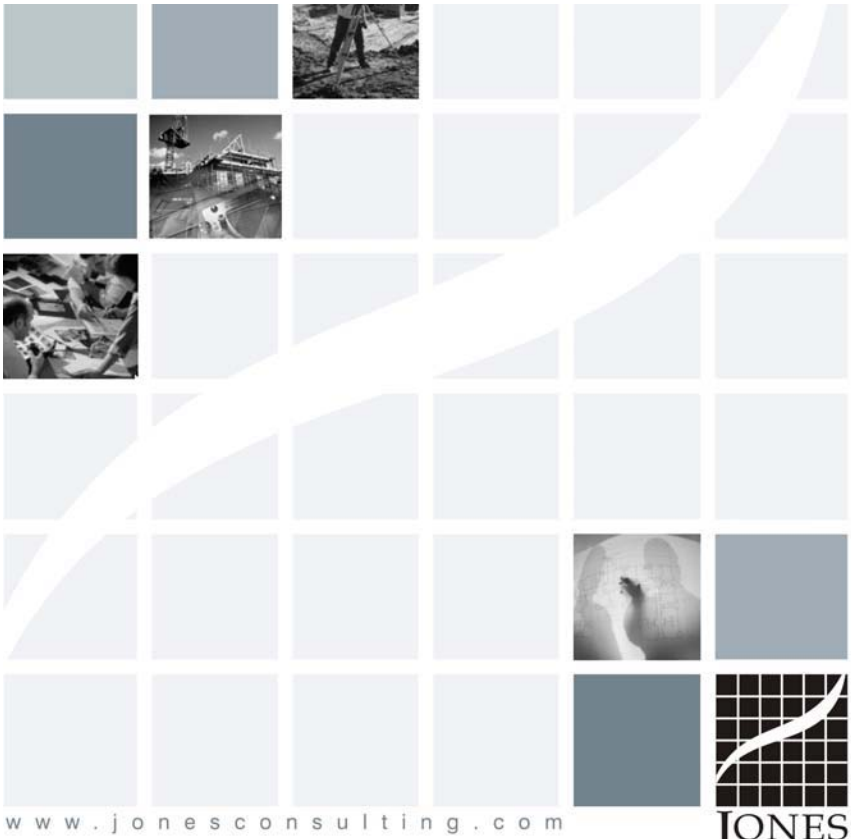
Background Research Paper

Windpower & Renewable Energy Planning Study

County of Essex

September 4, 2007
ESS - 07256



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1.0 Introduction

The Jones Consulting Group Ltd. has been retained by the County of Essex to undertake a wind and renewable energy study that will run from June 2007 through to January 2008. The study includes the preparation of a Background Research Paper, undertaking public and stakeholder consultation, and the preparation of an amendment to the County of Essex Official Plan as well as the preparation of a standardized amendment for the local Official Plans and Comprehensive Zoning By-laws.

The purpose of this report is to review the topic of wind and renewable energy generation in terms of current approaches and best practices. This Paper will act as the foundation of the overall planning study and the basis of the planning approval framework. It will be the impetus to the creation of policy and future discussions.

1.1 Background

Generation of electricity using wind energy is quickly gaining attention at the municipal and county levels of government in Ontario as a new land use. Wind energy generation facilities have been in operation in Europe and California for decades; however, it was not until the election of the provincial Liberal government in 2003, and the promise to close coal fired generation plants, that serious attention was placed on the topic of renewable energy generation. Since their election, the Provincial Government has developed new policies promoting the development of renewable energy generation facilities, including wind power.

As a result of Provincial renewable energy policies, and supporting financial incentives, new wind power projects are being developed in many regions in Ontario including the County of Essex. Aside from some broad based policy guidance at the provincial level, there is no specific provincial guidance on how to properly plan for renewable energy facilities. County and local municipalities must therefore determine how to properly plan for new facilities.

1.2 Study Area

The study area is defined as the boundaries of the County of Essex as depicted in Figure 1 together with its general location. Regional implications have also been considered within this report. A greater detailed base map is provided in Figure 1, which identifies roads, parcel mapping, settlement boundaries, and municipality boundaries.

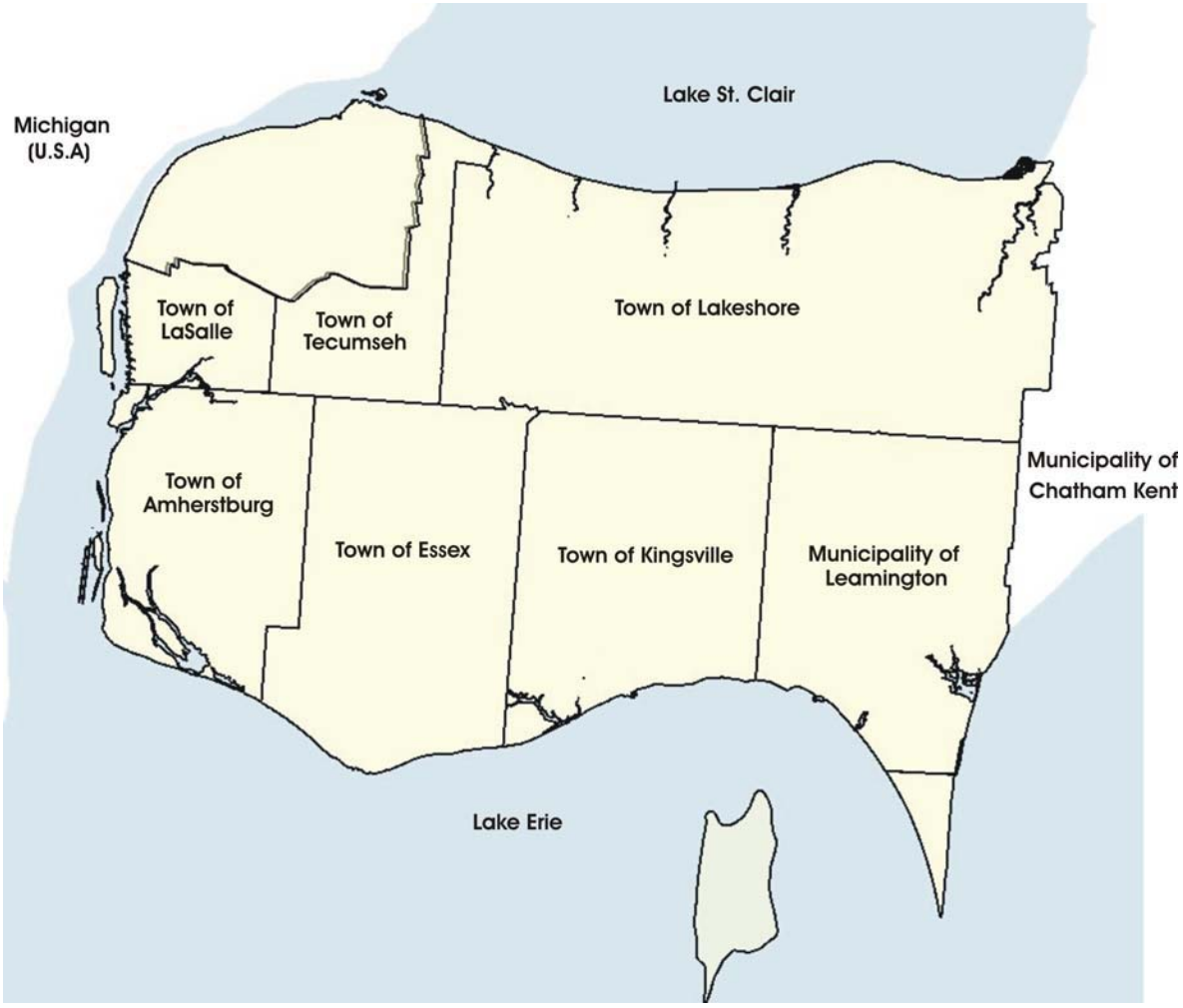

Plate 1: Map showing the extent of the County of Essex and its member municipalities.

1.3 Methodology

The preparation of this background research paper is Stage 2 of the Windpower and Renewable Energy Planning Study for the County of Essex. A detailed workplan for the project is provided in Appendix A.

The following tasks have been undertaken in the preparation of this Paper:

- **Planning Steering Committee meeting:** A Steering Committee has been established to oversee the study process. The Committee is chaired by the Director of Planning for the County, and comprises the Planners from each of the area municipalities, as well as a representative from the Essex Region Conservation Authority (ERCA). A project start-up

meeting was held at the County of Essex offices on June 25, 2007 to finalize the work plan and confirm the scope of the study.

- **Planner discussions:** We have contacted planners from each of the area municipalities and the ERCA to discuss their preliminary thoughts on renewable energy and to gain insight into stakeholder interest and existing or anticipated projects. The planners contacted include the following:

  - Mr. Bill King, County of Essex
  - Brian Hillman and Enrico De Cecco, Town of Tecumseh
  - Chad Jeffrey, Town of Essex
  - Larry Silani, Town of LaSalle
  - Danielle Stevenson, Town of Kingsville
  - Tracey Pillon-Abbs, Municipality of Leamington
  - Tom Storey, Town of Lakeshore
  - George Balango, Town of Amherstburg
  - Matthew Child, ERCA

- **Stakeholder and agency consultation**: Throughout the course of researching the background information, we have contacted and/or consulted with the following individuals or associations:

  - Bill Armstrong, Ministry of the Environment
  - Winston Wong, Ministry of Culture
  - Jim Mader, Windsor Airport
  - Bernard Nelson, Essex County Federation of Agriculture
  - Paul Dockrill, Hydro One Networks Inc.
  - Mark Alzner, Essex Power
  - Nancy Forsythe, Transport Canada
  - Wendy Stark, Windsor Essex Development Commission
  - Kristen Callow, Ontario Greenhouse Vegetables Growers Association
  - Tom McLaren, Stakeholder Strategies
  - Shirley Cater, County of Norfolk
  - Ron Truman & Peter Carrie, OptiSolar Farms Canada
  - Michael Audet, E.L.K. Energy
  - Doug Millen, Electrical Safety Authority
  - Jeff Thomson, Electrical Safety Authority
  - Dave Posliff, County of Lambton

- Durk Vanderwerff, Township of Middlesex Centre
- Maureen Anderson, Essex County Wind Action Group
- Andy Comber, Harrow News
- Janice, Lally, Municipality of Chatham Kent
- Jo-Anne Egan, Prince Edward County
- Elain Brun Shaw, Haldimand County
- Terry O'Shay, County of Frontenac
- Earnest and Linda Kennette, residents of the Town of Lakeshore
- Collette McLean, resident of the Town of Essex (Harrow)
- Allan Parks, resident of the Town of Amherstburg
- Jim Turner, resident of the Town of Amherstburg
- Bob Singh, Hydro One
- Tom McLaren, Stakeholder Strategies
- Ansar Gafur, AIM PowerGen Corporation
- Austin Hughes, Wind Prospects Inc.
- Brian White, resident of the Town of Tecumseh
- Mo Navo, Hydro One

- **Geographic Information System (GIS) Constraint Analysis**: Through the use of the GIS information from the County, ERCA and the local municipalities, we undertook a broad assessment of the opportunities and constraints for wind energy development. Local features examined as part of this exercise included:

  - Transmission & distribution infrastructure
  - Airports and transportation infrastructure
  - Trails/tourist routes
  - Average annual wind speeds at 30 metres and 80 metres in height.
  - Natural heritage features
  - Parcel Fabric
  - Flood Prone Areas
  - Topography
  - Mineral/petroleum/aggregate resources
  - Settlement boundaries
  - Cultural heritage landscapes and built heritage resources

- **Field Reconnaissance**: A drive through evaluation depicted in Figure 2, of the key areas of the County was undertaken on July 19, 20 and 25th to examine the following:

- Potential cultural heritage landscapes;
- Identify potential views along tourist routes/scenic viewsheds;
- Typical county landscapes and land uses.

