Implementation Guideline was prepared by staff with substantial input from the Ecological and Environmental Advisory Committee (EEAC). Council directed that it be circulated in February 2010 to the Area Municipalities, Grand River Conservation Authority and Ministry of Natural Resources, as well as environmental consulting firms. At the close of the commenting period on April 30, 2010, many helpful comments and suggestions had been received from Area Municipal and GRCA staff, the great majority of which were incorporated into the Second Draft. After further review by EEAC on September 28, 2010, Council directed that it be circulated and also that a Public Meeting be held in order to receive formal comments before a final draft is submitted for Council's consideration.

Advertisements have been placed in local newspapers, and agencies have been informed of the Public Meeting as required. A copy of the draft Implementation Guideline is attached to this report.

REPORT:

The Greenlands Network Implementation Guideline is referenced in Policy 7.A.4 of the Regional Official Plan (ROP). It is intended to provide guidance at a higher level of technical detail than is appropriate in official plan policies to development applicants, the Ecological and Environmental Advisory Committee (EEAC), and agency staff in the preparation and review of applications for development and site alteration which affect the Greenlands Network. The Greenlands Network consists of significant environmental features such as Environmentally Sensitive Landscapes (ESLs), Provincial Greenbelt Natural Heritage System, Environmentally Sensitive Policy Areas

1. This comprises staff at the Area Municipalities, Grand River Conservation Authority, as well as the Region of Waterloo.

(ESPAs), woodlands, wetlands and other valuable or rare habitats and the linkages among them which are designated in the Regional Official Plan (ROP) and Area Municipal official plans.

Implementation Guidelines provide detailed guidance in the application of ROP policies which direct that the elements of the Greenlands Network be maintained, enhanced, or wherever feasible, restored. Specifically, they guide the preparation of Environmental Impact Statements, the delineation of environmental features, the determination of buffers around environmental features, and the creation or restoration of ecological linkages among those features.

ROP Policies 10.B.9 and 10.B.10 recognise Implementation Guidelines as:

. . . statements adopted by resolution of Regional Council which detail the manner in which policies established in this Plan will be implemented. The content and scope of these Implementation Guidelines will be determined by the Region, in consultation with the Area Municipalities and the Grand River Conservation Authority as appropriate, will be updated from time-to-time and will be in conformity with the policies in this Plan. (ROP 10.B.9).

Implementation Guidelines may not be used as a means of introducing “new policy provisions that could be the basis for denying development applications . . . or for interfering with the natural justice rights of landowners and the public” (ROP 12.2.2.3; 10.B.10). Proposed Implementation Guidelines must also be publicised in newspapers and circulated to public agencies and affected organisations in order to provide interested parties an opportunity to comment upon them. They must also be the subject of a formal Public Meeting where Council may receive comments directly from affected agencies or individuals.

Development of the Draft Greenlands Network Implementation Guideline

Throughout 2009, EEAC worked closely with staff to develop the initial draft of the Greenlands Network Implementation Guideline. On February 3, 2010, Regional Council directed that the First Draft attached to Report P-10-007 dated January 26, 2010 be circulated to government agencies and the environmental consulting community for a commenting period ending April 30, 2010. During that time, Regional environmental planning staff met with the Waterloo Citizens Environmental Advisory Committee (February 9, 2010), Cambridge Environmental Advisory Committee (February 12, 2010), and the Kitchener Environmental Committee (February 18, 2010) to introduce the document and request comments. Staff suggested that Area Municipal committees look at the Implementation Guideline as a potential common document that all municipalities in the Region could use when environmental impact statements are required pursuant to their respective policies. This has the potential to streamline the environmental aspect of the development review process for agency staff and applicants alike.

By the close of the commenting period, detailed comments had been received from the City of Cambridge, City of Kitchener, City of Waterloo and Grand River Conservation Authority, the great majority of which were subsequently incorporated into the Second Draft. This draft was circulated informally to Area Municipal and GRCA environmental planning staff in early September 2010. Further comments were provided by City of Waterloo staff, and on September 28, 2010, the Ecological and Environmental Advisory Committee reviewed the entire document. On November 24, 2010, Council directed that the second Draft be circulated and also authorised a Public Meeting of the Planning and Works Committee. In addition to the Area Municipalities, GRCA, and MNR, the document was also circulated to eleven planning consulting firms and 24 environmental planning and engineering active in the Region, as well as to the Waterloo Region Homebuilders Association, the K-W Field naturalists, and GREN.

ROP Policy 10.B.11 requires that the public and agencies be notified of the Public Meeting at least 20 days prior to the meeting. Accordingly, staff has placed advertisements in the following newspapers:

- Waterloo Region Record, Friday, February 11, 2011
- Cambridge Times, Tuesday, February 15, 2011
- Waterloo Chronicle, New Hamburg Independent, Ayr News, and Elmira Independent, Wednesday, February 16, 2011
- Woolwich Observer, Saturday, February 19, 2011.

In addition, letters announcing the Public Meeting were sent to the clerks of the seven Area Municipalities, the GRCA, and MNR on February 10, 2011.

Following the Public Meeting, individuals or agencies will be able to submit comments until March 24, 2011. After that date, a final draft will be prepared for submission to the Planning and Works Committee for consideration as the Region's Greenlands Network Implementation Guideline.

Area Municipal Consultation/Coordination

ROP Policy 10.C.9 requires that the content and scope of Implementation Guidelines be determined by the Region in consultation with Area Municipalities and other appropriate agencies. The First Draft was accordingly circulated to the Area Municipalities, and the great majority of comments returned by Area Municipal staff and their environmental advisory committee members have been incorporated in the Second Draft. The Second Draft has also been circulated to the Area Municipalities for further comment.

CORPORATE STRATEGIC PLAN:

The Greenlands Network Implementation Guideline will help achieve the objective to maintain, enhance and restore sensitive environmental features, and will also be one component of completing the new Regional Official Plan by fulfilling the policy commitment to develop the Guideline.

FINANCIAL IMPLICATIONS:

The cost of advertising the Public Meeting of the Planning and Works Committee has been accommodated through budgeted funds already approved by Council.

OTHER DEPARTMENT CONSULTATIONS/CONCURRENCE:

Council and Administrative Services staff has circulated the first and second drafts of the Implementation Guideline. They have advertised the Public Meeting in local newspapers and posted it on the Region's website.

ATTACHMENTS:

Attachment 1: Second Draft Greenlands Network Implementation Guideline Version - February 11, 2011

PREPARED BY: *Chris Gosselin*, Manager of Environmental Planning

APPROVED BY: *Rob Horne*, Commissioner of Planning, Housing and Community Services

ATTACHMENT A

Second Draft: Version February 11, 2011

REGION OF WATERLOO GREENLANDS
NETWORK IMPLEMENTATION
GUIDELINE

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A. INTRODUCTION

Regional Official Plan

7.A.4 The Region will prepare and update a Regional Greenlands Network Implementation Guideline to guide the implementation of the policies in this Chapter.

The purpose of the **Greenlands Network Implementation Guideline** is to provide guidance to *development* applicants, the Ecological and Environmental Advisory Committee (EEAC), and agency staff² in the preparation and review of *applications* for *development* and *site alteration* which affect the Greenlands Network. The Greenlands Network consists of the following categories of *environmental features* designated in the Regional Official Plan (ROP) and Area Municipal Official Plans:

Landscape Level Systems

Environmentally Sensitive Landscapes
Significant Valleys
Regional Recharge Areas
Provincial Greenbelt Natural Heritage System

Core Environmental Features

Significant habitat of Endangered and Threatened Species
Provincially Significant Wetland
Environmentally Sensitive Policy Areas
Regionally Significant Woodlands
Environmentally Significant Valley Features

Supporting Environmental Features

Environmentally Significant Discharge Areas
Environmentally Significant Recharge Areas
River or stream valleys and floodplains
Grand River Conservation Authority wetlands
Linkages

The Implementation Guideline provides detailed implementation guidance on the ROP's environmental policies. These policies direct that the elements of the Greenlands Network be maintained, *enhanced*, or wherever feasible, *restored*.

The Regional Official Plan relies on Implementation Guidelines in a number of subject areas to provide detailed technical guidance in the application of certain policies. Implementation Guidelines elaborate upon ROP policy, but may not be used as a means of introducing "new policy provisions that could be the basis for denying development applications or for interfering with the natural justice rights of landowners and the public." (see Policy 10.B.10).

The content and scope of Regional Implementation Guidelines are determined through a full, open, and transparent consultation process with Area Municipalities, other agencies, interested organisations, and concerned citizens. Once adopted by resolution of Council, Implementation

2. This comprises staff at the Area Municipalities, Grand River Conservation Authority, as well as the Region of Waterloo.

Guidelines are legally binding elaborations of Regional policy. As relevant policies are updated, added, or deleted, Implementation Guidelines must also be updated to conform more closely to the provisions of the Regional Official Plan.

On June 26, 2002, Regional Council adopted the ***Guideline for the Preparation of Environmental Impact Statements in the Regional Municipality of Waterloo***. This document provided detailed guidance for *development* applicants required to prepare Full *Environmental Impact Statements*. The adoption of a new Regional Official Plan on June 16, 2009 and its approval by the Minister of Municipal Affairs on December 22, 2010 is the impetus for the adoption of the ***Region of Waterloo Greenlands Network Implementation Guideline***. This includes an updated ***Guideline for the Preparation of Full Environmental Impact Statements*** which reflects changes in practice and policy since 2002. It also includes a ***Guideline for the Preparation of Scoped Environmental Impact Statements***, since the great majority of *Environmental Impact Statements* prepared for review by agencies are scoped. Reflecting the purpose of the guidelines, the ***Greenlands Network Implementation Guideline*** includes other matters related to the implementation of the ROP environmental policies which are addressed in *Environmental Impact Statements* such as

- interpreting the boundaries of *environmental features*,
- delineating *ecological buffers*, and *linkages*, and
- expanded definitions of terms³.

In order to identify potential *adverse environmental impacts* upon *environmental features* and assist *development* proponents and public agencies to avoid, minimise, or mitigate such impacts, *Environmental Impact Statements* are required pursuant to the Provincial Policy Statement, Regional Official Plan, Area Municipal Official Plans, and secondary plans. This Guideline will assist proponents to organise and synthesise all the information required by the respective approval agencies. The information and expert opinions expressed in an *Environmental Impact Statement* by the *qualified professionals* who prepare them inform approval agency decisions to accept, modify, or refuse *applications* for *development* or *site alteration*. As the information and opinions contained in an *Environmental Impact Statement* may be questioned or challenged by agency staff, it should be noted that mere completion of an *Environmental Impact Statement* does not necessarily mean that the *development application* will be approved. Moreover, individual agencies may decline to review draft documents or *Environmental Impact Statements* not fulfilling the requirements of the Guideline.

A.1 ***Environmental Impact Statements***

An *Environmental Impact Statement* is defined within the Regional Official Plan as:

a study prepared in accordance with established procedures to refine the boundaries of elements of the Greenlands Network, identify the potential impacts of a *development application* on such elements, and recommend a means of preventing or minimizing these impacts through avoidance or mitigation.

The ROP further specifies that an *Environmental Impact Statement* recommend means to *enhance* or *restore* the quality and *connectivity* of elements of the Greenlands Network.

The *Environmental Impact Statement* will often be coordinated with other technical studies such as

3. Terms defined in the Glossary of this Implementation Guideline but not included in the ROP are marked with an asterisk. As in the ROP itself, all terms defined in the Glossary are printed in italics in the text when the text specifically refers to that term. Terms in the Glossary are in the form of nouns. In the text of the Implementation Guideline, they may take the form of verbs when appropriate (e.g., *restoration* – *restore*).

hydrological, hydrogeological, or stormwater management reports. *Environmental Impact Statements* will be prepared in accordance with this Guideline.

There are three types of *Environmental Impact Statement*:

1. A **Comprehensive Environmental Impact Statement** is carried out at a landscape scale prior to widespread *development* in order to identify *environmental features* for protection, delineate potential development areas, and recommend development setbacks and other environmental protection measures in order to maintain the ecological sustainability of the Greenlands Network in the area. It informs the type, scale and location of development. Typically, detailed Terms of Reference are prepared for such a study which often takes the form of a watershed or sub-watershed study carried out under the auspices of government agencies, and once completed, is approved by Council.
2. A **Full Environmental Impact Statement** is an area or site-specific study carried out in accordance with the approved Guideline to address potential *adverse environmental impacts* anticipated to arise from a *development application* or *site alteration*, and to identify means to *enhance* or *restore* elements of the Greenlands Network.
3. A **Scoped Environmental Impact Statement** is an area or site-specific study where the impacts of the proposed *development* or *site alteration* upon one or more elements of the Greenlands Network are expected to be limited in area and/or scope, or where other environmental studies fulfilling the requirements of an *Environmental Impact Statement* have been previously approved. Terms of Reference are scoped by staff in consultation with the Ecological and Environmental Advisory Committee and other agencies.

A.2 When is an *Environmental Impact Statement* Required?