- **Local and County Policy Review:** The existing Official Plan Policies of the member municipalities and the County were reviewed in the context of energy generation to improve our knowledge of the region and assist us in the preparation of local policy guidelines.

2.0 County of Essex Overview

This Section provides a general overview of the characteristics of the County including location, context and unique attributes.

2.1 Location

The County of Essex consists of seven municipalities which are each host to their own unique characteristics and history. The County has a total population of approximately 166,000 persons, with a predicted population of approximately 196,000 by 2016.[1] The County has a total land mass area of 1,851 square kilometres.[2] The County offers an abundance of recreational activities, tourist attractions and a unique natural environment.

Seven municipalities make up Essex County:

- Town of Amherstburg
- Town of Essex
- Town of Kingsville
- Municipality of Leamington
- Town of LaSalle
- Town of Tecumseh
- Town of Lakeshore

The **Town of Amherstburg** is located near the mouth of the Detroit River, approximately 25 kilometres south of the City of Windsor. The 2006 population of 21,748 persons represents a 6.9% increase in population from 2001.[3] Amherstburg is bound by County Road 50 along the southern boundary, County Road 20 along the Detroit River shoreline, County Road 8 along the northern boundary and partial County Road 11 along the eastern boundary.

The **Town of Essex** consists of the former Town of Essex, Township of Colchester North, Township of Colchester South and Town of Harrow (amalgamated in 1999). The amalgamated municipality has a population of 20,032 persons, and has remained relatively constant since the last

[1] Statistics Canada 2006
[2] Statistics Canada 2006
[3] Statistics Canada 2006

census[4]. The Town of Essex is bound by County Road 50 along the Lake Erie shoreline, County Road 11 along the westerly boundary, County road 8 along the northern boundary and County road 23 along the eastern boundary.

The **Town of Kingsville** is situated on the northern shore of Lake Erie and is Canada's southernmost town. The Town has a population of 20,908 persons which is a 6.6% increase since 2001. The Town is situated on Pigeon Bay and became an important lake port for sailing ships, and Pelee Island Ferries arrive and depart at this port. Kingsville is bound by County Road 20 and 50 along the Lake Eric Shoreline, County Road 23 along the westerly boundary, County Road 8 along the northern boundary and County Road 31 along the eastern boundary.

The **Town of Lakeshore** is located on the northern boundary of the County on Lake St. Clair and has the largest land area within the County. With a population of 33,245 persons, the Town has experienced a 15.7% increase from 2001, which represents the largest population increase in Essex County for the 2001 to 2006 time period.[5] The Town of Lakeshore is an amalgamated municipality consisting of Maidstone, Belle River, Rochester, Tilbury North and Tilbury West. Lakeshore is bound by County Road 8 along the southern boundary, County Road 19 along the western boundary, County Road 2 and 22 along the northern boundary and County Road 35 and County Road 1 along the eastern boundary of the Town, which is also the eastern boundary to the County. Provincial Highway 401 also traverses the Town in an east west direction.

The **Town of LaSalle** is located on the westerly shoreline of Essex County on the Detroit River and the Town abuts the City of Windsor to the north. The population of the Town of LaSalle is 27,652, which is a 9.4% increase over 2001.[6] The Town is bound by County Road 20 along the shoreline of the Detroit River, County Road 6 and Kings Highway 3, County Road 9 along the eastern boundary and County Road 8 along the southern boundary.

The **Municipality of Leamington** has a population of 28,833 persons, which is an increase of 6.2% over 2001. The Town is host to a diverse range of crops due to its rich soils.[7] The municipality is located on the shore of Lake Erie and contains the mainland portion of Point Pelee National Park. Leamington is a major site for rare species, bird watching, and natural wetlands, including the Hillman Marsh. The Municipality is home of the HJ Heinz Company factory and the landscape is dotted with numerous large scale greenhouses. A large marina is in the Town of Leamington with boat trips to Pelee Island and an auto ferry that runs to Sandusky, Ohio. Leamington also has a small

[4] Statistics Canada 2006
[5] Statistics Canada 2006
[6] Statistics Canada 2006
[7] Statistics Canada 2006

private airport located two and a half miles to the east of the Town of Leamington. The Municipality is bound by County Road 1 along the eastern boundary of the Town/County, County Road 31 along the western boundary and County Road 8 along the north boundary.

The **Town of Tecumseh** is located in the north westerly quadrant of the County with frontage on Lake St. Clair. The population of Tecumseh is 24,224.[8] Based on a 2003 boundary change with the City of Windsor, the Town is now bound by lands just west of County Road 43, shoreline north of County Road 2, County Road 19 to the east and County Road 8 to the south. Provincial Highway 401 also traverses Tecumseh in an east west direction.

The **Township of Pelee** is not part of the County of Essex and is located south of Kingsville and Leamington in Lake Erie. The Township is accessed by water and air and has a population of 287 persons. Ninety-seven of the 387 dwellings are occupied by permanent residents.[9] Pelee Island is located in Lake Erie, midway between Essex County and Ohio. Pelee Island is the most southern populated point in Canada and is close to Middle Island which is the southern most point in Canada. The Township is made up of nine islands, the largest being Pelee Island and includes Middle Island, Middle Sister Island, Hen Island, Big Chicken Island, Little Chick Island, Chick Island, East Sister Island and North Harbour Island. Due to its location, it has a slightly milder climate than inland areas. Its climate, classified as Carolinian is one of the mildest in Canada and the island has long been used for vineyards and wine making. Point Pelee National Park is one of Canada's forty National Parks. The Park is part of the Carolinian Forest with hiking trails, boardwalks and beaches. The area is ecologically significant with rare plant, animal species and bird habitat.

2.2 Physiography & Economy

Lands throughout the County are relatively flat with little variation. The County enjoys a great diversity of agricultural production as is evidenced by the extent of land clearing and limited mature woodlots. In addition to the typical grains and oilseeds, the climate and soils in this region are ideal for vegetable and fruit crops including grapes, primarily consisting of Prime Agricultural Lands, Classes 1, 2 and 3. The grape (wine) industry in Essex County has seen continuous improvements and wine tours have become popular with tourists to the area. Greenhouse vegetable production in the County is the most intensive in all of Canada. Over 1100 acres of greenhouse vegetable production represents over 83% of the provincial total.

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[8] Statistics Canada 2006
[9] Statistics Canada 2006

Manufacturing in the County is also one of the most important industries and employs 28% of the labour force. The manufacturing industry has expanded beyond automotive because of the County's proximity to the US border. Research and Development industries have also grown with respect to agriculture, automotive, environment and medicine.

The area is also a prime tourism destination. The historic and scenic attractions together with the long shorelines bring visitors to the area. These attractions include Jack Miner Bird Sanctuary, Colasanti's Tropical Gardens, Fort Malden, Heritage Village, Point Pelee National Park and the expanding wine industry.

2.3 General Landscape Characteristics

An assessment of the County's landscape characteristics was undertaken on June 19, 20 and 25, 2007. As a result of this exercise, a number of landscape characteristic units were observed including:

- Significant shoreline landscape, lake or river edge
- Historic attributes
- Agricultural
- Agricultural – specialty crops
- Flat topography vegetated
- Rural commercial
- Settlement areas
- Settlement interface
- Non linear road patterns
- Unique agricultural operations
- Unique island landscape
- Unique landscape with National Park status
- Petroleum extraction

The detail of these evaluations will be discussed in the following sections of this report, however, an initial observation is that the topography of the County results in significant development along the shorelines. The shorelines provide opportunities for viewsheds, accessibility, rich soils, micro-climates, vegetation and a preferred amenity for development. Visual experience or character of the area is predominately derived from the user immediately adjacent to roads. There are areas of significant residential development, agricultural and commercial investment, historical areas and

unique specialty crops due to the microclimate. There are long views from most roads due to the flat landscape. These views take in the vast amounts of rural and agricultural landscapes including vegetation and croplands. There are road networks that follow the shoreline including No. 33, No. 50, No. 20 and No. 22. The majority of these routes provide long viewsheds of the water or on land. Mature vegetation rarely interrupts site lines. These routes are identified as tourism routes, including a wine route.

Our general evaluation is that the general topography of the County results in long distant views inland from the roads that traverse the shoreline and long uninhibited views through interior road networks due to extensive field crops and relatively limited tree cover.

3.0 Renewable Energy Policy Review

This Section provides an overview of the Planning Act in addition to policies at the Provincial, County and Local level as they relate to the development of renewable energy generation facilities. This Section also includes an overview of the Environmental Assessment Act requirements.

3.1 The Planning Act

Land uses and development within the province are governed by many overlapping statues; however, the primary legislation is the Ontario Planning Act, RSO, 1990 Chap. P. 13 (Planning Act). The Planning Act enables Approval Authorities to enact Official Plan policies, Zoning By-law provisions and Site Plan Control requirements for new development in the Province. In order for municipalities to enact Site Plan Control, their Official Plan must designate all, or certain areas as a Site Plan Control Area.

Section 2 of the Planning Act lists 17 areas of provincial interest, of which the only limited reference to energy generation is in subsection (e) which states "the supply, efficient use and conservation of energy and water". While the Act does not define "sustainable development" it would conceivably include the consideration of existing and planned power generation infrastructure to support growth. When reviewing planning applications the approval authority must have regard for the extent to which the plan's design optimizes the available supply, efficient use and conservation of energy. Under site plan control, municipalities can also now approve matters related to exterior design, including sustainable design. Presumably, exterior sustainable design could include solar panels, micro wind turbines and other energy related features that are available for residential, commercial and industrial development.[10]

Section 62 of the Planning Act exempts energy projects from the Planning Act if they are approved under the Environmental Assessment Act, and, an exempting regulation has been passed. The full text is contained below:

> *Prescribed undertaking relating to energy*
>
> ***62.0.1*** *An undertaking or class of undertakings within the meaning of the Environmental Assessment Act that relates to energy is not subject to this Act or to section 113 or 114 of the City of Toronto Act, 2006 if,*

[10] Ontario Planning Journal, May-June 2007.

(a) it has been approved under Part II or Part II.1 of the Environmental Assessment Act or is the subject of,

(i) an order under section 3.1 or a declaration under section 3.2 of that Act, or

(ii) an exempting regulation made under that Act; and

(iii) a regulation under clause 70 (h) prescribing the undertaking or class of undertakings is in effect.

The implications of Clause 62 could be significant or inconsequential pending the text of a future regulation, if any, approved by the Lieutenant-Governor. If a regulation is approved that exempts a class of energy generation projects, such as wind power, county and local municipalities across the province will be unable to address planning issues associated with these projects through the traditional land use tools such as Official Plan policy, zoning provisions and site plan control if the project has been approved under the Environmental Assessment Act.

Conversely, if on the other hand, no regulation is approved by the Lieutenant-Governor exempting any specific or class of energy projects, then the Planning Act will continue to apply to energy projects.

There has been no regulation proposed under Clause 62 and in speaking with a Ministry representative, at this time, there is no intention to draft a regulation relating to energy projects. We have also received a copy of a letter from John Gerretsen, the Minister of Municipal Affairs and Housing advising that exempting energy undertakings "would require a regulation, which would be considered if projects faced inappropriate delays". The Minister's letter confirms speculation that the Province does not intend to automatically or immediately exempt specific energy projects or classes of energy projects from the Planning Act unless municipalities across the province delay the approval of applications for inappropriate reasons.

It is important to understand that 62.0.1 of the Planning Act is intended as a tool to be used by the provincial government. The Province may choose not to draw on this section and not to develop the required regulations, unless deemed necessary for projects that are unreasonably delayed by the planning approval process. Alternatively, regulations may be prepared when the approvals process needs to be streamlined to avoid electricity shortages.

3.2 Provincial Policy Statement 2005 (PPS)

Section 3 of the Planning Act enables the Minister to issue policy statements on matters of municipal planning that are of provincial interest. On March 1, 2005, the latest version of the Provincial Policy Statement (PPS) came into effect.

Section 1.8 of the PPS provides specific policy direction for renewable energy projects including:

- Section 1.8.1 e) states that planning authorities shall support land uses which promote design and orientation which maximize the use of alternative and renewable energy such as solar and wind energy.
- Section 1.8.2 states that opportunities should be provided to increase energy generation through the use of renewable and alternative energy systems, where feasible
- Section 1.8.3 states that renewable and alternative energy systems shall be permitted in settlement areas, rural areas and prime agricultural areas.

In our opinion, Section 1.8 does not mandate the use of a specific size or type of wind turbine or other form of renewable energy, and it should not be interpreted as necessarily permitting all forms and all scales of renewable energy at any density in any location.

As stated in Section 4.3, the PPS must be read in its entirety and all relevant policies are to be applied to each situation. While this is a first principal in land use planning, in our experience, the polarization and uncertainty involved with wind power generation leads professionals and laypeople alike to inappropriately highlight only specific policies in the PPS in order to validate their opinion on an application's consistency with the PPS.

For example, anti-wind groups rely on Section 1.1.1 of the PPS which states that healthy, liveable and safe communities are sustained by avoiding development and land use patterns which may cause environmental or public health and safety concerns (1.1.1 c). However, sub-section g) goes on to state that the same healthy, liveable and safe communities require necessary infrastructure to meet current and projected needs.

Similarly, pro-wind groups reference Section 1.7.1 a) and h) of the PPS which states that long-term economic prosperity should be supported by optimizing the use of land, resources and infrastructure and providing opportunities for increased energy generation through alternative and renewable energy systems. However, subsection e) states that major facilities are to be appropriately designed, buffered and/or separated from sensitive land uses to prevent adverse effects from odour, noise and other contaminants and minimize risk to public health and safety.

We recommend that approval authorities support renewable energy projects of a size and scale and in appropriate locations, which have been sited in a manner that demonstrates that adverse effects will not be experienced by area residents and other sensitive land uses.

3.2.1 Summary Interpretation – A Balanced Approach

The PPS establishes a baseline approval for renewable energy generation facilities in most areas; however, the development of new renewable energy generation facilities may be restricted and in some cases, prohibited, in order to ensure that "Ontario's long term prosperity, environmental health and social well-being" is protected through the consideration of natural heritage features, cultural heritage landscapes, specialty agriculture, airports, separation distances from sensitive land uses, and natural hazards.[11]

To be consistent with the PPS, the development of new renewable energy generation facilities should be supported and promoted, provided they are sited, constructed, and operated in a manner that balances environmental, social and economic benefits with potential impacts.

Listed below is a summary of relevant policies that support this balanced approach. Please note that the items below have only been summarized or paraphrased and that the full text of the PPS should always be consulted for accuracy. Portions of the policies have been highlighted that are particularly noteworthy.

a. Long-term prosperity, environmental heath and social well-being should **take precedence over short-term considerations.**

b. Healthy, livable and safe communities are sustained by ensuring that **necessary infrastructure** will be available to meet **current and projected needs**.

c. In rural areas, development that is **compatible with the rural landscape** and can be sustained by rural service levels should be promoted.

d. In rural areas, locally**-important agricultural and resource areas should be designated and protected** by directing non-related development to areas where it will not constrain these uses.

e. Healthy, active communities should be promoted by considering the **impacts of planning decisions** on provincial parks, conservation reserves and conservation areas.

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[11] Provincial Policy Statement. 2005

f. Infrastructure shall be provided in a coordinated, efficient and cost-effective manner to **accommodate projected needs**.

g. Airports shall be **protected from incompatible land uses** and development by discouraging land uses which may cause a potential aviation safety hazard.

h. Long term economic prosperity should be supported by (a) optimizing the long-term availability of infrastructure, (e) planning so that **major facilities** (including airports and infrastructure and corridors) **and sensitive land uses are appropriately designed, buffered and/or separated from each other to prevent adverse effects** from odour, noise and other contaminants, and to minimize risk to public health and safety, and (h) providing opportunities for increased energy generation, supply and conservation including renewable energy facilities.

i. Energy efficiency and improved air quality shall be supported by design and orientation that **maximizes the use of alternative or renewable energy**, such as solar and wind energy, and the mitigating effects of vegetation.

j. Supply increased energy by providing opportunities for energy generation facilities to **accommodate current and projected needs**, and the use of renewable and alternative energy systems where feasible.

k. Alternative and renewable systems **shall be permitted in settlement areas, rural areas and prime agricultural areas** in accordance with Provincial and Federal requirements. Rural and prime agricultural areas should be designed and constructed to minimize impacts on agricultural operations.

l. **Natural features** and areas shall be protected for the long term.

m. Development and **site alteration** shall not be permitted in significant habitat of endangered and threatened species and significant wetlands.

n. Development and **site alteration** shall not be permitted in significant wetlands, woodlands, valleylands, wildlife habitat and areas of natural and scientific interest unless there will be no negative impacts.

o. Prime agricultural areas shall be protected for long-term use for agriculture and **specialty crop areas shall be given the highest priority for protection**.

p. In areas adjacent to or in known deposits of mineral deposits, petroleum resources, and mineral aggregate resources, development and activities which would preclude or hinder the establishment of new operations or access to the resources shall only be permitted if the

proposed land use or **development serves a greater long-term public interest** and issues of public health, public safety and environmental impact are addressed.

q. Significant built heritage resources and **significant cultural heritage landscapes** shall be conserved.

r. Development and site alteration may be permitted on adjacent lands to protected heritage property where the proposed development and site alteration has been evaluated and it has been demonstrated that the heritage attributes of the protected heritage property will be conserved. Mitigative measures and/or alternative development approaches may be required in order to **conserve the heritage attributes of the protected heritage property affected by the adjacent development or site alteration**.

s. Development and **site alteration shall not be permitted** within defined portions of the one hundred year flood level along connecting channels including the Detroit River.

t. Development and site alteration shall not be permitted within areas that would be rendered inaccessible to people and vehicles during times of flooding hazards, erosion hazards and/or dynamic beach hazards, unless it has been demonstrated that the site has **safe access appropriate for the nature of development and the natural hazard**.

3.2.2 PPS Definitions

An understanding of several relevant definitions in the PPS assists in interpreting how local municipalities must be consistent with policies relating to renewable energy generation facilities. Three key definitions are development, site alteration and infrastructure as noted below:

> ***Development:*** *means the creation of a new lot, a change in land use, or the construction of buildings and structures, requiring approval under the Planning Act, but does not include activities that create or maintain infrastructure authorized under an environmental assessment process.*
>
> ***Site Alteration****: means activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site.*
>
> ***Infrastructure****: means physical structures (facilities and corridors) that form the foundation for development including electric power generation and transmission.*

Upon review of the definitions above, renewable energy generation facilities are considered "Infrastructure" and not "Development" when they have been subjected to an environmental screening process under the Environmental Assessment Act. The only question that remains is

whether an exemption from the Environmental Assessment process is considered an 'authorization' in the context of the definition of development. There are two possible interpretations of this definition. The first being that an exemption afforded by the Environmental Assessment Act should be considered an authorization, and therefore, energy generation is not considered 'development'. The alternative interpretation is that a project must be subject to an environmental assessment process, and not exempt from it, in order to be authorized, and therefore, energy generation would be considered 'development'. The former interpretation removes energy generation from all 'development' policies in the PPS, while the latter would mean that Category 'A' or exempted projects remain subject to the development policies in the PPS. All wind energy projects less than 2 MW are considered Category 'A' projects under the environmental assessment process.