The purpose of an *Environmental Impact Statement* is to provide technical input to approval agencies considering the approval of *development applications* or applications for *site alteration* affecting a designated *Landscape Level System*, *Core Environmental Feature*, or *Supporting Environmental Feature*. Where appropriate, an *Environmental Impact Statement* may also be required to assess the ecological significance of a hitherto undesignated natural area. The *Environmental Impact Statement* identifies potential *adverse environmental impacts* to ecological features and *functions*, and recommends measures to prevent, avoid, minimise, and mitigate those potential impacts. It also identifies opportunities to *enhance* and/or *restore* the *environmental features* and *functions* of the area. An *Environmental Impact Statement* is generally required when *development* or *site alteration* is proposed on lands within or *contiguous* to *environmental features*. Further guidance is provided by the policies in Chapter Seven of the Regional Official Plan. The following discussion summarises these policies.

It is intended that this Guideline consolidate the study requirements of review agencies having jurisdiction over elements of the Greenlands Network in order to avoid discrepancy or duplication. Prior to undertaking an *Environmental Impact Statement*, applicants for *development* or *site alteration* are encouraged to consult at the earliest opportunity with staff of the respective agencies having jurisdiction in order to facilitate early identification of environmental issues, clarify the precise nature of the information required, and ensure timely processing of the application.

- If Significant Habitat of an *Endangered* or *Threatened Species* or a Provincially Rare Species is involved, the applicant shall contact the Ministry of Natural Resources, Regional Municipality of Waterloo, and affected Area Municipality.
- If the *environmental feature* is a *Landscape Level System* (not including Significant Valleys), a *Core Environmental Feature*, or *Environmentally Significant Discharge Area* and/or *Environmentally Significant Recharge Area* that sustains *Core Environmental Features*, the

applicant shall contact the Region and affected Area Municipality.

- Where the application affects a *Significant Valley*, a Provincially Significant Wetland located outside an *Environmentally Sensitive Policy Area* or a *wetland* not identified as provincially significant (including an unevaluated *wetland*), a watercourse, steep slope, or floodplain, applicants shall consult with the Grand River Conservation Authority and affected Area Municipality.
- If the affected environmental feature is a *Supporting Environmental Feature*, or Locally Significant Natural Area, applicants shall consult with Area Municipal staff.
- If the affected feature lies within the Grand River Corridor or other Significant Valley, the applicant shall contact all agencies.

Applicants are also advised to solicit input from local residents having knowledge of the environmental characteristics of the area.

Where an *Environmental Impact Statement* would normally be required by the Region, the submission of an *Environmental Impact Statement* will not be required where an *Environmental Assessment* or alternative environmental review is being undertaken under Provincial or Federal Legislation, providing the alternative process fulfills all the requirements for site specific, and/or landscape level *Environmental Impact Statements* otherwise required by the Regional Official Plan. Further, the Region may waive the requirement for an *Environmental Impact Statement* where consultation with other agencies or site investigation by the Region indicates that there are not likely to be *adverse environmental impacts* upon the Greenlands Network.

A.3 Pre-Submission Consultation with the Region of Waterloo

In accordance with the Regional Official Plan, if an *Environmental Impact Statement* is required in support of an *application for development* or *site alteration*, it must be submitted before the application is deemed complete and the review process can begin. The *Environmental Impact Statement* will be prepared to the satisfaction of Regional staff in consultation with the respective Area Municipality(ies) and other agencies. Therefore, it is necessary that the proponent of the proposed *development* or *site alteration* schedule a *pre-submission consultation meeting* with the Region, and as appropriate, the *Province*, Area Municipality, and Grand River Conservation Authority, as early as possible.

Pre-submission consultation will help to clarify whether an *Environmental Impact Statement* is required and whether the Terms of Reference can be scoped. If an *Environmental Impact Statement* is to be scoped, scoping must be done by agency staff, and not by the applicant. *Pre-submission consultation* can also provide an opportunity to harmonise Regional, Area Municipal and Grand River Conservation Authority requirements.

B. GUIDELINES

I. Guideline for the Preparation of a Full *Environmental Impact Statement*

Regional Official Plan

- 7.G.1 An *Environmental Impact Statement* may be required to identify and evaluate the potential effects of a proposed *development* or *site alteration* on elements of the Greenlands Network, and recommend means of preventing, minimizing or mitigating these impacts, as well as enhancing or restoring the quality and *connectivity* of elements of the Greenlands Network. An *Environmental Impact Statement* may also be used to interpret the boundaries of these elements. The *Province*, Region, Area Municipalities and the Grand River Conservation Authority will co-ordinate the requirements for the preparation of *Environmental Impact Statements*.
- 7.G.2 The Region, in consultation with the *Province*, Area Municipalities and the Grand River Conservation Authority may require the completion of a single comprehensive *Environmental Impact Statement* where:
- (a) *development* or *site alteration* is proposed on multiple contiguous properties containing elements of the Greenlands Network;
 - (b) a comprehensive community planning process is being undertaken;
 - (c) environmental studies are required to support the proposed expansion of the Urban Area or a Township Urban Area; or
 - (d) the extent of a *development application* and its anticipated impacts on the Greenlands Network are anticipated by the relevant agency(ies) to be substantial.
- 7.G.3 The need for, and scope of *Environmental Impact Statements*, will be determined by:
- (a) the *Province*, for *development* or *site alteration* potentially affecting Significant Habitat of Endangered or Threatened Species, or;
 - (b) the Region, for *development* or *site alteration* potentially affecting:
 - i) Landscape Level Systems, not including Significant Valleys;
 - ii) Core Environmental Features; or
 - iii) *Environmentally Significant Discharge Areas* and/or *Environmentally Significant Recharge Areas* that sustain Core Environmental Features.
 - (c) the Grand River Conservation Authority for Significant Valleys, Provincially Significant Wetlands located outside Environmentally Sensitive Policy Areas and *wetlands* not identified as provincially significant, including unevaluated *wetlands*;
 - (d) the affected Area Municipality for *development applications* potentially affecting other elements of the Greenlands Network; and
 - (e) the Federal Department of Fisheries and Oceans, or its delegate, for *fish habitat*.
- 7.G.4 The following provisions will apply to *Environmental Impact Statements* required by the Region under Policy 7.G.3(b):
- (a) the *Environmental Impact Statement* will be prepared in accordance with the provisions of the Regional Greenlands Network Implementation Guideline; . .

Application

In accordance with policy 7.G.4 of the **Regional Official Plan**, this Guideline will apply when a Full *Environmental Impact Statement* is required for *development* or *site alteration* within or *contiguous to*

- a *Landscape Level System* (not including *Significant Valleys*),
- a *Core Environmental Feature*,
- an *Environmentally Significant Discharge Area* and/or *Environmentally Significant Recharge Area* that sustains a *Core Environmental Feature* or
- a *Supporting Environmental Feature* designated by an Area Municipality.

Purpose

The purpose of this Guideline is to ensure that appropriate and consistent methods and report formats are followed in the preparation of *Environmental Impact Statements*. In cases when a Comprehensive Environmental Impact Study or Sub-watershed Plan is not in place, or when the extent of a proposal and its potential impacts on the Greenlands Network are anticipated by the relevant agency(ies) to be substantial, a Full *Environmental Impact Statement* may be required. Compliance with these guidelines will help to expedite the review process by reducing the need for further study and information. Prior to commencing such a study, a *pre-submission consultation meeting* with agency staff is strongly recommended in order to determine study parameters and/or specific Terms of Reference.

Guideline for a Full *Environmental Impact Statement*

A Full *Environmental Impact Statement* required pursuant to the policies of the ROP and/or the Provincial Policy Statement and/or an Area Municipal Official Plan will consist of the following:

1. A statement of the purpose and rationale for the *application for development or site alteration*;
2. Maps, site plans, and/or recent airphotos at an appropriate scale showing previously documented and newly obtained information on:
 - 2.1 The location of lands affected by the *application for development or site alteration* in relation to elements of the Greenlands Network, as defined in the ROP and/or Area Municipal Official Plan, including but not necessarily limited to the following:
 - 2.1.1 *significant* habitat of *Endangered and Threatened species* identified by the Ministry of Natural Resources,
 - 2.1.2 Provincially Significant Wetlands identified by the Ministry of Natural Resources and other wetlands identified by the Grand River Conservation Authority,
 - 2.1.3 Provincially and Regionally Significant Life Science and Earth Science Areas of Natural and Scientific Interest identified by the Ministry of Natural Resources,
 - 2.1.4 Environmentally Sensitive Policy Areas designated by the Regional Municipality of Waterloo,
 - 2.1.5 Significant Woodlands,
 - 2.1.6 Environmentally Significant Valley Features,
 - 2.1.7 significant wildlife habitat, as defined by the Provincial Policy Statement and associated technical guidelines,
 - 2.1.8 fish habitat, as defined by the **Fisheries Act**,
 - 2.1.9 surface water features,
 - 2.1.10 groundwater recharge and/or *discharge areas*,
 - 2.1.11 other natural high quality or unusual *environmental features or functions* such

- as good representative communities of native species typical of the region, natural corridors, migration staging areas, and deeryards, and
- 2.1.12 Locally Significant Natural Areas and/or *Supporting Environmental Features* identified by an Area Municipality;
 - 2.2 Ecologically functional natural *linkages* and potential *linkages* among elements of the Greenlands Network;
 - 2.3 Topography - showing the relationship of the proposed *development* or *site alteration* to natural heritage features;
 - 2.4 Predominant soil series;
 - 2.5 Groundwater regime (where known);
 - 2.6 Regulation Limit (formerly Flood and fill lines);
 - 2.7 Existing land uses and ownership patterns of properties abutting the subject property;
 - 2.8 Existing and proposed Regional and Area Municipal Official Plan designations and zoning;
 - 2.9 geological hazards (e.g., shallow bedrock, active faults, karst, old waste deposit sites); and
 - 2.10 Other *development* or *site alteration* applications known to be in progress which would affect the identified *environmental features*.

The above features may have been identified by the respective agencies. In cases where they may not have been so identified, however, the proponent is required to assess *environmental features* and *ecological functions* in the light of applicable Provincial guidelines, the current version of the Natural Heritage reference Manual, or other generally accepted principles.

3. Information on the *environmental features* identified in 2.1 on the subject property and on adjacent or *contiguous* lands as defined in the ROP, Area Municipal Official Plans or secondary plans which might also be affected or that might reasonably be expected to be affected, either directly or indirectly, by the proposed *development* or *site alteration*, namely:
 - 3.1 detailed mapping of the *environmental feature(s)* and nearby related natural features at an appropriate scale showing any boundary interpretations recommended by the applicant;
 - 3.2 mapping and description of ecological communities within the *environmental features* identified in 2.1 in the study area on and *contiguous* to the site proposed for *development* or *site alteration* by *qualified professionals* during the appropriate season(s) using the current published version of Ecological Land Classification, with such mapping and description taken to the vegetation type level with dominant, abundant, and significant species keyed to the mapped communities;
 - 3.3 assessment of the quality of vegetation in the study area with reference to successional state, predicted successional pathway, assessment of natural regeneration, habitat specialization, degree of disturbance, presence of pathogens, and presence and extent of invasive plant species using qualitative description as well as quantitative measures

such as the Floristic Quality Assessment Index (FQAI);

- 3.4 a comprehensive inventory, conducted by qualified professionals in the appropriate seasons, of species occurring in the study area, including but not limited to:
 - 3.4.1 vegetation in spring (May), summer (July), and late summer (August-early September), using commonly acceptable sampling and recording methods,
 - 3.4.2 breeding birds (late May to the end of the first week of July), using **Ontario Breeding Bird Atlas** protocols and conventions,
 - 3.4.3 herpetofauna (amphibian breeding season in early spring, March 20 – April 30), and later sightings using currently accepted sampling procedures such as the Environment Canada Marsh Monitoring Protocol, methods approved by species-at-risk recovery teams, and other procedures generally accepted by qualified herpetologists,
 - 3.4.4 fish and other aquatic organisms, especially those used as indicators of environmental quality, using commonly acceptable sampling methods,
 - 3.4.5 fauna observed during fieldwork, including non-breeding or migrating birds, mammals (sightings or tracks), and insects in the **Lepidoptera** and **Odonata**. Winter surveys should be completed with respect to wildlife life stages and habitat requirements for over-wintering habitat (e.g. waterfowl, raptors, deer) potentially occurs,
 - 3.4.6 plants (e.g., Giant Hogweed, Poison Ivy) and animals (e.g., mosquitoes, ticks) likely to cause nuisance and health problems.