In our opinion, a simpler way to avoid the varied interpretation, is to acknowledge that site alteration will occur when larger new wind energy projects are constructed, and as a result, the site alteration policies and restrictions in the PPS apply.

The PPS also makes an important distinction in that renewable energy generation systems and alternative energy generation systems are promoted over conventional systems. The definitions are provided below:

> ***Renewable energy systems**: means the production of electrical power from an energy source that is renewed by natural processes including, but not limited to, wind, water, a biomass resource or product, or solar and geothermal energy.*
>
> ***Alternative energy systems**: means sources of energy or energy conversion process that significantly reduce the amount of harmful emissions to the environment (air, earth and water) when compared to conventional systems.*

The protection of Cultural Heritage Landscapes is required by the PPS as noted in Section 2.6.

> ***Cultural Heritage Landscape**: means a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways and industrial complexes of cultural heritage value.*

As noted at the beginning of this Section, 1.7.1 e) within the PPS, states that major facilities are to be appropriately designed, buffered and/or separated from *sensitive land uses* to prevent *adverse effects* from odour, noise and other contaminants and minimize risk to public health and safety.

***Sensitive Land Uses**: to mean buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include but are not limited to: residences, day care centres, and educational and health facilities.*

***Adverse Effects** in the context of the Environmental Protection Act, means one or more of:*

a) Impairment of the quality of the natural environment for any use that can be made of it;
b) Injury or damage to property or plant or animal life;
c) Harm or material discomfort to any person; an adverse effect on the health of any person;
d) Impairment of the safety of any person;
e) Rendering any property or plant or animal life unfit for human use;
f) Loss of enjoyment of normal use of property; and
g) Interference with normal conduct of business.

With respect to the integration of the Environmental Assessment process, the following definition is considered relevant:

***Provincial and federal requirements:** means in regard to policy 1.8.3, ;legislation and policies administered by the federal or provincial governments for the purpose of protecting the environment from potential impacts associated with energy facilities and ensuring that the necessary approvals are obtained.*

3.3 County of Essex Official Plan

The County of Essex consists of seven lower tier municipalities operating under a County Official Plan which was approved on July 19, 2005. This Plan provides the fundamental broad based guidance at the upper level. One of the key principles of the Plan is to establish a policy framework for coordination and cooperation between municipalities, both internal and external to the County on planning, development, resources and inter municipal servicing issues that cross municipal boundaries.[12]

The County Plan recognizes the importance of agriculture and industry as the major contributors to the economic vitality of the area. The County's location has also proven to be advantageous in relation to tourism, economic development and transportation. The settlement areas within the County are diverse and vary in terms of built form, services and amenities. All non-urban areas are designated Agricultural Area with the exception of natural environment areas as shown in Fig 3. Small scale commercial and industrial uses are encouraged to locate in Settlement Areas. (Figure 3)

However, other permitted uses in the Agricultural designation include those farm related commercial and farm related industrial uses that are small scale and directly related the farm operation and are required in close proximity to the farm operation.[13] Limited non-residential uses may be permitted in prime agricultural areas provided the following is met:

i. Demonstrated need for additional land to be designated to accommodate the proposed use.
ii. No reasonable alternative locations which avoid prime agricultural areas.
iii. No reasonable alternative locations in prime agricultural areas with lower priority agricultural areas with lower priority agricultural lands.
iv. Minimum Distance Separation requirements are met.

Figure 4 identifies the areas susceptible to flooding within the County, including three distinct categories, Lake St. Clair Floodprone Areas, Lake Erie/Detroit River Floodprone Areas and Inland Floodplain Development Control Areas. The Lake St. Clair Floodprone Areas are located within the north sections of Essex County, and encompass nearly the entire shoreline area. There are some areas with greater floodprone areas, for example the areas of Tecumseh, St.Joachim and Lighthouse Cove. The Lake Erie/Detroit River area flanks the eastern Detroit River shore southward into Lake Erie. The Lake Erie shoreline includes a substantial floodprone area. The Inland Floodplain Development Control Areas area equally dispersed throughout the County following susceptible areas based on the 1:100 year or maximum flood conditions.

The Official Plan provides that development and site alteration within the Lake System, shall only be permitted in areas identified as being susceptible to flooding if:

i. The hazard can be safely addressed.
ii. New hazards are not created and existing hazards are not aggravated.
iii. No adverse environmental impacts will result.
iv. Vehicles and people has a way of safely entering and exiting the area during times of flooding, erosion or emergencies.
v. The development does not include institutional uses or essential emergency services or the disposal, maintenance, treatment or storage of hazardous substances.

Within the Inland Watercourse areas development will not be permitted in a floodway. Development and site alteration shall only be permitted in floodfringe areas (addressed at the local level) if the following are addressed:

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[12] County of Essex Official Plan. July 19, 2005 p.1
[13] County of Essex Official Plan. July 19, 2005 p.3 & p.27

i. The hazard can be addressed.

ii. New hazards are not created.

iii. No adverse environmental impacts will result.

iv. Vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion or emergences.

v. The development does not include institutional uses or essential emergency services or the disposal, maintenance, treatment or storage of hazardous substances.

With regard to these areas including the Lake Systems and Inland Watercourses, development setbacks are encouraged as the preferred method for protecting new development as opposed to relying on structural or non-structural protection measures.

There are no policies in the County Plan relative to energy generation facilities. The only related policies are found in Section 2.12 Utility Corridors. This section relates directly to utility corridors, including communication corridors and transmission facilities. Although the context of this section is related to transmission and distribution lines and not the generation of energy from renewable or conventional energy facilities, the following policies apply:

i. Properly and efficiently serve the public.

ii. Must be considered in conjunction with other legislative requirements.

iii. Preferred routes include existing rights of way, property lines and fence line. , avoid built up areas and not infringing on natural heritage corridors.

iv. Minimizing impact on agricultural lands and natural environment.

v. Mitigation of impacts on agriculture during construction.

vi. Good accessibility from existing road network.

vii. Design, construction, site restoration and maintenance completed in accordance with all environmental guidelines.

viii. Visual harmony.

The challenge for the County and its member municipalities is to provide opportunities for renewable energy facilities, while ensuring that adverse effects are eliminated or minimized. County and local planning policies that reflect local physical, social, economic and environmental sensibilities will play a key role in the responsible siting of renewable energy projects.

Two additional sections of the Plan have implications for energy generation facilities. Specifically, Section 2.3 of the Plan provides for the long-term protection of mineral aggregates, minerals and petroleum resources. Based on County GIS mapping, these areas are shown in Figure 12. These areas may represent a constraint to the development of certain types of renewable energy facilities.

Lastly, Section 2.8 of the Plan requires the conservation of cultural heritage and built heritage resources; however, they have not been identified at the County level.

3.4 Local Official Plans

There are seven municipalities within the County, each of which has their own local official plans based primarily on pre-amalgamation boundaries. The plans vary in terms of adoption, approvals, five year reviews and draft amendments for wind/renewables. The plans are similar in the directive policies regarding electric power generation facilities. Discussions with each of the local planners provided an overview of current official plan policies, five year review updates and pre-consultations in regard to renewable energy projects.

Town of Amherstburg – Private wind energy facilities are a permitted use. (1999)
The Town of Amherstburg adopted a new Official Plan on September 11, 1999 after the amalgamation of the three municipalities effective January 1, 1998. This Official Plan has not yet been approved by the County.

The adopted Official Plan includes policies relating to electric power facilities (hydro transmission) as well as wind turbines. Specifically, wind turbines are permitted outside of Settlement Areas, with the exception of Industrial designations (located along Howard Avenue). Small Scale wind energy systems are permitted as accessory structures within the Agricultural, Industrial and Institutional designations. The policies allow for an individual zoning by-law amendment to be applied for on multiple turbines projects.

During discussions with George Balango, it has been confirmed that the Planning Department has had ongoing consultation meetings with two wind companies. Furthermore, there are two MET towers existing within the Municipality, approved by temporary use by-law.[14]

Town of Essex – Private wind energy facilities are not a permitted use. (1999)
Private wind energy facilities are a permitted use. (draft)

The Town of Essex is currently consolidating their 1999 Official Plan documents for Essex, Colchester North, Cochester South, Harrow, as well as updating the policies in an effort to produce a comprehensive, relevant and unified Official Plan for the entire Town. The 1999 Official Plans, which are currently in place, do not speak to wind or renewables.

The draft Official Plan includes policies relating to electric power facilities (hydro transmission), as well as renewable energy. This document currently has no status.

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[14] Balango, George. Planning Department, Town of Amherstburg. Discussion July 12, 2007.

The Planning Department continues to have ongoing consultations with a number of wind developers as well as a local small scale wind turbine company. There have been no formal submissions to date. There are MET towers existing within the Town that were subject to the building permit process and were considered an 'as of right' use in the Agricultural zone.[15]

Town of Kingsville - Private wind energy facilities are not a permitted use. (1995, 1999)
Private wind energy facilities are a permitted use. (2004)

The Town of Kingsville approved in principle an Official Plan on May 24, 2004. Council has made significant changes since this time, the document remains not approved. The 1995, 1996 Official Plans, which are currently in place, do not speak to wind or renewables.

The adopted Official Plan includes policies relating to electric power facilities (hydro transmission) and wind.

The Planning Department has had ongoing consultation meetings with several wind companies. In addition there has been one formal submission of an OPA and ZBA for a wind project as part of a neighbouring development in the Town of Lakeshore. There are two existing MET towers that were erected with no approvals required.[16]

Municipality of Leamington - Private wind energy facilities are not a permitted use. (2003)

The Municipality of Leamington adopted an Official Plan on November 24, 2003. At this time, the document has not yet been approved by the Ministry and is not in effect. This Official Plan does not speak to wind or renewables. The adopted Official Plan includes policies relating to energy conservation in order to promote alternative energy sources, but only speaks to design.

The Municipality of Leamington has also passed By-law No. 771-07, being a by-law to impose Interim Control for all lands within the Municipality of Leamington in regard to windpower and renewable energy. The intent of the interim control by-law was to undertake a study to determine the best manner in which to address wind energy and other renewable energy sources as well as the necessary implementation to upper and lower tier planning documents. The by-law prohibits the construction of small and large scale wind turbines. In addition, the by-law prohibits large scale alternative energy projects, such as solar, biomass and geothermal. However, alternative energy projects accessory to a main use, such as a biomass furnace used for a greenhouse development, are permitted.