In addition, it is recommended that expert local naturalists and residents be consulted with respect to the flora and fauna of the site.
- 3.5 identification of the *ecological, hydrological, hydrogeological, economic, and social functions* of the respective *environmental features* identified pursuant to 3.4 above;
- 3.6 groundwater regime showing groundwater contours and the locations and elevations of monitoring wells, piezometers and test pits, along with a record of the dates and duration of observations; an assessment of the adequacy of the groundwater observations and mapping, and a statement of the spatial and temporal variability of groundwater levels and flows;
- 3.7 existing environmental management plans including council-approved *Watershed Studies*, Master Drainage Plans, Community or Secondary Plans;
- 3.8 apparent impacts of previous *development applications* or *site alteration*, or other land management activities on the identified *environmental features* and *functions*, including alteration of natural topography, draining or filling of wetlands, removal of woodlands, trails, dumping, excavation and fill, grazing, forestry, and invasive plant and animal species; and
- 3.9 other relevant information.
4. A discussion of the proposed *development* and/or *site alteration*, with plans showing existing grades, proposed grades, grade changes with contour intervals not exceeding one metre, and where appropriate, structure elevations, of:
 - 4.1 the proposed *development* or *site alteration* in relation to the *environmental features* and other natural features as delimited by the proponent and confirmed by agencies having jurisdiction, including locations of existing and proposed streets and lots, infrastructure, stormwater management facilities, trails, and, where appropriate, other structures;

- 4.2 reasonable alternatives to the proposal; and
- 4.3 alternative designs and/or methods of carrying out the proposal with less *adverse environmental impact*.
5. A concise description of anticipated direct and indirect impacts to the *environmental features* identified in 2.1 and 3 that may reasonably be expected to result from the proposal, alternatives to the proposal, and alternative methods of carrying out the proposal. The impacts should be discussed in terms of their likelihood of occurrence, anticipated areal extent, reversibility/irreversibility, and anticipated duration. Reference should be made to the definition and examples of *adverse environmental impacts* in the Glossary. Where *fish habitat* is present, the applicant will complete a Risk Assessment Process for *Fish Habitat* in order to identify the risk of development to *fish habitat*.

The above shall include an explanation of the methods and assumptions, and potential errors arising therefrom, used to determine the above-mentioned effects of the proposed development.

6. A comparative evaluation of the alternatives identified in item 4 in terms of anticipated *adverse environmental impacts* and other relative advantages and disadvantages. This will result in selection or confirmation of a preferred alternative.
7. The actions required, in the following order of precedence, to prevent, minimize, or mitigate *adverse environmental impacts* to the *environmental features* resulting from the implementation of the alternative selected in 6. This section shall include detailed recommendations for buffers or other appropriate safeguards around *environmental features*.
8. A discussion of opportunities for *ecological enhancement, restoration*, and long term conservation of natural areas including the conservation, enhancement, or restoration of ecological *linkages* among *environmental features* and other natural features on and *contiguous* to the subject property.
9. A summary consisting of:
- 9.1 A detailed discussion of expected *adverse environmental impacts* on the environmental features in relation to policies and definitions in the ROP, applicable Area Municipal Official Plans, Community Plans, international conventions, the Provincial Policy Statement, Risk Assessment Process for Fish Habitat, council-approved *watershed plans, Comprehensive Environmental Impact Statements*, or other applicable studies. Where good quality natural habitat may be irretrievably altered by the proposed development, this discussion shall also indicate whether habitat of comparable type, quality, or extent which will not be directly affected by the proposed *development* or *site alteration* exists in the vicinity. Where significant features or species within an *environmental feature* may be adversely affected, this discussion shall also indicate whether similar features or another population of the significant species exists in the vicinity and that offsite habitat will not be adversely affected resulting in further reduction of the significant species.
- 9.2 Recommended conditions of *development* approval to
- prevent, minimize, and mitigate identified *adverse environmental impacts* identified in the Environmental Impact Statement,
 - realise opportunities for environmental *enhancement* and/or *restoration*, and

- (c) achieve the objectives of applicable council-approved sub-*watershed plans* or community plans.
This discussion shall assess the adequacy of recommended measures to prevent or mitigate *adverse environmental impacts*, and shall assess the significance of impacts likely to persist after mitigation.
- 9.3 Recommendations for long term management, conservation, *enhancement*, or *restoration* of significant *environmental features* and *functions* on the subject property or which may have to be considered for adjoining lands.
- 9.4 Recommendations for monitoring the site including items/areas of particular concern, meaningful benchmarks, timelines, frequency, targets, and recommendations for a plan to address deviations from desired outcomes in an adaptive management framework.
10. The following appendices:
- 10.1 Species lists of organisms observed in the study area as well as a detailed timeline showing dates when bio-physical information was collected in the study area and the field workers responsible for collection of the data. The above information, along with the species recorded, should be specific to each ecological unit as identified by mapping in the report and should be consistent with the following:
- 10.1.1 The ***Ontario Plant List*** (Newmaster *et al.*, 1998), or subsequent updates, shall be used for all vascular plant species names. Both the scientific and common name shall be given for each species on the plant list. Regional or Provincial lists shall be consulted for the preferred taxonomy and nomenclature for all other organisms.
- 10.1.2 Species used to characterise vegetation communities through the current version of the Ecological Land Classification shall be identified as dominant, abundant, occasional, or rare.
- 10.1.3 While presence is the only requirement for recording common species, most vascular plant species listed on the Region's "Significant Vascular Plant List" shall be further qualified as to precise location, distribution and approximate numbers. Species that are susceptible to collecting (i.e., ***Panax***, ***Drosera***, spp.), or any species considered Vulnerable, Threatened, or Endangered should NOT be qualified in a published appendix. Rather, Regional, Grand River Conservation Authority, and Area Municipal staff should be notified directly of such information. Locations should be defined in NAD83 UTM coordinates or most currently acceptable standards, if possible. Abundance should be expressed using standard scales such as Doman or Braun-Blanquet.
- 10.1.4 Breeding evidence is critical for birds. ***Ontario Breeding Bird Atlas*** protocols and conventions should be followed in both collection and reporting of data for all species. Consult <http://www.birdsontario.org/atlas/atlasmain.html>.
- 10.2 Relevant Ecological Land Classification geo-referenced mapping and datasheets, including those for canopy description and soil moisture regime analysis.
- 10.3 Detailed descriptions of methodologies used to gather field data, model hydrological or hydrogeological regimes (including a water balance), or make assumptions about

other biophysical processes. The above shall include an explanation of the methods and assumptions, and potential errors arising therefrom, used to determine the above-mentioned effects of the proposed development.

- 10.4 A geo-referenced monitoring plan consistent with item 9.4 above.
 - 10.5 A list of agencies and individuals contacted in the preparation of the report, the date of contact, information supplied, and the contacts' addresses, phone numbers and/or e-mail addresses. This must include copies of correspondence with appropriate agencies when a *Threatened or Endangered species*, or other item subject to Provincial or Federal legislation or regulation is identified in the course of fieldwork.
 - 10.6 Bibliography of references cited.
 - 10.7 Current *curricula vitae* of the principal author(s), and a list of other technical staff who contributed to the document.
11. Format of the *E.I.S.*
- 11.1 The *Environmental Impact Statement* shall be printed on 8½ by 11 inch paper, **double-sided to conserve paper and file storage space**. An electronic copy or website where the report is posted shall also be provided.
 - 11.2 Maps up to 11 inches by 17 shall be bound into the report. Larger maps shall be inserted in a pocket inside the back cover of the report.
 - 11.3 The title page shall list the name of the proponent, address and legal description of the subject property, planning file number (i.e., 30T, OP, ZCA), principal author(s) of the report and/or their firm, and the date the report was completed.
 - 11.4 An executive summary shall follow the title page.
 - 11.5 Following the Executive Summary, the *Environmental Impact Statement* shall contain a statement to the effect of whether the report has been edited, by whom, and for what purpose, including normal editing which would occur by the principal author with respect to text prepared by the firm's field staff.
 - 11.6 The *Environmental Impact Statement* shall be signed by the lead author(s) and their firms.

II. Guideline for the Preparation of an Environmental Impact Statement where the Terms of Reference have been Scoped

Regional Official Plan

- 7.G.1 An *Environmental Impact Statement* may be required to identify and evaluate the potential effects of a proposed *development* or *site alteration* on elements of the Greenlands Network, and recommend means of preventing, minimizing or mitigating these impacts, as well as enhancing or restoring the quality and *connectivity* of elements of the Greenlands Network. An *Environmental Impact Statement* may also be used to interpret the boundaries of these elements. The *Province*, Region, Area Municipalities and the Grand River Conservation Authority will co-ordinate the requirements for the preparation of *Environmental Impact Statements*.
- 7.G.4 The following provisions will apply to *Environmental Impact Statements* required by the Region under Policy 7.G.3(b):
- (a) the *Environmental Impact Statement* will be prepared in accordance with the provisions of the Regional Greenlands Network Implementation Guideline;
 - (b) the Region may reduce the scope and/or content of the *Environmental Impact Statement* where the impacts of the proposed *development* or *site alteration* upon an element of the Greenlands Network are expected to be limited in area and/or scope, or where other environmental studies fulfilling the requirements of an *Environmental Impact Statement* have been previously been prepared; . .

Application

The Regional Official Plan provides for a reduction in the scope and/or content of the Terms of Reference of an *Environmental Impact Statement* where the impacts of the proposed *development* or *site alteration* upon an element of the Greenlands Network are expected to be limited in area and/or scope, or where other environmental studies such as *Comprehensive Environmental Impact Statements* or council-approved *watershed studies*, which fulfill some of the requirements of an *Environmental Impact Statement*, have been previously completed.

This guideline will apply in assessing an application for *development* or *site alteration* on lands determined to be within or contiguous to a:

- Landscape Level System (not including Significant Valleys);
- Core Environmental Feature;
- *Environmentally Significant Discharge Area* and/or *Environmentally Significant Recharge Area* that sustains Core Environmental Features; and/or
- *Supporting Environmental Feature* designated by Area Municipalities.

when the content of the required *Environmental Impact Statement* has been scoped pursuant to policy in the Regional Official Plan or an Area Municipal Official Plan.

Purpose

The purpose of this guideline is to ensure appropriate and consistent methods are applied in the preparation of Scoped *Environmental Impact Statements*. The Terms of Reference of a Scoped *Environmental Impact Statement* will focus on areas or issues of particular concern. Subject to applicable policy, scoping is done by the approval agency(ies) in pre-consultation with one another. Applicants are strongly advised not to attempt to scope the Terms of Reference themselves as this could result in the rejection of the Environmental Impact Statement or the requirement for additions or revisions which could cause delays or generate further costs to the applicant.

Once the Terms of Reference have been scoped, consultants are responsible to report and discuss new information that emerges during site investigation which may be relevant to the consideration of the *development application*. This may include, for example, such items as the unexpected discovery of an undocumented groundwater *discharge area*, Regionally significant species of flora and fauna, or other information which increases knowledge about the *environmental feature*, or identifies previously unanticipated potential for *adverse environmental impacts*. Such changes should be reported to staff of the relevant agency(ies) at the earliest opportunity to determine whether the Terms of Reference need to be updated.

Guideline for a Scoped *Environmental Impact Statement*

A Scoped *Environmental Impact Statement* required pursuant to the policies of the Regional Official Plan and/or the Provincial Policy Statement and/or an Area Municipal Official Plan will consist **at a minimum** of the following:

1. A statement of the purpose and rationale of the *application for development or site alteration*;
2. Maps, site plans, and/or recent airphotos at an appropriate scale showing previously documented and newly obtained information on:
 - 2.1 The location of lands affected by the *application for development or site alteration* in relation to elements of the Greenlands Network, as defined in the Regional Official Plan, including but not necessarily limited to the following:
 - 2.1.1 *significant* habitat of *Endangered and Threatened species* identified by the Ministry of Natural Resources,
 - 2.1.2 Provincially Significant Wetlands identified by the Ministry of Natural Resources and other wetlands identified by the Grand River Conservation Authority,
 - 2.1.3 Provincially and Regionally Significant Life Science and Earth Science Areas of Natural and Scientific Interest by the Ministry of Natural Resources,
 - 2.1.4 Environmentally Sensitive Policy Areas designated by the Regional Municipality of Waterloo,
 - 2.1.5 Significant Woodlands,
 - 2.1.6 Environmentally Significant Valley Features,
 - 2.1.7 significant wildlife habitat, as defined by the Provincial Policy Statement and associated technical guidelines,
 - 2.1.8 fish habitat, as defined by the ***Fisheries Act***,
 - 2.1.9 surface water features,
 - 2.1.10 groundwater recharge and/or *discharge areas*,
 - 2.1.11 other natural high quality or unusual *environmental features or functions* such as good representative communities of native species typical of the region, natural corridors, migration staging areas, and deeryards, and
 - 2.1.12 Locally Significant Natural Areas and/or *Supporting Environmental Features* identified by an Area Municipality;
 - 2.2 Ecologically functional natural *linkages* and potential *linkages* among elements of the Greenlands Network;
 - 2.3 Topography - showing the relationship of the proposed *development or site alteration* to natural heritage features;
 - 2.4 Predominant soil series

- 2.5 Groundwater regime (where known);
- 2.6 Regulation Limit (formerly Flood and fill lines);
- 2.7 geological hazards (e.g., shallow bedrock, active faults, karst, old waste deposit sites); and
- 2.8 Other *development applications* known to be in progress which would affect the identified *environmental features*.

The above features may have been identified by the respective agencies. In cases where they may not have been so identified, however, the proponent is required to assess *environmental features* and *ecological functions* in the light of applicable Provincial guidelines or other generally accepted principles.

3. The approved Terms of Reference for the Scoped *Environmental Impact Statement*.
4. Information requested ***pursuant to the approved Terms of Reference*** on any *environmental features* identified in 2.1 on the subject property and on *adjacent* or *contiguous* lands as defined in the Regional Official Plan, Area Municipal Official Plans or secondary plans which is relevant to the items to which the *Environmental Impact Statement* has been scoped. Depending on the approved Terms of Reference, this may include:
 - 4.1 detailed mapping of the *environmental feature(s)* and nearby related natural features at an appropriate scale showing any boundary interpretations recommended by the applicant;
 - 4.2 mapping and description of ecological communities within the *environmental features* identified in 2.1 in the study area on and *contiguous* to the site proposed for *development* or *site alteration* by *qualified professionals* during the appropriate season(s) using the current published version of Ecological Land Classification (ELC), with such mapping and description taken to the vegetation type level with dominant, abundant, and significant species keyed to the mapped communities;
 - 4.3 assessment of vegetation quality in the study area with reference to successional state, predicted successional pathway, assessment of natural regeneration, habitat specialization, degree of disturbance, presence of pathogens, and extent of invasive plant species using qualitative description as well as quantitative measures such as the Floristic Quality Assessment Index (FQAI);
 - 4.4 a comprehensive inventory, conducted by qualified professionals in the appropriate seasons, of species occurring in the study area, including but not limited to:
 - 4.4.1 vegetation in spring (May), summer (July), and late summer (August-early September), using commonly acceptable sampling and recording methods,
 - 4.4.2 breeding birds (late May to the end of the first week of July), using ***Ontario Breeding Bird Atlas*** protocols and conventions,
 - 4.4.3 herpetofauna (amphibian breeding season in early spring, March 20 – April 30), and later sightings using currently accepted sampling procedures such as the Environment Canada Marsh Monitoring Protocol, methods approved by species-at-risk recovery teams, and other procedures generally accepted by qualified herpetologists,
 - 4.4.4 fish and other aquatic organisms, especially those used as indicators of environmental quality, using commonly acceptable sampling methods,

- 4.4.5 fauna observed during fieldwork, including non-breeding or migrating birds, mammals (sightings or tracks), and insects in the ***Lepidoptera*** and ***Odonata***. Winter surveys should be completed with respect to wildlife life stages and habitat requirements for over-wintering habitat (e.g. waterfowl, raptors, deer) potentially occurs,
- 4.4.6 plants (e.g., Giant Hogweed, Poison Ivy) and animals (e.g., mosquitoes, ticks) likely to cause nuisance and health problems.

In addition, it is recommended that expert local naturalists and residents be consulted with respect to the flora and fauna of the site.

- 4.5 identification of the *ecological, hydrological, hydrogeological, economic and social functions* of the *environmental features* identified in 4.4 above;
 - 4.6 groundwater regime showing groundwater contours and the locations and elevations of monitoring wells, piezometers and test pits, along with a record of the dates and duration of observations; an assessment of the adequacy of the groundwater observations and mapping, and a statement of the spatial and temporal variability of groundwater levels and flows;
 - 4.7 existing environmental management plans including council-approved *Watershed Studies*, Master Drainage Plans, Community or Secondary Plans; and
 - 4.8 apparent impacts of previous *development applications* or *site alteration*, or other land management activities on the identified *environmental features and functions*, including alteration of natural topography, draining or filling of wetlands, removal of woodlands, trails, dumping, excavation and fill, grazing, forestry, and invasive plant and animal species; and
 - 4.9 other relevant information.
5. A discussion of the proposed *development* and/or *site alteration* in relation to the *environmental features* as delimited by the proponent and confirmed by agencies having jurisdiction, with plans showing existing and proposed grades with contour intervals not exceeding one metre, and where appropriate, structure elevations of the proposal, including locations of existing and proposed streets and lots, infrastructure, stormwater management facilities, trails, and, other structures;
 6. A concise description of anticipated direct and indirect impacts to the *environmental features* identified in 2.1 and 4 above that may reasonably be expected to result from the proposed *development* or *site alteration*. The impacts should be discussed in terms of their likelihood of occurrence, anticipated areal extent, reversibility/irreversibility, and anticipated duration. Reference should be made to the definition and examples of *adverse environmental impacts* in the Glossary. Where *fish habitat* is present, the applicant will complete a Risk Assessment Process for Fish Habitat in order to identify the risk of *development* and *site alteration* to *fish habitat*. The above shall include an explanation of the methods and assumptions, and potential errors arising therefrom, used to determine the identified effects of the proposed *development* or *site alteration*.
 7. The actions required, in the following order of precedence, to prevent, minimise, or mitigate *adverse environmental impacts* to the *environmental features* resulting from the proposed *development* or *site alteration*. This section shall include detailed recommendations for buffers or other appropriate safeguards around *environmental features*

8. A discussion of opportunities for *ecological enhancement, restoration*, and long term conservation of *environmental features* including the conservation, enhancement, or restoration of ecological *linkages* among *environmental features* and other natural features on and *contiguous* to the subject property.
9. A summary consisting of:
 - 9.1 A detailed discussion of expected *adverse environmental impacts* on the environmental features in relation to policies and definitions in the ROP, applicable Area Municipal Official Plans, Community Plans, international conventions, the Provincial Policy Statement, Risk Assessment Process for Fish Habitat, council-approved *watershed plans, Comprehensive Environmental Impact Statements*, or other applicable studies. Where good quality natural habitat may be irretrievably altered by the proposed development, this discussion shall also indicate whether habitat of comparable type, quality, or extent which will not be directly affected by the proposed *development or site alteration* exists in the vicinity. Where significant features or species within an *environmental feature* may be adversely affected, this discussion shall also indicate whether similar features or another population of the significant species exists in the vicinity and that that offsite habitat will not be adversely affected resulting in further reduction of the significant species.
 - 9.2 Recommended conditions of *development* approval to:
 - (a) prevent, minimise, and mitigate identified *adverse environmental impacts*,
 - (b) realise opportunities for environmental *enhancement* and/or *restoration*,
 - (c) meet the objectives of applicable council-approved sub-*watershed plans* or community plans.This discussion shall assess the adequacy of recommended measures to prevent or mitigate *adverse environmental impacts*, and shall assess the significance of impacts likely to persist after mitigation.
 - 9.3 Recommendations for long term management, conservation, *enhancement*, or *restoration* of significant *environmental features* and *functions* on the subject property or which may have to be considered for adjoining lands.
 - 9.4 Recommendations for monitoring the site including items/areas of particular concern, meaningful benchmarks, timelines, frequency, targets, and recommendations for an adaptive management framework plan to address deviations from desired outcomes in.
10. The following appendices (where such information is required by the Terms of Reference):
 - 10.1 Species lists of organisms observed in the study area while carrying out the study as well as a detailed timeline showing dates when bio-physical information was collected in the study area and the field workers responsible for collection of the data. The above information, along with the species recorded, should be specific to each ecological unit as identified by mapping in the report and should be consistent with the following:
 - 10.1.1 The ***Ontario Plant List*** (Newmaster *et al.*, 1998), or subsequent updates, shall be used for all vascular plant species names. Both the scientific and common name shall be given for each species on the plant list. Regional or Provincial lists shall be consulted for the preferred taxonomy and nomenclature for all other organisms.
 - 10.1.2 Species used to characterise vegetation communities through the current version of the Ecological Land Classification shall be identified as dominant,

abundant, occasional, or rare.

- 10.1.3 While presence is the only requirement for recording common species, most vascular plant species listed on the Region's "Significant Vascular Plant List" shall be further qualified as to precise location, distribution and approximate numbers. Species that are susceptible to collecting (i.e., ***Panax***, ***Drosera***, spp.), or any species considered Vulnerable, Threatened, or Endangered should NOT be qualified in a published appendix. Rather, Regional, GRCA, and Area Municipal staff should be notified directly of such information. Locations should be defined in NAD83 UTM coordinates or most currently acceptable standards, if possible. Abundance should be expressed using standard scales such as Doman or Braun-Blanquet.
- 10.1.4 Breeding evidence is critical for birds. ***Ontario Breeding Bird Atlas*** protocols and conventions should be followed in both collection and reporting of data for all species. Consult <http://www.birdsontario.org/atlas/atlasmain.html>.
- 10.2 Relevant Ecological Land Classification geo-referenced mapping and datasheets, including those for canopy description and soil moisture regime analysis.
- 10.3 Detailed descriptions of methodologies used to gather field data, model hydrological or hydrogeological regimes (including a water balance), or make assumptions about other biophysical processes. The above shall include an explanation of the methods and assumptions, and potential errors arising therefrom, used to determine the above-mentioned effects of the proposed development.
- 10.4 A geo-referenced monitoring plan consistent with item 9.4 above.
- 10.5 A list of agencies and individuals contacted in the preparation of the report, the date of contact, information supplied, and the contacts' addresses, phone numbers and/or e-mail addresses. This must include copies of correspondence with appropriate agencies when a *Threatened or Endangered species*, or other item subject to Provincial or Federal legislation or regulation is identified in the course of fieldwork.
- 10.6 Bibliography of references cited.
- 10.7 Current *curricula vitae* of the principal author(s), and a list of other technical staff who contributed to the document.
11. Format of the Scoped *Environmental Impact Statement*
- 11.1 The scoped *Environmental Impact Statement* shall be printed on 8½ by 11 inch paper, ***double-sided to conserve paper and file space***. An electronic copy or website where the report is posted shall also be provided.
- 11.2 Maps up to 11 inches by 17 shall be bound into the report. Larger maps shall be inserted in a pocket inside the back cover of the report.
- 11.3 The title page shall list the name of the proponent, address and legal description of the subject property, planning file number (i.e., 30T, OP, ZCA), principal author(s) of the report and/or their firm, and the date the report was completed.
- 11.4 An executive summary shall follow the title page.

- 11.5 Following the Executive Summary, the *Environmental Impact Statement* shall contain a statement to the effect of whether the report has been edited, by whom, and for what purpose, including normal editing which would occur by the principal author with respect to text prepared by the firm's field staff.
- 11.6 The scoped *Environmental Impact Statement* shall be signed by the lead author(s) and their firms.

III. Guideline for Interpreting the Boundaries of *Environmental Features*

Regional Official Plan

- 7.A.6 Interpretation of the boundaries of *Landscape Level Systems* and *Core Environmental Features*, as required to support the review of *development applications*, will be achieved through the completion of *Environmental Impact Statements* or other appropriate studies in accordance with the policies in Section 7.G.
- 7.A.7 Boundary interpretations not consistent with the Technical Appendix for *Landscape Level Systems* and *Core Environmental Features* must be approved by Regional Council, in consultation with the *Province*, Area Municipalities, the Grand River Conservation Authority and other stakeholders.
- 7.A.8 Boundary interpretations not generally in conformity with the Greenlands Network as shown on Map 4 will require an amendment to this Plan.

1. Application

This guideline will apply in interpreting the boundaries of *Core Environmental Features* and *Supporting Environmental Features* designated in the Regional Official Plan and Area Municipal Official Plans respectively, but excluding Significant Habitat of *Endangered or Threatened Species*, which is identified by the *Province*.

2. Purpose

The preliminary delineation of *environmental features* is usually undertaken through air photo interpretation. When *development* or *site alteration* are proposed, boundaries need to be more precisely interpreted through site-specific field work preparatory to technical studies such as *Environmental Impact Statements*, draft plans of subdivision, and site plans. The purpose of this guideline is to:

- a. guide interpretation of the small scale mapping of *Core Environmental Features* shown on Map 4 in the ROP and at a larger scale in the ROP Environmental Technical Appendix (1:5000 to 1:1000), or as may be required in support of an *application* for *development* and/or *site alteration*;
- b. outline a consistent basis for delineating existing *Core Environmental Features* and *Supporting Environmental Features* in Environmental Impact Statements, and other newly identified features which may be identified in the future;
- c. document a repeatable process for producing credible GIS-based mapping, which can be used as a long-term monitoring tool; and
- d. develop a common understanding among agency staff, environmental advisory committees, and *development* proponents regarding the technical aspects of natural area boundary interpretation.

3. Principles

The boundaries of *Core Environmental Features* and *Supporting Environmental Features* can be

defined by various means including, vegetation features, wetland boundaries, or topography. For the purposes of implementing the policies of the Regional Official Plan, boundary interpretations are guided by the following principles:

- 3.1 The establishment of credible boundary interpretations is dependent on scale and resolution, both of the source information and the mapping. The working scale for this exercise is generally in the range of 1:5000 to 1:2000. Mapping of elements of the Greenlands Network in the ROP is at a scale of 1: 184,549 (or 1 centimetre = 2 kilometres). Mapping of Environmentally Sensitive Policy Areas (ESPAs) and Provincially Significant Wetlands in the 1995 Regional Official Policies Plan was at a slightly smaller scale of 1:250 000. ESPA mapping in the 1985 Technical Appendix was at 1:10 000.
- 3.2 In defining most *Core Environmental Feature* or *Supporting Environmental Feature* boundaries, consideration must be given to land uses on both sides of the proposed boundary, as these affect the *ecological functions* of the *environmental feature*. Boundaries should reflect the most abrupt change in land use or habitat type, while recognising that, in reality, the boundary will always be a continuum from an ecological perspective. (This may not apply to ESPAs or *Environmentally Significant Valley Features* defined primarily on earth science criteria).

An *environmental feature* needs to be evaluated as a continuous unit containing natural habitats of different types and varying quality. If there is variation around the periphery of an *environmental feature* (i.e. where a wetland or prairie remnant extends beyond the dripline of existing mapped limits of an ESPA or *Significant Woodland*), the larger area will be determined to represent the boundary. In some instances, a topographical contour may be interpreted to be the most appropriate boundary of an *environmental feature*.