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[15] Jeffrey, Chad. Planning Department, Town of Essex. Email July 18, 2007.
[16] Stevenson, Danielle. Planning Department, Town of Kingsville. Discussion July 12, 2007.

Based on email correspondence with Tracey Pillon-Abbs, it has been confirmed that the County has requested a modification to the adopted Official Plan to include a statement regarding energy, based on the Provincial Policy Statement 2005. It is anticipated that Council will consider this modification in the fall of 2007. The Planning Department has had ongoing consultation meetings with several wind companies. In addition there has been one formal submission of an OPA and ZBA for a wind project. There are two existing MET towers that were erected with no required approvals.[17]

Town of LaSalle – The Town operates under the Official Plan for LaSalle (1998). The Official Plan does not speak to wind or renewables. Small Scale (accessory) Wind Turbines are permitted (1998, OPA#1 approved in 2003, OPA). Zoning By-law Amendment No. 6717 was passed on August 8, 2006 permitting small wind turbines accessory to agricultural or residential uses. An application for a minor variance in regard to a small scale turbine was applied for and granted, and since this time the applicant has re-submitted for an increase in height. Staff supported the application subject to the completion of a noise study, shadow flicker assessment, development agreement and setbacks to implement noise and shadow flicker findings.

Town of Tecumseh – Private wind energy systems are not permitted (2000, 2003, 2004, OPA)

The Town of Tecumseh has three Official Plans for the respective former municipalities of Tecumseh (2000), St. Clair Beach (2004), Sandwich South (2003+OPA 9). These Official Plans do not speak to wind or renewable energy.

Based on a discussion with Enrico De Cecco, it has been confirmed that a temporary use by-law has been submitted for a MET tower, which staff are supporting. Further, it is understood that there has been little pressure for wind or renewable energy policies within the Town of Tecumseh.[18]

Town of Lakeshore – Small Energy Private Wind Turbines are permitted. (OPA)

The Town of Lakeshore is governed by five existing Official Plans for Belle River (1999), Maidstone (1999), Rochester (1999), Tilbury North (1996) and Tilbury West (1987). These Official Plans do not speak to wind or renewables.

Based on a discussion with Tom Storey, it has been confirmed that Council adopted a generic Official Plan Amendment and Zoning By-law Amendment on July 10, 2007 with regard to renewable energy.[19] Council has been supportive of encouraging renewable energy systems and has recently

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[17] Stevenson, Danielle. Planning Department, Town of Kingsville. Discussion July 12, 2007.
[18] De Cecco, Enrico. Town of Tecumseh, Planning Department. Discussion July 13, 2007.
[19] Storey, Tom. Town of Lakeshore, Planning Consultant. Discussion July 13, 2007. Email August 2, 2007.

visited the Lake Erie windfarm to better understand noise impacts. An appeal has been received within Belle River, the hearing date is scheduled for October 12, 2007.[20]

The "newly" adopted energy conservation and generation policies (Section 4.2.4) include policies on renewable energy systems and wind energy conversion systems. Renewable Energy Systems have been categorized as small scale generating systems and large scale generating systems, defined by energy generation for the landowner, versus a system connected to the grid. All large scale projects are subject to Site Plan Control, a site specific Zoning By-law Amendment, siting requirements, submission of supporting documentation and a completed EAA process prior to development

Wind Energy Conversion Systems are defined as small scale generating systems and large scale generating systems. A small scale generating system generates electricity only for the property owner and does not contribute to the grid, and setbacks will be established within the zoning by-law. The large scale generating system generates electricity into the grid system and will require a zoning by-law amendment, with the use of a holding symbol and will require a complete submission of technical documents.

In summary, after reviewing the Official Plans of each of the local municipalities and during discussions with each of the municipal planners, it is apparent that there is a range of approaches, processes and timelines regarding the accommodation of wind energy facilities within the County. Within most municipalities, Official Plans were silent on the issue, but have either begun a review process or are in the midst of a review and draft official plan amendment.

3.5 Environmental Assessment Act

Through Regulation 116/01, the Environmental Assessment Act (EAA) classifies electricity projects based upon the type of fuel used, the size of the project and the efficiency of the facility. Requirements of the EAA are then applied based on the classification of the project:

- Wind: No EAA requirements for projects less than 2MW. Projects greater than or equal to 2 MW have to complete the Environmental Screening Process.
- Solar: No EAA requirements.
- Biomass: No EAA for projects less than 5MW. Projects greater than or equal 5MW have to complete an Environmental Screening Process.

[20] Storey, Tom. Town of Lakeshore, Planning Consultant. Email August 31, 2007.

- Waste Biomass: No EAA for projects less than 10MW. Projects greater than or equal 10MW have to complete an Environmental Screening Process.

- Municipal Solid Waste: The incineration of less than or equal to 100 tonnes per day requires an Environmental Screening Process. A facility incinerating greater than 100 tonnes per day requires a full and individual Environmental Assessment (EA). This does not apply for municipal solid waste that has been pre-processed into pellets for biomass generation.

  * for a full description of project classifications please refer to Ontario Regulation 116/01 and Ministry of Environment Publication PIBS 4021e.

Most renewable energy projects either have no EAA requirements or have to carry out an Environmental Screening Process. While proponents are legally required to meet the requirements of the Environmental Screening Process, this process is a proponent driven, self-assessment process that may not be reviewed or approved by the MOE unless there is a request by a third party to elevate the project. An overview of the Environmental Screening Process is as follows:

- Proponent publishes a Notice of Commencement of a Screening
- Proponent decides on public and agency consultation necessary during the process
- Proponent prepares Screening/Review Report
- Proponent publishes a Notice of Completion of Screening/Review
- Report and makes report available for a minimum 30-day public and agency review
- If no requests to elevate, proponent issues a Statement of Completion and project may proceed subject to any other required approvals.[21]

If there is an elevation request, the following occurs:

- The Ministry is required to review the Screening/Review Report
- Director Environmental Assessment and Approvals Branch makes a decision on elevation requests
- Minister can be requested to review the Director's decision.[22]

Public participation in the Environmental Screening Process is summarized as follows:

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[21] LeGorw, Marie. Ministry of the Environment. Municipal Issues and Wind Energy Proceedings. London. June 19, 2007.
[22] Ibid.

- Proponent is responsible for designing and implementing an appropriate consultation program for the project.
- Purpose is to provide the public with an opportunity to receive information about and make meaningful input into the project review and development.
- Failure to carry out adequate public consultation or to address public issues and concerns may result in requests to elevate the project.
- Public consultation should be commenced early in the screening process and continue throughout the process as necessary.[23]

Public consultation associated with an Environmental Screening Process usually consists of a series of open houses together with required notices and a comment period for the draft screening report. It is envisioned that during the pre-consultation with a proponent, the design of the consultation program could include opportunities for combined public meetings. For example, a public meeting for a rezoning application could be held during the consultation period of the draft Environmental Screening Report. This would allow for public comments at that meeting to be incorporated into both the implementing zoning by-law and final Environmental Screening Report.

Certain changes to renewable energy projects may also be considered by the proponent to be a minor modification and require no notice of the changes to the public. With respect to wind projects, all changes would be considered minor except for an increase in nameplate generating capacity greater than 2MW.

Proponents of wind energy generation projects have expressed concern in the past that the EA process and approvals required under the Planning Act are duplicative processes. At a recent OMB hearing, there was discussion that the Planning Act process does not to concern itself with environmental issues as these would be considered under the EA process and the expertise of the MOE. We fundamentally do not agree with this suggestion as the Planning Act specifically states that all planning approvals must consider provincial policies including those related to natural heritage. For this reason the EAA states that the environmental screening process can be conducted in conjunction with and/or coordinated with other approval requirements and that the Environmental Screening Process does not relieve the proponent from the responsibility of obtaining any necessary approvals under the other applicable legislation.

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[23] Ibid.

The Planning Act and EAA should be considered to complement each other rather than be duplicative processes. The processes can be run concurrently and the public meetings of the 2 processes can be integrated to minimize duplication and share common background information. In most cases, minor changes to the scope of key background studies will provide the necessary information to satisfy approval processes under both the Planning Act and EAA is required.

For example, the completion of the Environmental Screening Process would allow for the fully processed planning application to be approved at the next available Council meeting. Alternatively, if the environmental screening process results in an amendment to the project, then these changes can be made to the implementing planning approval prior to its finalization.

3.6 Environmental Protection Act

The principal environmental law in Ontario is the Environmental Protection Act (EPA). The EPA is founded upon a general prohibition against polluting (s. 6 prohibits "discharging" a "contaminant" "into the natural environment"), and gives the Minister of the Environment various powers to enforce the prohibition, such as the power to issue stop orders and control orders.[24]

Section 9 of the EPA provides for the issuance or amendment of a Certificate of Approval (C of A) by the Director, allowing for the construction, alteration, extension or replacement of a plant or equipment that may discharge a contaminant into the environment (other than water), or change the rate of such a discharge from a facility. Certificates of Approval can be seen generally as officially authorized exemptions from the general prohibition against discharging contaminants.[25] The regulations requiring Certificates of Approval may allow exemptions in particular situations.

Certificates of Approval are required for facilities that release emissions to the atmosphere, discharge contaminants to ground and surface water, provide potable water supplies, or store, transport, process or dispose of waste. Proponents of these types of activities are required to obtain Certificates of Approval to ensure that the environment will not be adversely affected.

The Ontario Ministry of the Environment is responsible for the development, administration and enforcement of environmental legislation.

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[24] www.uic.edu/sph/glakes/pcb/regs_ca_ontario.htm

[25] www.uic.edu/sph/glakes/pcb/regs_ca_ontario.htm

4.0 Renewable Energy Facilities – Overview

As part of the County's planning study, renewable energy generation will be identified and discussed. For the purpose of this document and future land use policies, the definition of Renewable Energy Systems as stated in the Provincial Policy Statement 2005 will be used:

> *Means the production of electrical power from an energy source that is renewed by natural processes including, but not limited to, wind, water, a biomass resource or product, or solar and geothermal energy.*

A differentiation needs to be made between *renewable* energy systems and *alternative* energy systems. Alternative Energy Systems are also defined in the Provincial Policy Statement as:

> *Means sources of energy or energy conversion processes that significantly reduce the amount of harmful emissions to the environment (air, earth, and water) when compared to conventional energy systems.*

While Renewable Energy Systems could also be considered an Alternative Energy System (AES) Alternative by virtue of the definition (i.e. wind as an energy source), AES' are generally associated with the production of alternative fuels rather than the production of electricity. On this basis, they will not be considered as part of this background paper. Our planning interest from a policy perspective is when the Renewable Energy System generates electricity. The use of renewable energy primarily for the production of heat are not the focus of this Background Paper. However, it is recommended that any system producing electricity be subject to the applicable policies of renewable energy systems.