- 3.3 Previous site-specific boundary determinations by the Ecological and Environmental Advisory Committee and/or Regional Council must be respected. However, recognising that changing land uses and/or natural succession over time may have rendered some of these determinations obsolete, some of them may need to be revisited at the time *development* or *site alteration* is proposed.
- 3.4 Although the digital format of the boundary mapping implies a high degree of precision, the boundaries should still be regarded as approximate and therefore subject to further site-specific interpretation based on field work carried out in support of *development applications* or in other circumstances.

4. Guidelines for Interpreting Boundaries of *Environmental Features*

- 4.1 **“Bays” and “Inlets”**: Active cultivation and cropping (including lawns and similar intensive uses) on the periphery of a *Core Environmental Feature* or *Supporting Environmental Feature* are excluded regardless of the size or shape of the intrusion. (Exception: ESPAs or Environmentally Significant Valley Features designated primarily on earth science criteria may include agricultural or other land uses that would otherwise be excluded).
- 4.2 **“Islands”**: Isolated patches of land within the interior of a *Core Environmental Feature* or *Supporting Environmental Feature*, which are experiencing ongoing active land use not consistent with the natural habitat of the designation, are generally excluded if larger than one hectare. Smaller “islands” are included. Subsequent permanent abandonment of active human use or *ecological restoration* would qualify the “island” for inclusion.

- 4.3 **Dwellings**: The previous rules apply to dwellings within *Core Environmental Features* or

Supporting Environmental Features. Generally, if there is lawn frontage on the road, the house and yard are excluded. Otherwise, they are treated as “islands”.

- 4.4 **Roads:** Roads that divide a *Core Environmental Feature* or *Supporting Environmental Feature* are excluded where they pose a significant barrier to the movement of wildlife. In some cases, laneways that connect “islands” to the surrounding land use may be excluded. Roads without shoulders and little-travelled roads are generally included. In no case is a road or lane with a continuous tree canopy excluded.
- 4.5 **“Peninsulas”:** Projections that differ significantly in habitat character from the main body of a *Core Environmental Feature* or *Supporting Environmental Feature* are excluded unless they appear to provide some significant supporting *ecological function*. Thus, a small wetland contiguous to an upland forest would probably be included, whereas a contiguous fence-row would not (however, note the linkage criterion below).
- 4.6 **“Ecologically Functional Linkages”:** Where habitats of marginal quality abut a *Core Environmental Feature* or *Supporting Environmental Feature*, they may be included where they facilitate the movement of wildlife (i.e., the *linkage* criterion in ROP Policy 7.C.5(c)(iii).
- 4.7 **Plantations:** Plantations projecting out from *Core Environmental Features* or *Supporting Environmental Features* are generally excluded unless it can be demonstrated that the plantation provides habitat for Regionally significant species or an important buffer function for sensitive natural habitat within the area. If, however, exclusion of a plantation would increase the perimeter-to-area ratio of the *environmental feature* (by creating a “bay”), it is included. Where they occur in the interior of *Core Environmental Features* or *Supporting Environmental Features*, plantations are always included.
- 4.8 **Old Fields:** Long-abandoned fields or pastures on the margins of *Core Environmental Features* or *Supporting Environmental Features* often consist of successional habitats that may fulfill an important supporting role to the *environmental feature* or contribute significantly to its indigenous biodiversity. In either case, they would normally be included, although field work may be necessary in order to verify the value of the habitat. Where old fields occur in the interior, or serve to reduce the perimeter-to-area ratio of the *environmental feature*, they are always included.

5. Procedure for the Delineation of *Environmental Features*

- 5.1 **Wetland Boundary Delineation:** Wetland boundaries should be interpreted by qualified professionals in accordance with the most recent edition of the Ontario Wetland Evaluation System and GRCA Wetland Evaluation Protocol. Such interpretation should normally be carried out in the field by a qualified professional on behalf of the applicant for proposed *development* or *site alteration*, and subsequently verified by Ministry of Natural Resources or GRCA staff, as required.
- 5.2 **Woodlands and other Upland Habitats:** The boundaries of woodlands shall generally be interpreted to coincide with the *dripline* of the trees and/or indigenous shrubs forming the outer perimeter of the woodland. This may be augmented by a metre to accommodate the root zone in areas where the adjacent lands have not been regularly ploughed. The initial staking of the boundary shall be carried out by a *qualified professional* on behalf of the applicant for proposed *development* or *site alteration*, and subsequently verified by Regional and/or Area Municipal staff, as required.

5.3 Earth Science Features: The boundaries of earth science features shall be interpreted by a *qualified professional* on behalf of the applicant for proposed *development* or *site alteration*, and subsequently verified by Ministry of Natural Resources, Regional, and/or Area Municipal staff, as required.

IV. Guideline for Determining Buffers around *Environmental Features*

Regional Official Plan

7.B.9 Within the Environmentally Sensitive Landscapes designation, *development applications* submitted in accordance with the policies in Chapter 6 to:

- (a) establish or expand *recreational and tourism uses* or *rural institutional uses*;
- (b) create a new lot, or permit a lot addition, for a *recreational and tourism use* or *rural institutional use*;
- (c) permit the minor intensification of *existing* industrial, commercial, recreational and/or institutional uses, including minor changes in the uses thereof;
- (d) permit new *agriculture-related uses* or *secondary uses*;

may be considered for approval subject to the following additional criteria: . . .

- iii) the *development* will be buffered from existing natural features by an appropriate width of natural vegetation, and will otherwise facilitate the enhancement or restoration of new areas and/or corridors and *linkages*;

7.C.10 An *Environmental Impact Statement* submitted in accordance with Policies 7.C.8 or 7.C.9 will identify appropriate buffers to Core Environmental Features to the satisfaction of the Region, in consultation with Area Municipalities and the Grand River Conservation Authority. Such buffers will not only serve to protect Core Environmental Features from *adverse environmental impacts* but will also provide opportunities for net *habitat enhancement* to enhance or, wherever feasible, restore the *ecological functions* of the Core Environmental Feature. The location, width, composition and use of buffers will be in accordance with the approved *Environmental Impact Statement, with buffers being a minimum of 10 metres as measured from the outside boundary of the Core Environmental Feature and established and maintained as appropriate self-sustaining native vegetation.*

1. Application

This guideline will apply in assessing an application for *development* or *site alteration* within or contiguous to

- a *Landscape Level System* (not including Significant Valleys), or
- a *Core Environmental Feature*.

Area Municipalities may also apply them to determine buffers around *Supporting Environmental Features*. It will not apply to determining buffers around the Significant Habitat of *Endangered or Threatened Species*, however, as such buffers are determined by the *Province*).

2. Purpose

The purpose of this guideline is to inform sections of *Environmental Impact Statements* dealing with the determination of buffers around *environmental features*. Policy 2.1.6 of the 2005 Provincial Policy Statement directs municipal approval authorities to prevent negative impacts to the natural features or *ecological functions* of designated *environmental features* that might be caused by new *development* or *site alteration* on *adjacent lands*. To this end, Regional Official Plan Policy 7.C.10 requires a minimum buffer of ten metres around a *Core Environmental Feature*, and Policy 7.B.9 requires that natural features within *Environmentally Sensitive Landscapes* be buffered from new *development*. These requirements are very general, however, and are not intended to promote a rigid approach to buffer delineation. The policy directions are also not intended to override recommendations in council-approved watershed studies or Comprehensive *Environmental Impact Statements* for wider buffers. In general, however, the ultimate width and configuration of buffers

needs to be determined in a context-sensitive fashion. This guideline sets out matters to be considered in an *Environmental Impact Statement* when a buffer is required.

3. Rationale for Buffers

Buffers help protect the *ecological integrity* of *environmental features* from *adverse environmental impacts*. As such, they may therefore be something of a functional extension of the features. Effective buffers must be based upon the relationship between an *environmental feature* and *contiguous* lands proposed to undergo *development* and/or *site alteration*. This involves identifying lands which help maintain the *ecological functions* and *ecological integrity* of the *environmental feature*. For example, *contiguous* lands that contribute groundwater or surface flows or trap sediment before it enters wetlands or streams would perform buffer functions. Buffers may also include upland grassland, waterfowl or turtle nesting habitat, or foraging areas for amphibians (Burke, 1995; Canadian Wildlife Service, 2004). Buffers attenuate a range of abiotic and biological “edge effects,” some of which are summarised in Table 1.

Table 1: Edge Effects

EDGE EFFECT	IMPACTS
Abiotic effects	Changes to forest microclimate, including changes in wind velocity, temperature, relative humidity
	Increased nutrients
	Changes in soil chemistry
	Modified hydrological regimes, i.e. Increase or decrease in flows
	Introduction of rubbish
	Increased pedestrian access resulting in greater disturbance
Direct biological effects	Changes in vegetative structure and composition
	Increase weed diversity and abundance
Indirect biological effects	Increase opportunities for aggressive fauna
	Changes in animal behaviour
	Increased predation

(Source: Adapted from Brisbane City Council, 2003)

A buffer can be designed to prevent or minimise a variety of edge effects on an *environmental feature* by

- filtering out nutrients or contaminants before they enter a wetland or watercourse;
- attenuating noise);
- blocking artificial lighting, or the sight of adjacent developed lands;
- reducing direct human intrusion from the outside through edge treatments such as fences and appropriate plantings;
- accommodating transitional grading between an *environmental feature* with irregular native topography and a graded *development* area;
- containing buried linear infrastructure or portions of stormwater management facilities; and
- providing for the alignment of community trails outside rather than within *environmental features* in order to reduce impacts to *ecological integrity* and also enhance human safety.

4. Principles to Guide Buffer Design

The section of an *Environmental Impact Statement* dealing with buffers should demonstrate how the following three principal objectives are being met.

4.1 Protection of *environmental features* from *adverse environmental impacts* originating on *contiguous* lands approved for *development* or *site alteration*

Objective: To protect the *ecological integrity* of an *environmental feature*, including the habitat of *significant* species of concern, from *adverse environmental impacts*, a buffer should be designed to:

- mitigate edge effects by separating post-*development* land uses from an *environmental feature*;
- maintain the habitat of *significant* species, other sensitive habitats, and *hydrological functions* of the *environmental feature*;
- retain natural catchments of wetlands, ponds, and watercourses within *environmental features* in order to maintain their *hydrological functions*;
- provide upland breeding and foraging habitat for organisms found within wetlands in the *environmental feature*;
- prevent the entry of sediments, nutrients, pesticides, and fertilizers into *environmental features*;
- be continuous, to the extent feasible, particularly along riparian corridors;
- shade watercourses and thereby moderate thermal impacts; *and*
- prevent the movement of invasive non-indigenous species from landscaped areas into *environmental features*.

4.2 Transition between *new development* or *site alteration* and *environmental features*

Objective: To create an intermediate zone between new *development* and/or *site alteration* and a residual *environmental feature*, a buffer should:

- allow for transitional grading (if required) between permitted new *development* and/or *site alteration* and natural topography which is to be maintained within and *contiguous* to *environmental features*;
- be supplemented by building setbacks at least as wide as the potential height of trees, and as wide as the recommended buffer, along the edge of the *environmental feature*;
- control access to *environmental features* by demarcating adjacent property boundaries with fences, bollards, and/or “living fences;”
- prevent encroachments of lawns and gardens and dumping of refuse into *environmental features*;
- require directional exterior lighting on adjacent land uses to shine away from the *environmental feature*;
- accommodate public trails rather than align them within an *environmental feature*, provided this is supported through review of an *Environmental Impact Statement* which balances the need to prevent or minimise impacts to the *ecological integrity* of the *environmental feature* with the obligation of the trail operator to promote the safety of trail users and achieve an appropriate trail network design. In such cases, a buffer would need to be wider than the minimum ten metres.

4.3 Opportunities for net *ecological enhancement* or wherever feasible, for *restoration* of the *ecological functions* of the *Core Environmental Feature*.

Objective: To improve the form and function of an *environmental feature* and enhance its *ecological integrity*, a buffer should:

- improve the configuration of the *environmental feature* by reducing the perimeter-to-area ratio by filling in gaps and consolidating linkages;

- enhance *connectivity* for wildlife movement, where feasible, by connecting nearby disjunct *environmental features* or other natural features, by incorporating hedgerows, or by installing eco-passages where a buffer is interrupted by a road (if this would not exacerbate mortality);
- use locally appropriate *native species* reflective of historic vegetation communities and of varying successional stages to complement habitat functions of the *environmental feature* (e.g., upland deciduous forest species around wetlands); and
- provide opportunities for public education/interpretation of *environmental features* and *functions*

5. Design of Buffers

The location, width, composition and use of buffers shall be determined through the completion and review of an *Environmental Impact Statement*. Buffers shall be **a minimum** of 10 metres measured from the outside boundary (i.e., dripline or wetland boundary) of the *environmental feature* as interpreted using the **Guideline for Interpreting the Boundaries of Environmental Features**. Wider minimum buffers will be delineated where previously recommended in an approved sub-watershed study or Comprehensive *Environmental Impact Statement*, or if required by the policies of another approval agency.

Scientific literature indicates that standard buffer widths do not always reflect the requirements of individual *environmental features* and that the resulting buffers are often too small to provide adequate protection (Semlitsch & Bodie, 2003). This guideline is intended to inform the design of context-sensitive buffers for *Core Environmental Features* and *Supporting Environmental Features*. It seeks to integrate:

- changing land use and *development* patterns on *contiguous* lands;
- physical and topographical characteristics of the *environmental feature* and *contiguous* lands;
- locally-occurring *significant* species and their habitat requirements;
- ecological interactions between the *environmental feature* and *contiguous* lands where *development* or *site alteration* are proposed;
- intensity, frequency, and duration of potential stressors; and
- design options for buffers.

While it may not be possible to eliminate all edge effects, appropriate delineation, design, and maintenance of buffers can reduce their impact. Table 2 lists potential edge effects, and identifies suggested buffer widths to prevent, minimise or mitigate them. If the buffer recommended in an *Environmental Impact Statement* differs significantly from the recommended value, this would need to be justified with reference to relevant scientific literature or by the professional opinion of a *qualified professional*.

While Policy 7.C.10 specifies a minimum buffer width, consideration should also be given to creating buffers of variable width and shape (Castelle, 1994). This can afford greater buffer protection to particularly sensitive features such as *significant* vernal ponds which need their entire surface catchment areas protected from *development* or *site alteration*. Varying the width can also accommodate highly irregular topography and/or result in better design of adjoining *development* by smoothing out what would otherwise be a line mirroring the irregular boundary of an *environmental feature*.

Table 2: Range of Edge Effects and Suggested Buffer Widths

Stressor	Suggested buffer width	Reference	Notes
Herbicide drift from agricultural lands	>6 m to 9 m Strip at edge of cultivated fields	Boutin and Jobin, 1998.	Cites other studies suggesting 5 m to 10 m.
Nitrate	16 m to 104 m	Basnyat <i>et al.</i> , 1999.	Objective was >90 percent nitrate removal.
Non-point source agricultural pollutants	16.3 m grass/woody strip (riparian)	Lee <i>et al.</i> , 2003.	Removed >97 percent of sediment, narrower (7 m) grass provided some benefits.
Residential stormwater	15 m; 23 m to 30 m on slopes greater than 12 percent	Woodard and Rock, 1995.	Groundcover type also very important.
Urban cats	190 m	Haspel and Calhoun, 1991.	Predation rates on wildlife variable.
Lawn-related (e.g., wood piles, composting)	19 m to 38 m	Matlack, 1993.	Fencing may achieve same results in less width.
Recreation-related (e.g., camping, hacked trees)	67 m to 130 m	Matlack, 1993.	
Human disturbance on nesting Great Blue Herons	100 m	Rodgers and Smith, 1995. Erwin, 1989.	Flush distance was 32 m plus 5.5 m standard deviation, plus 40 m to mitigate antagonistic behaviour.
Introduction of artificial nocturnal light levels	N/A - Species specific response dependent on a number of factors such as type of light, intensity, duration.	Outen (2002)	Review of the literature identifies impacts on mammal, bird, bat, fish, amphibian, insect behaviour.

(Source: adapted from Canadian Wildlife Service, 2004, Outen, 2002)

V. Guideline for Determining *Linkages*

Regional Official Plan

- 7.E.6 The Region, Area Municipalities, Grand River Conservation Authority and other stakeholders will identify *linkages* through *watershed studies*, Natural Heritage Inventories, *Environmental Impact Statements* or other appropriate studies. These areas are intended to provide opportunities for plant and animal movement among *environmental features*, support hydrological and nutrient cycling, and contribute to the overall *ecological integrity* of the Greenlands Network.
- 7.E.7 Area Municipalities will require the incorporation of any *linkages*, identified in accordance with Policy 7.E.6, into the design of new *development* to maintain, enhance or, wherever feasible, restore *linkages* among *environmental features*.
- 7.E.8 The Region will enhance *linkages*, where appropriate, by restoring natural habitat on lands owned by the Region. The Region encourages the naturalization of inactive sections of parks and open space areas under the jurisdiction of other agencies and in private ownership, wherever appropriate, to enhance *linkages*.

1. Application

These guidelines will apply in assessing an application for *development* or *site alteration* or a stewardship proposal that is within or contiguous to:

- a Landscape Level System (not including Significant Valleys), or
- a Core Environmental Feature.

Area Municipalities may also apply them to identify and design *linkages* associated with *Supporting Environmental Features*. They will not apply to identifying and designing *linkages* affecting the Significant Habitat of *Endangered or Threatened Species*, however, as such *linkages* are determined by the *Province*).

2. Purpose

The purpose of this guideline is to ensure that appropriate *linkages* among *environmental features* are identified, maintained, or established in accordance with the 2005 Provincial Policy Statement and Regional Official Policies Plan. It is the role of *watershed studies*, Natural Heritage Inventories, *Environmental Impact Statements* or other appropriate studies to identify ecological linkages. This guideline identifies a variety of means to prevent, minimize and mitigate the fragmentation of the Greenlands Network and other potential *adverse environmental impacts* resulting from *development* and *site alteration contiguous* to *environmental features*. It will also guide efforts to *enhance* and *restore* ecological *linkage* functions and contribute to the *ecological integrity* of natural areas within a landscape.

3. Rationale for *Linkages*

Essentially, a *linkage* is an area of natural habitat within a *landscape matrix* of agricultural fields, urban development, infrastructure, and other land uses that helps connect separated *environmental features* and other natural habitat features. The scientific literature has for many years shown that, in general, maintaining *connectivity* among patches of natural habitat helps ensure better functioning of individual ecosystems. *Linkages can* facilitate the movement of indigenous organisms among what would otherwise be isolated habitat patches. This enhances or maintains the viability of populations of indigenous species in the habitat patches by conserving the potential for genetic variability and allowing populations of indigenous species to meet their habitat needs, disperse, and re-colonise *environmental features* where those species had been extirpated.

Linkages function on multiple scales, and typically vary in width and length as well as structure due to plant species composition (Dougan & Associates, 2005). In the context of the Greenlands Network, *linkages* provide *connectivity* and sufficient habitat to sustain local populations of indigenous species by facilitating their movement among both *Core Environmental Features* and *Supporting Environmental Features*. *Linkages* can, however, provide *ecological functions* beyond simply connecting fragmented habitat patches. *Linkages* can provide valuable feeding and breeding habitat for smaller species in their own right, as well as perform important land use planning functions such as serving as ecological buffers along streams, headwaters, and groundwater recharge areas, or even accommodating recreational trails and other amenities, where appropriate (Hess and Fischer, 2001).

4. Principles for Identifying and Designing *Linkages*

4.1 Ecological Context

Understanding the context of *environmental features* and *ecological functions* at the landscape scale is the essential first step in assessing landscape *connectivity*. This permits the identification of *linkages* to be retained and *enhanced* or the delineation of new ones to be *restored*. The following should be assessed in the *Environmental Impact Statement*:

4.1.1 The present *landscape matrix*:

- landscape patterns and features (topographical and hydrological);
- extent and pattern of principal land use(s) of the *landscape matrix* (e.g., rural, urban, extraction, infrastructure);
- relative size and distribution of natural areas;
- nature and degree of fragmentation; and
- patterns of *connectivity* among environmental features and other natural features.

4.1.2 Local *biodiversity*

- diversity and distribution of natural habitat types in relation to landscape patterns, features, and land uses;
- prevalent *native species*;
- ecological integrity of habitats;
- the presence and distribution of *native species* of conservation concern in a landscape;
- the habitat requirements at various stages in the life of the *significant species*; and
- nature of ecological relationships and existing movement patterns among the *environmental features* and other natural features of the landscape.

4.1.3 *Connectivity* Assessment

Before determining whether existing *linkages* are to be retained or enhanced, or whether new ones need to be re-created, the following must be considered:

- Are existing *linkages* sufficient to maintain *connectivity* under present conditions?
- Will the proposed *development* and/or *site alteration* result in the weakening or loss of *connectivity* by isolating *environmental features* or other natural features?

If existing *linkages* need to be *enhanced* or new ones re-created,

- What is the scale at which the *linkage* is to function, (i.e., landscape scale to a relatively small part of a landscape between two *environmental features*)?

- Which *environmental features* or other natural features are to be connected by the linkage?
- Is there an ecological relationship among the features to be connected?
- For which species are the *linkages* being maintained or re-created, and what is the nature of their need to migrate from one area of natural habitat to another?
- Is there compatible habitat for target species within the destination area?
- Will creating a *linkage* to an *environmental feature* jeopardise its *ecological integrity* by facilitating the introduction of predators or pathogens where they are not currently present?
- Can existing *linkages* be enhanced or must new connections be re-created?
- Are there linear landscape features such as valleylands, riparian areas, utility corridors, and landforms such as escarpments, moraines, eskers, glacial meltwater channels, and the edges of relatively uncultivated agricultural lands which may have relief, terrain, soil, drainage or other characteristics that discourage intensive uses where *linkages* can be aligned?
- What is the nature of the *landscape matrix* that the *linkage* must cross (i.e., urban area, agricultural fields, or transportation corridors)?
- Are there physical barriers to the movement of animals and plants (e.g., major roads or urban areas) due to urban use, resource extraction, or construction of linear transportation infrastructure, and if so, can passages be created over or under them?

4.2 Design Guidelines for *Linkages*

Linkages must be ecologically functional. They must meet the movement patterns and requirements of identified species or groups of species. To the extent feasible, Environmental Land Classification (ELC) mapping and a comprehensive list of *native species* inhabiting the locality should inform the design in terms of identifying particular species and their various habitat and movement needs. Nevertheless, where such locally-specific information is not available, a precautionary approach should be taken. *Linkages* should be conserved or created with respect to the more vulnerable or conservative species (i.e., with a Coefficient of Conservatism of 8-10) documented in an area (MNR, 2010:148).

The alignment, width, species composition, and continuity of a linkage must accommodate the ecological function(s) it is intended to support.

4.2.1 Alignment

The alignment of a linkage is a primary determinant of its effectiveness. In connecting environmental features, *linkages* should be reasonably direct in order to minimise the distance vulnerable organisms have to travel, and to reduce edge effects (Environment Canada, n.d.).

The type and pattern of *connectivity* contributes to habitat quality (Pickett and Cadenasso 1995, Jordán 2000). Providing multiple linkages among *environmental features* enhances *connectivity* by:

- providing greater opportunities for movement (Figure 2).
- embodying a precautionary approach, by enabling the system to retain overall *connectivity* in the event a particular linkage is interrupted by future activities or natural events (MNR, 2010: 148).

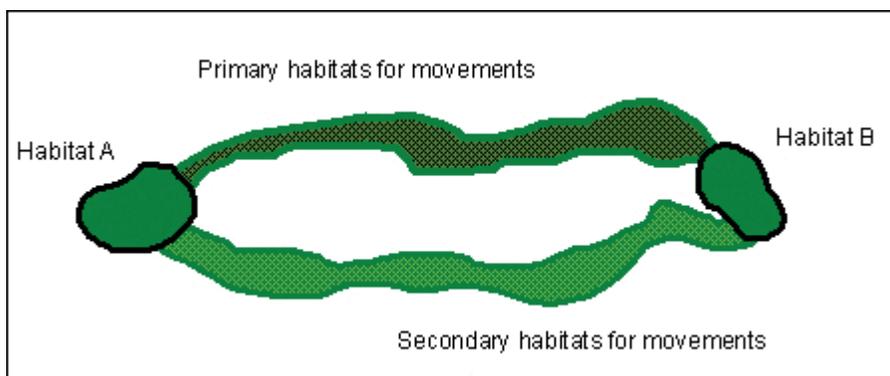


Figure 2: Increased movement options provided by multiple connections (Environment Canada, n.d.)

Linkages and corridors need to be designed to maximize the ability of plants and animals to use them.

- *Linkages* are best aligned along existing natural corridors which follow linear landscape features (e.g., valleys, stream corridors, escarpments, moraines, eskers, and glacial meltwater channels), or along linear cultural features such as utility corridors or along the edge of uncultivated farmland.
- Longer *linkages* should contain ‘nodes’ of compatible habitat which can serve as a destination or temporary refuge habitat.
- Some animals will disperse along established routes and will learn to use newly created *linkages* while other species may disperse randomly.
- To increase the probability that animals will locate *linkages*, they should be designed with a funnel shape at either end to maximize the “contact surface” between the *environmental features* and the *linkage*. (M.N.R., 2010: 150)
- *Linkages* should be a suitable length for the animals for which they are designed. (See table 4.1).

Table 4.1 Optimal Linkage Length Requirements of Different Groups of Wildlife: Examples from the Literature.

Linkage “Type” (Source)	Target Species or Species Group	Sizes / Distances	Comments
<i>Distances travelled between environmental features</i>			
Wetland – Upland Corridor (Helferty 2002)	Amphibians	up to 1 km between wetland and terrestrial habitats	Terrestrial habitat must be naturally forested, but corridors may be open or semi-wooded fields.
Wetland – Upland Corridor (Semlitsch and Bodie 2003)	Amphibians Reptiles	159 – 290 m 127 – 289 m	Range of distances traveled between wetland and terrestrial forested habitats.
Wetland – Upland Corridor (Calhoun and Klemens 2002)	Amphibians	152 – 1510 m; salamanders at the lower end of this range and frogs at the upper end	Distances traveled between isolated wetlands and between wetlands and upland forests.
Terrestrial Corridor (Merriam 1991)	Eastern Chipmunk	20 – 460 m; most frequent usage in the 20 40 m range	Range of distances traveled between isolated upland forests; 90% via wooded linkages.