The overview of renewable energy sources will be followed by a summary of potential land use considerations. The discussion will focus on forms of renewable energy primarily for the production of electricity. Other jurisdictions that have established policies to address these issues will then be examined together with planning best practices for accommodating renewable energy land uses.

4.1 Forms of renewable energy

Forms of renewable energy generation are derived from renewable energy sources and improved technological advancements to harness them. A literature review and recent technological advancements identified the following renewable energy sources.

Renewable Source:	Associated Technology:
Wind	Horizontal axis turbines Vertical axis turbines
Solar	Photovoltaic Solar thermal
Hydropower	Diversion Dams Tidal/Wave
Geothermal	Conventional Steam Binary Plant
Biomass (waste, co-generation, municipal solid waste)	Combustion - purpose grown renewable fuel - agricultural by-products - manure - industrial by-products - municipal solid waste
Biogas	Creation of methane gas through fermentation, anaerobic digestion, and landfill catchment.

A Brief Description is provided for each of the forms of renewable energy described above. A more complete description of renewable energy forms likely suitable to be considered in Essex County will be discussed in Section 5.0.

4.1.1 Wind

Atmospheric conditions on the earth create temperature differences and variations in atmospheric pressure. These differences and variations result in moving air in the form of wind. Renewable energy from wind is accomplished by using the moving air to physically turn blades on a turbine. The kinetic energy in the moving blades is then converted to electrical energy by turning an electrical generator.

The amount of energy contained within the wind is based primarily on wind speed although cooler temperatures can create more dense air and thus increase the amount of available kinetic energy.

Wind turbine technology has been around for centuries on farms and early industrial processes. However, recent technological advancements have resulted in a variety of turbine styles capable of producing electrical energy.

The most common form of modern day turbine is a large scale horizontal axis turbine using three blades mounted to the nacelle atop a tower. The moving blades turn a generator in the nacelle or in the turbine base.

Plate 3: Horizontal Axis Turbine – typical three bladed design.
Source: CANWEA 2007.

Other wind turbines use a vertical axis to which blades, with profiles like wings, turn a generator in the base. The use of this type of turbine is less popular than horizontal designs due to maintenance issues, construction near the ground where wind speeds are less and lower efficiency.[26]

Plate 4: Vertical axis turbine.
Source: Danish Wind Energy Association 2007.

[26] Danish Wind Energy Association, http://www.windpower.org/en/tour/design/horver.htm, 2007.

4.1.2 Solar

Solar energy can be captured and converted to electricity through 2 primary methods – Photovoltaic cells and thermal collection systems.

Solar Energy Systems (SESs) represent a very new land use for Ontario that for the most part has never been contemplated by land use planning policies. Smaller scale systems accessory to primary uses are unlikely to need significant land use controls due to their passive nature and ability to be incorporated onto existing structures.

4.1.2.1 Technologies

Photovoltaic

Photovoltaic conversion is the direct conversion of sunlight into energy using solar cells in flat plane or concentrator systems. In the solar cells, sunlight generates free electrons from the energy of light particles to generate electricity.

Technology is improving but large areas of solar cells are required to generate significant electricity, particularly in less than ideal solar areas like southwestern Ontario. It is estimated that a 9.1 megawatt project proposed in Norfolk County will require approximately 80 acres of land.[27] Other solar projects in Lambton County of 10 MW generally require 150 to 200 acres of land. For comparison purposes, a similar sized wind energy project consisting of between 4 and 5 large scale wind turbines would require approximately 20 acres for construction and approximately 5 acres once in operation.

Photovoltaic cells are improving in technology (i.e. amount of energy converted within a finite area) while decreasing in cost. General Electric recently announced the availability of thin film solar cells that will reduce the demand on silicon cells (currently in short supply) while allowing greater flexibility for incorporating the cells onto other structures.[28] The GE technology represents another milestone in the fact that there are significant costs involved in mounting traditional photovoltaic cells to new and existing structures.

Solar Thermal

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[27] Blackwell, Richard. Here comes the sun: Ontario pushing solar power, Globe & Mail, May 30, 2007.

Technologies using solar thermal principles convert the sun's energy into heat energy which can then be applied to a variety of uses from water heating to steam for electrical generation. While early developments mainly centered on domestic hot water, new technologies allow for commercial scale power generation using parabolic troughs, parabolic dishes, central receivers and solar chimneys.

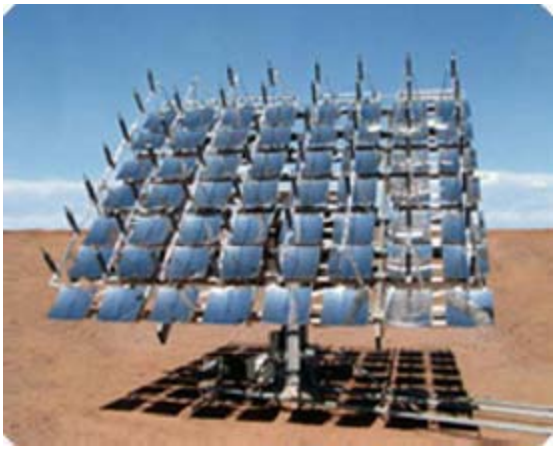

Plate 5: Solar collector used to capture the sun's thermal energy to generate steam and create electricity.
Source: http://www.nrel.gov/

Cloudless areas at lower elevations with little scattered radiation, such as deserts, are considered the most appropriate locations for solar thermal energy. Therefore, the primary markets for this form of generation are sunnier regions with warm temperate climates.

Solar thermal systems are generally combined with established power generation facilities using steam as a supplement for intermediate and peak load applications. At this time, solar thermal technologies are generally not competitive at the commercial level but can be used in remote sites with suitable climatic conditions.

Another form of solar thermal energy being considered are solar chimneys which heat air located below glass panels at ground level and direct the heated air up through a central chimney to more cooler air. The temperature differentiation and convection effect creates airflow that can be directed through turbines to generate electricity. One such project is currently in the approval stages in Australia and proposes a solar chimney 1000 metres high.

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[28] Hill, Michael. GE jumps on 'thin film' solar cell bandwagon, Globe & Mail, June 24, 2007.

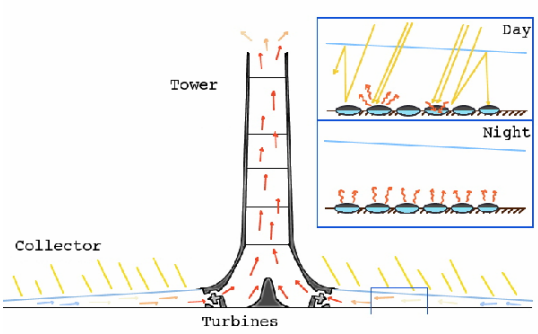

Plate 6: Concept of the solar chimney showing the heating of air at ground level and resultant convection effect.

Source:http://upload.wikimedia.org/wikipedia/en/2/29/Solar_Updraft_Tower.png

4.1.2.2 Solar Considerations

- Most photovoltaic generation projects have traditionally been for smaller projects accessory to a principle use. New technologies and pricing incentives are encouraging larger projects.
- Photovoltaic generation may prove to be a better alternative for smaller scale production in remote areas because of reduced operational and maintenance requirements.
- Photovoltaic generation has no moving parts resulting in project life spans of possibly up to 30 to 40 years.
- Solar thermal technologies can be integrated into existing power generation facilities using steam to preheat process water.
- Solar thermal technologies, particularly at these early stages of development, require higher solar energy areas such as the sunbelt regions of the world – not southern Ontario.

4.1.3 Biomass

Energy from biomass uses the combustion of biological material to generate steam and ultimately power. Energy from biomass is the second most widely used source of renewable energy after hydroelectricity.[29] In Canada, biomass supplies 5.9% of primary energy demand. In developing countries this figure can be as high as 35%.[30]

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[29] European Bank for Reconstruction and Development, Renewable Energy Resource Assessment: Stage 1, April 2003, Page 4-13.
[30] Pollution Probe, The Technologies of Renewable Energy, 2003, Page 42.

4.1.3.1 Resources

New technologies are resulting in new fuel sources such as wood, agricultural by-products, animal waste and municipal garbage. These sources can be provided in their 'raw' form or pre-processed to improve efficiency and storage capacity.

Given the agricultural nature of Essex County, viable biomass generation facilities have been and continue to be established to complement and support existing agricultural operations, particularly greenhouse operations which use large amounts of heat and electricity. Other agricultural operations can produce significant fuel resources as a by-product of existing grow operations (i.e. straw or grain by-products) or through crops grown specifically for biomass fuel (i.e. switchgrass or nuts/grains). However, these processes have proven more complex than other fuel sources and has delayed development in this sector.[31] Livestock operations can also produce manure that can be used as a fuel or fermented for biogas. An operation using this technology currently exists in the Town of Leamington.

4.1.3.2 Technologies

Direct Combustion - Direct biomass combustion plants ultimately use the same cycle of steam generation as those of other traditional generation facilities using fossil fuels. The only difference is the lower efficiency of the heating process due to the less concentrated nature of the fuel together with a higher water content. Pre-processing of the material (i.e. the formulation of pellets) may be undertaken to improve burning efficiency.

Smaller single installation biomass facilities for localized heating and energy generation are also gaining in popularity with technological improvements and the increased pre-processing of fuels.

The most promising source of biomass is from municipal waste which is currently used by the Region of Peel. Modern incineration is one of the least polluting industrial processes today. By burning garbage at high and constant temperatures, modern furnaces cut emissions and thoroughly 'scrub' any remaining emissions to exceed minimum environmental requirements. Combustion of municipal solid waste is a process whereby the hydrocarbons in the waste stream are converted to thermal energy, carbon dioxide (CO2) and water and the exhaust gases from combustion are cleaned prior to being emitted to the atmosphere.[32]

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[31] David Suzuki Foundation, Smart Generation: Powering Ontario with Renewable Energy, 2004, Page 47.
[32] Region of York, Background Document 2.2, Durham-York Residual Waste Study, 2007.

Sweden and France incinerate 41% and 36% of their garbage respectively. All 300 waste incinerators in the European Union combine to produce less pollution than a single steel mill.[33]

While incinerators have a high capital cost and a higher garbage disposal rate, they represent a real opportunity to solve Ontario's waste disposal crisis and provide some support for its renewable energy policy.

Anaerobic Digestion – This process breaks down organic matter such as animal, organic or solid wastes in an oxygen deprived environment (i.e. enclosed tank). The result is the production of combustible gas comprised primarily of methane and carbon dioxide.[34] The byproduct or liquid component of this process can be used as fertilizer. The Biogas produced by this process can then be burned to create heat for steam and ultimately electricity generation.

Co-Firing – Otherwise known as co-generation, this process introduces biomass to the boilers of coal fired plants to reduce the use of coal and is one of the most economical uses of biomass. This is an unlikely application due to current provincial policy and the lack of fossil fuel generation stations in the County.

Pyrolysis – This is a thermo-chemical process that converts solid biomass fuels, anything from wood waste to municipal waste, into a liquid fuel. The result of renewable liquid fuels is that they can be cleaned prior to combustion and are more easily stored, transported and burned.[35]

4.1.3.3 Biomass Considerations

The use of biomass warrants the following considerations:

- The larger concern for biomass facilities is the cost of transporting fuel to the facility and the need for a constant supply if stockpiling is not sufficient.
- Biomass plants have some of the same emission issues as fossil fuel plants. There is reliance on technology to ensure that the environmental benefit outweighs potential impact.
- Public perception of waste incineration is generally negative, based on stereotypical views from older technologies. European examples have demonstrated that this can be overcome.
- Incinerator facilities are primarily for waste disposal and not for electricity generation.
- Modernized agriculture can produce adequate fuel supplies for viable energy conversion.

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[33] Globe & Mail, 2006.
[34] Pollution Probe, The Technologies of Renewable Energy, 2003, Page 46.

- While biomass generation can be carbon neutral, long term use in an area growing the fuel can have negative impacts on soil fertility, water use, landscape and biodiversity.
- The need for transportation of the fuel increases the need for road infrastructure and delivery vehicle emissions thus reducing the net environmental benefit.
- Biomass provides an opportunity for on-site facilities to support existing greenhouse operations to supply heating and electricity needs. Communal support infrastructure may make this form of biomass energy more cost effective. It is understood that the use of biomass for greenhouses is primarily for heating with secondary benefits associated with electricity and carbon dioxide generation.
- Depending on the classification of the biomass facility for electrical generation, a biomass project may be exempted from the environmental assessment process. In addition, Certificate of Approval requirements for agricultural operations may be waived by the Ministry of the Environment leaving only the planning approval process to deal with land use issues.
- Storage of biomass materials has the potential for land use impacts such as odour, stormwater quality, and safety. Planning approvals should consider appropriate management techniques.
- The promotion of biomass facilities for greenhouse operations will assist in the reduction of fossil fuel based heating and generation systems.

4.1.4 Hydro

Electricity generation from water is considered to be one of the best sources of renewable energy supplies for its generating capacity, low cost, base-line reliability, and energy storage capability. Ontario's physiography and abundance of water makes it well suited for hydro projects with over 180 now established producing 22% of the Province's power.[36] The largest hydroelectric facility in Ontario is located in Niagara Fall and produces 1400 MW of electricity.

However, hydroelectric projects can have environmental impacts and high initial capital costs making them a limited option in most areas.

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[35] Ibid, Page 48.
[36] Ontario Ministry of Energy, http://www.energy.gov.on.ca/index.cfm?fuseaction=english.electricity, 2007.

4.1.4.1 Resources & Technologies

Hydroelectricity generation is generally regarded as a mature technology unlikely to further advance. Hydroelectric power functions on the basis of falling water creating kinetic energy that is then directed through a turbine to generate electricity. Power generated is dependent on the distance the water is falling and the flow rate. Capital costs are highly variable depending on site characteristics and constraints.

Other forms of water based renewable energy include the following:

Dams – Dams for the basis of most large scale electrical generation projects by allowing for the storage of water to increase fall and ensure reliability.

Diversion – Rivers and streams are a source of moving water and can provide large generation capacities. Plants located on rivers rely primarily on the natural flow of the river and therefore output becomes more varied as water flowing downstream is passed through turbines to turn electrical generators.

Tides – Coastline areas experience a variation in sea level twice a day as a result of tides. Tidal power uses the natural movement of water to fill inlets or basins as the tide rises and then release the collected water during times of low tide to turn a generator. There are only about 40 areas in the world considered appropriate for tidal generation, including the Bay of Fundy, due to the need for large tidal fluctuations.[37] The Great Lakes experience no appreciable water level fluctuations as a result of tides and could not be used for this type of technology.

Waves – Developed about 25 years ago, this technology uses the up and down motion of waves and swells for harnessing kinetic energy and generating electricity through the use of columns, floating devices and channels. It is not known if this energy source is viable on the Great Lakes.

4.1.4.2 Hydro Considerations

The following considerations are relevant for hydro resources:

- The damming of rivers for larger scale projects has the potential for significant environmental impacts.
- Resulting reservoirs can provide a community recreation resource and offset seasonal flooding impacts downstream.

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[37] Pollution Probe, The Technologies of Renewable Energy, 2003, Page 23.

- Hydro generation stations represent an effective means of storing electricity in response to the intermittent nature of other renewable energy sources. In the case of wind, on windy days where turbines are operating effectively, water in dams can be held back, effectively storing electricity for times when the wind turbines may not be turning due to atmospheric conditions.
- The wide spread potential of tidal power is very limited due to the physical requirements of coastline areas that produce a wide range in tides (i.e. The Bay of Fundy). However, the right location can produce very consistent and low cost power.
- Wave energy is also effective but subject to variations due to weather conditions. Ongoing operational maintenance is higher due to off shore locations.
- Wave and tidal facilities have the potential to have environmental impacts on shoreline ecosystems.
- Larger hydroelectric projects are often not referred to as "renewable" due to their potential environmental impacts.

4.1.5 Geothermal

Electrical generation using geothermal energy is based on the principle of using heat energy below the earth's surface for the creation of steam to drive an electrical generator.

Geothermal electrical generation should not be confused with heating using geothermal resources. This form of geothermal energy requires much lower levels of heat energy not sufficient enough for the creation of steam. In addition, heating and cooling technologies require electrical energy inputs to extract heat energy.

4.1.5.1 Resources

The earth's core of molten material creates a heat transfer towards the surface of the earth. In areas of the earth where the tectonic plates meet, greater heat resources come closer to the surface and in the case of volcanoes, molten material actually reaches the surface.

The cost effectiveness of geothermal electrical generation, like other forms of renewables, is based on the abundance and accessibility of the resource.

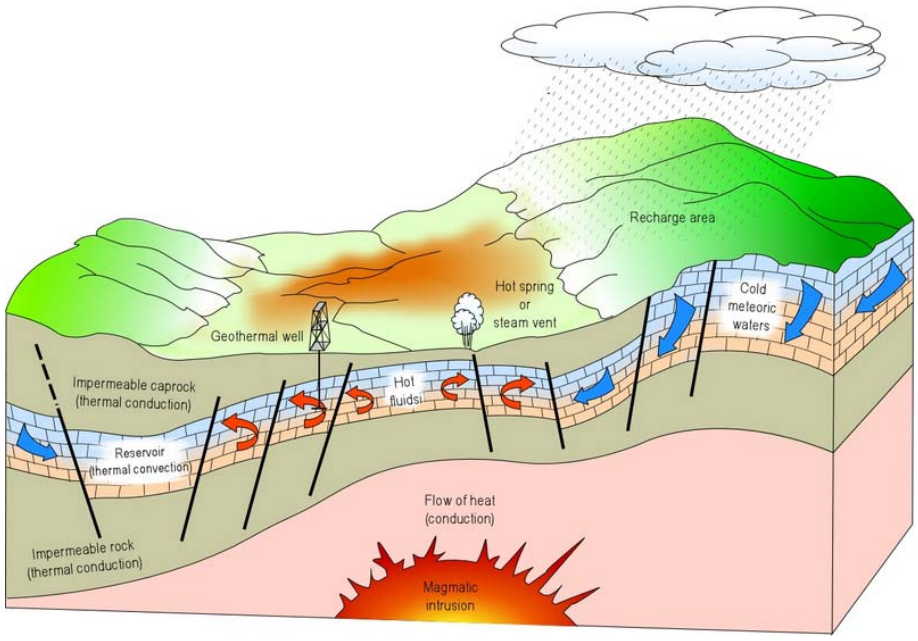

Plate 7: Illustration of the characteristics of a geothermal system.
Source: International Geothermal Association.

Global installed capacity of geothermal plants was approximately 8,400 MW as of 2003 with the Philippines and the United States accounting for the largest percentages of installed capacity.[38] Advances in technology should allow this figure to increase as measures to effectively transfer heat to the earth's surface improve.

Geothermal power is typically limited to locations where geothermal pressure reserves are found (preferably close to the earth's surface). These areas are generally near the edges of tectonic plates however smaller reserves can be found elsewhere.

4.1.5.2 Technology

The use of geothermal energy relies on expensive well drilling that may not always tap the necessary resource. Drilling technology is improving and these advancements will ultimately make sourcing geothermal resources a less risky and expensive venture.

Once the steam is harnessed, mature and proven technology for the generation of power through turbines can be implemented.

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[38] International Geothermal Association, http://iga.igg.cnr.it/geo/geoenergy.php, 2007.

Electricity from geothermal sources is usually generated by conventional steam turbines and binary plants depending on the available resource.[39]

Conventional Steam – This source of energy uses steam directly to turn a turbine or depressurizes hot water to create steam which is then passed through a turbine. Ground temperatures required for this process generally need to exceed 150 degrees Celsius.[40]

Binary Plants – In areas where ground temperatures are lower and cannot produce sufficient levels of steam to power a turbine, a secondary working fluid is used that has a lower boiling point. This fluid is then pumped down to the in-earth heat source where it is heated and returned to the surface and used in a heat exchanger to create steam before the cooled fluid is then returned to the heat source.[41]

4.1.5.3 Geothermal Considerations

The following issues need be considered with this renewable energy source:

- The gases contained in geothermal fluids can be an environmental concern, however, modern emission control technologies can reduce any impact. Most sources of heat and water do not produce harmful emissions.[42]
- There is the potential for ground subsidence as steam is pulled from the earth, however re-injection may offset this risk.
- Geothermal energy sources are constant and provide for a baseload of electricity supply.