(Source: Adapted from Dougan & Associates, 2005)

4.2.2 Width

Width is one of the most important design considerations as it generally correlates with the quality and effectiveness of *linkages* (Fleury and Brown 1997; Canadian Wildlife Service, 2004).

Unfortunately, there is a paucity of quantitative information on the ideal width of linkages, and available data vary from region to region (Environment Canada, n.d.). Moreover, optimal widths vary between and within taxonomic groups (see Table 4), site specific habitat structure and quality, the nature of the *landscape matrix*, and human use patterns (Adams and Dove 1989).

Table 4.2 Optimal Linkage Width Requirements of Different Groups of Wildlife: Examples from the Literature.

Linkage "Type" (Source)	Target Species or Species Group	Width	Comments
Stream Corridor (Rudolph and Dickson 1990)	Herpetofauna & Other Vertebrates	at least 30 m width on either side of the stream; more if adjacent landscape is cleared.	The corridor should have mature trees.
Stream Corridor (Burbrink et al. 1995)	Herpetofauna	100 m width on either side of the stream + require habitat heterogeneity outside corridor	Wider corridor not needed if upland woodlands found nearby.
Stream Corridor (Croonquist and Brooks, 1993) (Spackman and Hughes, 1995)	Breeding Birds	at least 25 - 175 m width on either side of the stream.	25 m provided some dispersal & breeding opportunities; 125 m forested corridor supported full complement of bird communities
Stream Corridor (Mactans et al. 1996)	Resident Juvenile Birds	at least 100 m width on either side of the stream	This width facilitated movement of juveniles.
Hedgerows / Fencerows (Wegner and Merriam, 1979)	Resident & Migrating Birds Small Mammals	not available	These groups readily moved along fencerows connecting isolated woods in an otherwise agricultural landscape.
Not specified (Fleury and Brown 1997)	Based on review of corridor width needs for birds	4 – 90 m	

(Source: Adapted from Dougan & Associates, 2005)

In the absence of clear standards, some general principles can be extrapolated from the literature:

- The longer the *linkage*, the wider it should be in order to provide habitat to organisms that take more than a short time to transit the *linkage* (Diamond et al. 2002; MNR, 2010:148);
- *Linkages* designed to function at the landscape scale may be greater in width (several hundreds of metres or more) and more generalized relative to local scale or site scale connections (MNR, 2010: 148);
- A *linkage* should be wide enough to shelter vulnerable animal species from predators, allow for movement by multiple species, provide nesting and feeding opportunities for slower moving groups of wildlife groups, and not function as a trap (Forman 1995; Spackman and Hughes 1995; Fleury and Brown 1997);
- In general, a *linkage* that is continuously 100 metres wide allows for the movement of many species, but not breeding or feeding (Environment Canada *et al.* 1998; Forman 1995);

- Corridors along watercourses are recommended to be a minimum of 30 metres of naturally vegetated habitat on either side.
- Width determines the quantity and configuration of forest interior habitat and determines the extent of edge effects. Forest *linkages* often have a high ratio of edge habitat to interior habitat. The wider the *linkage*, the better it can provide suitable habitat for forest-interior species as well as reduce mortality risks. (Environment Canada, N.D.);
- Even narrow *linkages*, such as fencerows connecting woodlands, have been observed to relieve the isolating effects of fragmented landscapes as well as provide temporary habitat for migrating birds and small mammals (Wegner and Merriam 1979; Merriam 1991; Hess and Bay 2000; Aude et al. 2004);

Based on these principles, the Canadian Wildlife Service (2004) has provided guidelines to the effect that *linkages* to facilitate species movement should be a minimum of 50 to 100 metres wide. However, there is no standard width as *linkages* to accommodate breeding and feeding habitat must be sized according to target species requirements (Canadian Wildlife Service, 2004). Further, the use of any one single species (such as “umbrella” or “keystone species”) as a reference cannot ensure conservation of all co-occurring species. It is best to adopt a multi-species strategy based on systematic selection procedures that meet the needs of all species present (Roberge and Angelstam 2004; Fischer et al. 2004).

4.2.3 Species Composition

In addition to width, the species composition and physical structure of the linkage determines its quality and effectiveness. Birds, small, medium, and large mammals all have different requirements for movement and cover. Vegetation in *linkages* must provide food, cover, and resting areas suitable for target species, particularly those that are smaller or that move more slowly. They should also not be subject to excessive pressure from human activities (Canadian Wildlife Service, 2004; Environment Canada (n.d.). Individual species have specific requirements of *linkages*. For example, a *linkage* connecting salamanders’ core forest habitat to wetland breeding ponds may need to be moist woodland habitat with abundant litter and woody debris. While vegetation composition in the *linkage* should be generally comparable to that in the nodes it connects, there should also be a degree of heterogeneity along the linkage. This is particularly important for species of herpetofauna (Burbrink et al. 1995).

4.2.4 Continuity

Fragmentation can diminish the quality and effectiveness of *linkages*. While some species can tolerate breaks in natural linkages, others such as salamanders and insects are very negatively affected (Beck, n.d).

Several measures can be implemented to reduce fragmentation effects in *linkages*:

- *Linkages* should be continuous maintaining a minimum width along the entire length with as few bottlenecks as possible (Canadian Wildlife Service, 2004).
- If gaps or breaks in continuity are necessary, they should be as small as possible.
- Where *linkages* are bisected by transportation corridors, consideration needs to be given to creating grade-separated “eco-passages.”
- In situations where unbroken natural linkages are not feasible, small patches of closely-spaced natural cover can serve as “stepping stones” for species movement, and thus serve a *linkage* function (MNR, 2010: 148).

C. GLOSSARY

* Indicates a definition in addition to those in the Regional Official Plan Glossary

Adverse Environmental Impacts – changes likely to arise directly or indirectly from *development* or *site alteration* within or *contiguous* to an element of the Greenlands Network that result in widespread, long-term, or irreversible degradation of the significant features or impairment of the natural functions of the designated area.

Examples of Adverse Environmental Impacts include, but are not limited to, the following:

- a) fragmentation or substantial reduction in size of an element of the Greenlands Network;
- b) significant increase in the perimeter-to-area ratio of an element of the Greenlands Network;
- c) disruption of corridors and *linkages* to other elements of the Greenlands Network;
- d) substantial alteration of natural topography;
- e) disruption of ecological relationships among significant or representative native species;
- f) increased potential for human or domestic animal intrusion into relatively inaccessible areas;
- g) alteration of the quantity, quality, timing (hydroperiod) or, direction of flow of surface or groundwater within or *contiguous* to an element of the Greenlands Network;
- h) alteration of the structure, functions, or ecological interrelationships of a natural habitat which sustain representative community associations or populations of significant species;
- i) reductions in the populations or reproductive capacity of significant species;
- j) mortality in or removal of the predominant vegetation which provides structure to an element of the Greenlands Network;
- k) erosion of soils or deposition of sediment;
- l) compaction or trampling of soils;
- m) increased potential for the introduction of invasive non-native species.
- n) disruption of ecological processes due to increased nocturnal artificial light levels; or
- o) increases in the level and quality of noise.

***Alvars** – naturally open areas of thin or no soil over essentially flat limestone, dolostone or marble rock, supporting a distinctive vegetation cover of mostly shrubs and herbs.

Areas of Natural and Scientific Interest – areas of land and water identified by the Province or the Region that contain natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.

***Benthic Community** – the assemblage of interacting populations of organisms, including those forming structural elements, found at or near the bottom of a body of water. The composition of the benthic community is frequently used as an indicator of water quality.

Biodiversity – the variety of life in all its forms, It includes species diversity, ecosystem diversity and genetic diversity within species.

***Connectivity** – the degree to which key natural heritage or significant hydrologic features are connected to one another by plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs.

Contiguous – lands that are situated in sufficiently close proximity such that *development* or *site alteration* could reasonably be expected to produce one or more of the following impacts: alterations to existing hydrological or hydrogeological regimes; clearing of existing vegetation; erosion and sedimentation; or producing a substantial disruption of existing natural *linkages* or the habitat of a significant species.

***Core Environmental Features** – the *environmental features* identified in Policy 7.C.1 and designated on Map 4 of the Regional Official Plan. They are provincially significant or Regionally significant elements of the regional landscape in that they maintain, protect, and enhance biodiversity and important ecological functions. Core Environmental Features consist of:

- (a) Significant Habitat of Endangered or Threatened Species;
- (b) Provincially Significant Wetlands;
- (c) Environmentally Sensitive Policy Areas;
- (d) Regionally Significant Woodlands; or
- (e) Environmentally Significant Valley Features.

Cumulative Impacts – the changes to the environment resulting from a particular activity in combination with the incremental impacts caused by other closely related past, present and reasonably foreseeable future activities. Cumulative impacts may reveal that relatively minor impacts associated with a particular activity may contribute to more significant impacts when considered collectively with other activities taking place over a period of time.

Development – the creation of a new lot, a change in land use, or the construction of buildings and structures, requiring approval under the *Planning Act*.

Development application – an application for approval under the *Planning Act*. Development applications may include applications for approval of the following: Plans of Subdivision; Plans of Condominium; Consent; Part Lot Control Exemption By-laws; Official Plan Amendments; and Zone Change Applications. Development applications do not include *site plans*.

***Dripline** - A line located on the ground vertically below the outer extent of the (live) tree crowns forming the perimeter of the woodland or hedgerow.

***Ecological enhancement** – ecological enhancement increases or improves the ecological functioning of altered or degraded natural areas. It may take the form of:

- a. restoring clearings within an *environmental feature* or “bays” around its perimeter to natural habitat similar to that within the environmental feature such that the area is expanded or made more compact by decreasing the perimeter-to-area ratio;
- b. adding onto existing *environmental features* new habitat elements such as wetlands, woodlands, or grasslands consisting of indigenous species characteristic of the locality;
- c. creating or strengthening natural habitat *linkages* among *environmental features*;
- d. eliminating or reducing the prevalence of invasive non-indigenous species of flora and fauna within *environmental features*;
- e. converting conifer plantations to stands of indigenous hardwoods, conifers, and herbaceous woodland plants;
- f. rehabilitating altered or degraded watercourses or wetlands to sustain populations of locally appropriate flora and fauna;
- g. re-introducing indigenous species known to have been extirpated from an environmental feature; or
- h. increasing the intrinsic, amenity, cultural, recreational and educational values of the environmental feature.

Such actions should ideally bear in mind the likely medium and long-term effects of climate change.

Discharge Constraint Areas – lands where groundwater naturally discharges to the surface of the soil or other surface water bodies and may pose a serious constraint to the construction, use and occupancy of land and buildings.

Ecological function – the natural processes, products or services that living and non-living

environments provide or perform within or among species, ecosystems and landscapes, including *hydrologic functions* and biological, physical, chemical and socio-economic interactions.

***Ecological Integrity** – the condition of an ecosystem in which (a) the structure, composition, and function are unimpaired by stresses from human activity, (b) natural ecological processes are intact and self-sustaining, and (c) ecosystem evolution is occurring naturally. Ecological integrity includes hydrological integrity. (Natural Heritage Reference Manual)

***Economic Functions** – natural products and services of value to human beings such as the production of timber, maple syrup, potable water, commercial outdoor recreational opportunities, enhancing property values, pollution abatement, etc.

Endangered or Threatened Species – means a species that is listed or categorised as an “Endangered Species” or “Threatened Species” on the Ontario Ministry of Natural Resources official species at risk list, as updated and amended from time to time. (PPS)

Environmental Assessment – a process for the authorization of an undertaking under legislation such as the Environmental Assessment Act, and the Ontario Energy Board Act.

Environmental features – features of the natural environment, including:

- a. Significant Habitat of Endangered or Threatened Species;
- b. *Fish habitat*;
- c. *Wetlands*;
- d. Provincially significant life science *Areas of Natural and Scientific Interest*, regionally significant life science *Areas of Natural and Scientific Interest*, or provincially significant earth science *Areas of Natural and Scientific Interest*;
- e. Environmentally Significant Valley Features;
- f. Regionally Significant Woodlands;
- g. *Significant* wildlife habitat;
- h. Sand barrens, savannas and tallgrass prairies;
- i. Alvars;
- j. Permanent and intermittent watercourses;
- k. Lakes (and their littoral zones);
- l. *Environmentally Significant Discharge Areas & Environmentally Significant Recharge Areas*; and
- m. Regional Recharge Areas.

Environmental Impact Statement – a study prepared in accordance with established procedures to refine the boundaries of the Greenlands Network, identify the potential impacts of a *development application* on such elements, and recommend a means of preventing or minimising these impacts through avoidance or mitigation.

Environmentally Significant Discharge Areas – lands where groundwater discharges to the surface of the soil or to surface water bodies to sustain wetlands, fisheries, or other specialised natural habitats.

Environmentally Significant Recharge Areas – lands where water infiltrates into the ground to replenish an aquifer that sustains, in full or in part, *environmental features*.

***Environmentally Sensitive Landscape** – An Environmentally Sensitive Landscape (ESL) is a geographically and ecologically definable landscape that is distinguishable from the surrounding areas by the concentration, proximity, and/or overlap of:

- a. designated natural features (such as Environmentally Sensitive Policy Areas, Provincially

Significant Wetlands, Significant Woodlands, and Environmentally Significant Valley Features),

- b. associated natural features (such as stream valleys and specialised habitats), and
- c. ecological functions (such as groundwater recharge areas and ecological corridors or linkages) which together constitute a heterogeneous landscape mosaic that contributes significantly to Regional biodiversity conservation.

An ESL may include lands under active human use or management, but should be predominantly natural, not bisected by major highways, and exclusive of areas irreversibly transformed by concentrated human settlement, or where widespread commitments to development in the form of land use designations have been made in Area Municipal Official Plans. In recognition of the cultural influences that have shaped, and continue to shape, the Region's landscape, ESLs are considered compatible with a number of limited human uses such as legally permitted agricultural, residential, commercial, and resource extraction uses. In addition to protecting regional and local biodiversity, providing a wide range of ecological functions, and accommodating some human land uses, ESLs also provide continued opportunities for aesthetic enjoyment, low-impact recreation, and scientific, archaeological and/or historical study in the Region's countryside.

***Environmentally Sensitive Policy Area** – a remnant natural area that fulfills sufficient technical criteria in the Regional Official Plan for designation. ESPAs are Core Environmental Features.

Fish habitat – as defined in the Fisheries Act, c. F-14, means spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes (PPS)

***Forest Interior Habitat** – habitat conditions typical of the central or interior part of a forest as distinguished from those around the perimeter. Interior habitat is usually relatively stable and less influenced by changing climatic conditions, noise, wind, sunlight, temperature, invasive non-indigenous species, and so forth. For Waterloo Region, this is taken to be approximately thirty metres in from the dripline, but may vary depending upon the ecological quality of the forest edge habitat.

Hydrological Functions – means the functions of the hydrological cycle that include the occurrence, circulation, distribution and chemical and physical properties of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere, and water's interaction with the environment including its relation to living things. (PPS)

***Landscape Level Systems** – are large-scale *environmental features* or significant concentrations of *environmental features* within the Greenlands Network, as defined in ROP Policy 7.B.1. They comprise:

- (a) Environmentally Sensitive Landscapes;
- (b) Significant Valleys;
- (c) Regional Recharge Areas; and
- (d) Provincial Greenbelt Natural Heritage System.

***Landscape matrix** – the most extensive and most connected landscape element type present, which plays the dominant role in landscape functioning. (PPS)

Linkages – areas that connect *environmental features* along which plants and animals can propagate, genetic interchange can occur, populations can move in response to environmental changes and life-cycle requirements, and species can be replenished from other *environmental features*. Linkages can also include those areas currently performing, or with the potential to perform, through restoration, linkage functions. Although linkages help to maintain and improve *environmental features*, they can also serve as important *environmental features* in their own right.

***Native species** – species known to be indigenous to Waterloo Region are considered native species.

Normal farm practices – a practice, as defined in the Farming and Food Production Protection Act, 1998, that is conducted in a manner consistent with proper and acceptable customs and standards as established and followed by similar agricultural operations under similar circumstances; or makes use of innovative technology in a manner consistent with proper advanced farm management practices. Normal farm practices shall be consistent with the Nutrient Management Act, 2002, and regulations made under that Act.

Pre-submission consultation meeting – Pre-submission consultation meeting – the opportunity for staff to consult with an owner/applicant prior to the owner/ applicant preparing an application, in order to outline the information and materials that the owner/applicant will be required to submit concurrently with the application form and prescribed fees.

Provincially constrained environmental areas – landscape features where the features are both identified as significant in any applicable official plan or *Provincial plan*, and where the applicable *Provincial plan* or Provincial Policy Statement prohibits development in the features: wetlands, woodlands, Significant Valleys, Environmentally Significant Valley Features, *Areas of Natural and Scientific Interest*, Significant Habitat of Endangered or Threatened species, *significant wildlife habitat* and fish habitat.

***Qualified professional** – a person carrying out studies or evaluations as recommended by the Natural Heritage Reference Manual, Regional or Area Municipal Official Plan, or Greenlands Network Implementation Guideline who meets any specific requirements (e.g., wetland evaluation training) to carry out the study or evaluation and where appropriate meets professional standards in their particular field and is accredited by a professional association. (Natural Heritage Reference Manual)

***Restore** – convert lands whose ecological properties have been substantively altered by human activity or natural processes back to natural habitat characteristic of the locality consisting of locally appropriate native species of flora and fauna using active planting, natural succession, prescribed burning, removal of non-native vegetation, other means accepted by the Society for Ecological Restoration, or any combination thereof.

***Savanna** – land (not including land that is being used for agricultural purposes) that:

- a. has vegetation with a significant component of non-woody plants, including tallgrass prairie species that are maintained by seasonal drought, periodic disturbances such as fire, or both;
- b. has from 25 per cent to 35 per cent tree cover;
- c. has mineral soils; and
- d. has been further identified, by the Ministry of Natural Resources or by any other person, according to evaluation procedures established by the Ministry of Natural Resources, as amended from time to time.

Significant –

- (a) in regard to wildlife habitat, areas where plants, animals and other organisms live and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species.
- (b) in regard to regionally significant features and areas comprising the Greenlands Network, areas identified as being ecologically important to the region based on the specific criteria

established by the Region and described in the associated policies in this Plan.

- (c) in regard to cultural heritage and archaeology, resources that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people.

Site alteration – activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site.

***Social Functions** – community amenity, local heritage, outdoor recreation, camping, education and research, aesthetic pleasure, spiritual experience, some residential use, and so forth.

***Supporting Environmental Features** – *environmental features* not considered Landscape Level Systems or Core Environmental Features which nonetheless perform *ecological functions* which help sustain the Greenlands Network and are designated by an Area Municipality.

***Tallgrass prairies** – land (not including land that is being used for agricultural purposes) that:

- a. has vegetation dominated by non-woody plants, including tallgrass prairie species that are maintained by seasonal drought, periodic disturbances such as fire, or both;
- b. has less than 25 per cent tree cover;
- c. has mineral soils; and
- d. has been further identified, by the Minister of Natural Resources or by any other person, according to evaluation procedures established by the Ministry of Natural Resources, as amended from time to time.”

***Valleylands** – a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year. (PPS)

Watershed studies – comprehensive scientific studies that describe how surface water and groundwater and terrestrial and aquatic ecosystems function within a defined drainage area. These investigations result in recommendations as to where and how development activity can safely occur so as to minimize flood risks, stream erosion, degradation of water quality, and negative impacts on natural systems. Recommendations may also identify opportunities for ecological enhancement and recreation.

Wetlands – lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of *wetlands* are swamps, marshes, bogs and fens. Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are not considered to be *wetlands* for the purposes of this definition.

***Wildlife habitat** – areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific *wildlife habitats* of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species. (PPS)

Woodlands – treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of *wildlife habitat*, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. *Woodlands* include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels.

D. REFERENCE LIST

- Adams, L. W., and L. E. Dove. 1989. *Wildlife Reserves and Corridors in the Urban Environment: a Guide to Ecological Landscape Planning and Resource Conservation*. National Institute for Urban Wildlife, Columbia, Maryland.
- Aude, E., K. Tybirk, A. Michelsen, R. Ejrnæs, A. B. Hald, and S. Mark. 2004. Conservation value of herbaceous vegetation in hedgerows - does organic farming make a difference? *Biological Conservation* 118: 467 - 478.
- Brisbane City Council, 2003. *Ecological Corridors and Edge Effects Project*, prepared by Chenoweth Environmental Planning & Landscape Architecture for Environment & Parks, Brisbane City Council, Chenoweth Environmental Planning & Landscape Architecture, Brisbane.
- Burbrink, F. T., C. A. Phillips, and E. J. Heske. 1998. A riparian zone in southern Illinois as a potential dispersal corridor for reptiles and amphibians. *Biological Conservation* 86: 107-116.
- Beck, G. n.d. 'Cores and Corridors – *The importance of a Green System in Southern Ontario*', *Federation of Ontario Naturalists*, available online: <http://www.ontarionature.org/pdf/cores.pdf>
- Calhoun, A. J. K., and M. W. Klemens. 2002. *Best Development Practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States*. 57 p. Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.
- Canadian Wildlife Service, 2004. *How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*. Second Edition. Environment Canada, Ontario.
- Castelle, A.J., A. W. Johnson and C. Conolly. (1994) Wetland and stream buffer size requirements a review. *Journal of Environmental Quality* 23:878-882.
- Croonquist, M. J., and R. P. Brooks. 1993. Effects of habitat disturbance on bird communities in riparian corridors. *Journal of Soil and Water Conservation* 48: 65-70.
- Diamond, M., J. Dougan, N. Helferty, E. Hodge, Niblett, P., M. Rose, and S. Rowe. 2002. *Natural Heritage Systems in Urbanizing Settings: Sustainable Practices for the Oak Ridges Moraine*. 83 p. +appendices. Prepared on behalf of Save the Rouge Valley Systems Inc. and the City of Toronto.
- Dougan & Associates, 2005). *Region of Waterloo Environmentally Sensitive Landscapes (ESLs) Study Discussion Paper – FINAL REPORT*, Region of Waterloo, Community Planning Division.
- Environment Canada, n.d. 'Forest Corridors: Literature Review', available online: http://www.gc.ec.gc.ca/faune/corridors_verts/html/criteres_litterature_e.html
- Fischer, J., D. B. Lindenmayer, and I. Fazey. 2004. Appreciating ecological complexity: habitat contours as a conceptual landscape model. *Conservation Biology* 18: 1245 - 1253.
- Fleury, A. M., and R. D. Brown. 1997. 'A framework for the design of wildlife conservation corridors with specific application to southwestern Ontario. *Landscape and Urban Planning* 37:163-186.
- Forman, R. T. T. 1995. *Land Mosaics: The Ecology of Landscapes and Regions*. Cambridge University Press, Cambridge, Massachusetts.

- Helferty, N. J. 2002. Natural Heritage Planning for Amphibians and their Habitats. 71 p. *Supplementary Report for Oak Ridges Moraine Richmond Hill Ontario Municipal Board Hearing*. Save the Rouge Valley System Inc. and the City of Toronto.
- Hess, G. R., and R. A. Fischer. 2001. Communicating clearly about conservation corridors. *Landscape and Urban Planning*, 55:195-208.
- Hess, G. R., and J. M. Bay. 2000. A regional assessment of windbreak habitat suitability. *Environmental Monitoring and Assessment*, 61: 237 - 254.
- Jordán, F. 2000. A reliability-theory approach to corridor design. *Ecological Modelling* 128:211-220.
- Lee, Harold, T. 2008. *Southern Ontario Ecological Land Classification: Vegetation Type List*. Southern Information Management and Spatial Analysis Section, OMNR.
- Machtans, C. S., M.-A. Villard, and S. J. Hannon. 1996. Use of Riparian Buffer Strips as Movement Corridors by Forest Birds. *Conservation Biology* 10:1366-1379.
- Merriam, G. 1991. Corridors and connectivity: animal populations in heterogeneous environments. Pages 133 - 142 in D. A. Saunders and R. J. Hobbs, eds. *Nature Conservation 2: The Role of Corridors*. Surrey, Beatty & Sons, New York.
- Ministry of Natural Resources, 2010. *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005* Second Edition. Toronto: Queen's Printer for Ontario.
- Newmaster, S.G. et al., 1998. Ontario Plant List. Ontario Ministry of Natural Resources , Ontario Forest Research Institute, Sault Ste Marie, Ontario. Forest Research Information Paper No. 123.
- Outen, A., 2002. 'The ecological effects of road highway lighting', Chapter 13 in Sherwood, B, Cutler, D and Burton, J. (eds), *Wildlife and Roads: The Ecological Impact*, Imperial College Press, London.
- Pickett, S. T. A., and M. L. Cadenasso. 1995. Landscape Ecology: Spatial Heterogeneity in Ecological Systems. *Science* 269:331-334.
- Roberge, J., and P. Angelstam. 2004. Usefulness of the umbrella species concept as a conservation tool. *Conservation Biology* 18: 76 - 85.
- Rudolph, D. C., and J. G. Dickson. 1990. Streamside zone width and amphibian and reptile abundance. *The Southwestern Naturalist* 35: 472 - 476.
- Semlitsch, R. D., and J. R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. *Conservation Biology* 17: 1219 - 1228.
- Spackman, S. C., and J. W. Hughes. 1995. Assessment of minimum stream corridor width for biological conservation: Species richness and distribution along mid-order streams in Vermont, USA. *Biological Conservation* 71: 325 - 332.
- Burke, Vincent J., and Whitfield Gibbons. (1995) Terrestrial buffer zones and wetland conservation: a case study of freshwater turtles in a Carolina bay *Conservation Biology* 9(6):1365-1369.
- Wegner, J. F., and a. G. Merriam. 1979. Movements by birds and small mammals between a wood and adjoining farmland habitats. *Journal of Applied Ecology* 16: 349 - 357.