4.2 Jurisdictional Analysis

4.2.1 Overview

The following is a list of general observations after reviewing policies and provisions from other jurisdictions in and outside of Ontario.

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[39] Ibid
[40] Ibid
[41] Union of Concerned Scientists, http://www.ucsusa.org/clean_energy/renewable_energy_basics/offmen-how-geothermal-energy-works.html, 2006.
[42] Pollution Probe, The Technologies of Renewable Energy, 2003, Page 74.

- Outside of Ontario (i.e. Alberta, United States, Australia), the 'development permit' represents the predominant form of planning approval as it allows for detailed review of a project on a site specific basis.
- All planning approval frameworks require supporting studies to address relevant potential issues, but there is a wide range of study requirements and scopes.
- In Ontario, specific planning controls for wind energy projects are becoming more common, as seen from the jurisdictional review of other counties and local municipalities. Project specific rezoning and site plan approval are the most common frameworks in use. Official Plans generally permit wind energy facilities in rural and agricultural areas while discouraging them from settlement and urban areas.
- With respect to zoning and site plan requirements, some North American planning frameworks provide specific setback and buffer distances. In Europe and Australia, where wind energy facilities are more mature, it is more common to look at detailed siting requirements on a site specific basis.
- There does not appear to be any municipalities specifically using a combined planning approval and environmental assessment process.
- In Ontario, there are limited planning policies related to wind turbine development other than large scale.
- Monitoring and the evaluation of wind energy projects once constructed tends to be absent in Ontario which is limiting for the continuous improvement of land use policies. Pincher Creek, Alberta has some of the most comprehensive monitoring and evaluation requirements.

In general, policies within Ontario are relatively recent and therefore policy effectiveness has not yet been demonstrated from a long term land compatibility perspective. Whereas policies in Alberta, United States, Australia and Europe tend to be more established due to longer established wind energy uses.

This maturity results in policies that include:

- Greater focus on decommissioning, abandonment and performance securities to ensure inoperable turbines do not continue to have land use impacts when not in operation. The ability to require securities for decommissioning and performance may be directly applicable to a municipality's ability to collect these funds through supporting legislation.

- The use of a development permit approval system allows for much more specific land use requirements reflective of a particular project that are not currently available through the Official Plan, Rezoning or Site Plan approval processes in Ontario.
- Permitted noise levels tend to be higher in the United States and Ontario and lower in Australia and Europe.

4.2.2 Jurisdictional Analysis

In order to complete an analysis of policy and processes in regard to wind and renewable energies across Ontario, we have contacted a selected list of counties, and local municipalities that are either in close proximity to Essex County or represent like landscapes and/or economies. The following is a comparative summary of our findings.

County or Local Municipality	**Policy on Wind/Renewable Energy**
Niagara Region	• Undertaking a comprehensive review and policy formulation exercise. • Policies are draft including OP and ZBL (Public Meeting Aug 15, 2007). • Micro scale (< 1Kw), small scale (>1Kw < 50Kw) and medium scale (>50Kw <500Kw and less than 100m) are permitted in most land use designations subject to local policy/provisions. • Large scale individual turbines permitted in specialty agricultural areas and prime agricultural areas if they support an agricultural use. Full permissions on rural lands. • Large scale multiple turbines not permitted on specialty agriculture and require an OPA on prime agricultural lands.
Town of Niagara on the Lake	• Undertaking a comprehensive review and policy formulation exercise. • Policies are draft including OP and ZB • Micro scale and small scale wind energy systems are permitted if proposal meets minimum siting criteria. Conditional re-zoning is referenced to allow for as of right proposals that meet minimum siting criteria. • Medium scale projects would require an OPA if minimum siting criteria is varied or if within 1 kilometre of a settlement area. All medium scale projects are subject to a site specific rezoning. • Large scale projects would require an OPA if minimum siting criteria is varied or if within 1 kilometre of a settlement area. All large scale projects are subject to a site specific rezoning. Further, multiple medium to large scale wind energy systems are not permitted in the Region of Niagara's Unique Agricultural Areas. There are additional policies for agricultural areas and medium/large scale developments that are capable of supporting

	agricultural operations.
Bruce County	• Extensive wind energy policies in place. • Encourages development of renewable energy systems. • Commercial scale wind energy is not permitted in Escarpment Natural Area (NEP) and Mineral Extraction designations. • Permitted subject to zoning by-law amendment. • Technical reports required include: site plan identifying all buildings within 500 metres of the site; engineered drawings of base and tower design; compliance with MOE Noise Guidelines; Siting if close to airports/aerodromes. • Subject to Site Plan Control. • Prior to Zoning By-law Amendment, a contract must be executed with the local utility or Ontario Hydro to allow connection to distribution line. • The Ontario Municipal Board and the Ontario Ministry of the Environment have removed the final hurdles for construction of Enbridge's wind power project in Bruce County. The project is expected to produce 182 MW of electricity and, on completion, be one of the largest wind power projects in Canada. The OMB ruled in favour of the project and the Ministry of the Environment has indicated that the project is compliant with its noise guidelines. (July 20, 2007)
Township of Melancthon	• Wind turbines permitted in specific areas. • Siting is regulated in order to consider safety, noise and visual impact. • Site specific zoning applied. • Wind farms must have regard for: presence of existing communities, residential subdivisions and built up areas, sensitive land uses as per MOE guidelines, environmental noise impacts, bird migrations and feeding areas, agricultural land capability, access to and impact on public roads, proximity to airports and aerodromes. • Technical Reports required include environmental noise study, visual impact study, natural heritage (EIS), bird migration, shadow or light reflection effects study. • Wind Turbines subject to Site Plan Control. • Zoning using the H Symbol may be utilized.
Municipality of Bayham	• Encourages development of wind energy systems. • Site specific zoning applied. • Technical Reports required include noise impact study, visual impact, visual impact study, natural heritage (EIS), Siting if close proximity to airports/aerodromes, planning justification report. • Where a significant amount of agricultural land is proposed to be removed from agricultural use, the proponent must demonstrate that the proposed

	wind farm Is a secondary use and that normal farm practice is not hindered.
Township of Malahide	• Encourages development of wind energy systems. • Site specific zoning applied. • Technical Reports required include noise impact study, visual impact, shadow flicker or reflection study, natural heritage (EIS), Siting if close proximity to airports/aerodromes. • Wind turbines should generally be located on lower priority agricultural lands. Where a significant amount of agricultural land is proposed to be removed from agricultural use, the proponent must demonstrate that the proposed wind farm is a secondary use and protects normal farm practice.
Grey County	• A 5 year review of the Official Plan is being undertaken in order to come into conformity with Provincial Policy. • Renewable Energy policies have been included in the review. The County supports the concept of alternative energy systems as a source of renewable energy. • Small scale systems are permitted in all land use designations excluding Wetlands and Hazard lands. Commercial projects are permitted in all land use designations excluding Wetlands, Hazard lands and Mineral Resource Extraction areas. At this time, small or commercial scale systems are in conflict with the Niagara Escarpment Plan. • Siting shall be controlled by municipal by-laws. • Development of new non wind or non solar projects will require an amendment to the Official Plan. • Technical reports to be provided include: Site Plan, Engineered drawings, Noise Impact Study, Visual Impact Study, MTO permits if required, Airport or Aerodromes clearances, Lighting clearances from MNR, Ice Throw report. If within Rural or Agricultural designations, a demonstration that agriculture will not be precluded or hindered, in addition to a decommissioning and rehabilitation plan. • Projects in excess of 2MW are subject to EA Screening process.
Middlesex County	• A recent 5 year review of the Official Plan was completed in order to come into conformity with Provincial Policy. • Renewable Energy policies were incorporated at that time. • Policies are general with local municipalities having their own local Official Plans. • County policy is clear in that no County Official Plan Amendment is required for commercial renewable projects. • Encourages commercial projects within the County.
Municipality of North Middlesex	• Has undertaken a policy review, documents remain draft. • Pre-consultation between municipality and developer is a requirement.

Township of Adelaide Metcalfe	• Has undertaken a policy review, documents remain draft. • Site Specific Official Plan Amendment required.
Township of Middlesex Centre	• Has began to undertake a five year review of Official Plan and will include renewable energy policies.
Huron County	• In January, 2007 Huron County passed a zoning by-law amendment and associated site plan control guidelines for wind energy development. The zoning by-law amendment is currently under appeal specifically dealing with setbacks from urban and recreational area. (the appeal states that the 600 metres setback is too large) (Hearing is set for September 5, 2007) • In order to establish a commercial scale wind energy facility (> than 500 kW nameplate capacity), the following must be applied for, EA, ZBA, SPC, use of holding symbol and a building permit. • In order to establish a small scale wind energy facility (< than 500 kW nameplate capacity in agricultural zones and < 50kW nameplate in urban zones), the following must be applied for, Certificate of Approval for noise from MOE, submission of a sketch including distances, locations etc., and a building permit. • Site Plan Control guidelines include the following submissions, detailed site plan, general map in relation to 500 metres of any lot proposed for a turbines, visual impact study, noise study, potential electromagnetic interference effects identification, copy of Environmental Screening report, EIS (if required), construction plan and decommissioning/rehabilitation plan.
Municipality of Chatham-Kent (single tier)	• Council adopted Official Plan (January 2005), but not yet approved by the Province with renewable energy policies. • Encourages the development of renewable energy systems including wind. • Strategic location on Lake Erie. • Wind farms are permitted in all designations. • Wind farms require a zoning by-law amendment. Safety, noise and visual impact will be contained on site. Access to a public road. Sufficient setbacks from sensitive land uses. • Technical reports required include, noise impact, visual impact, natural heritage (EIS), Siting if airports are involved. • Generally on lower priority agricultural lands in order to not disrupt normal farm practice. • Commercial wind farms shall be subject to Site Plan Control for location of roads, parking, accessory structures, buffers, external works, storm water and mitigative measures. • In the process of a comprehensive zoning by-law which is not yet at Council. • Draft Zoning includes a "Green Energy – Wind Farm" Zone. Minimum lot area 10 hectares with a minimum lot frontage of 100 metres.

	• Setbacks include: 600 metres from residential or institutional zone; 450 metres from industrial or commercial zone; 300 metres from off site residential dwelling; 1.25 times or 250 metres whichever is greater, from an on site residential dwelling.
Haldimand County (single tier)	• Council adopted Official Plan with renewable energy policies. • Not approved by Province at this time. • Council supports the development of wind energy systems for the economic benefit of the County and the Province. • One small scale turbine is permitted in all designations except Urban, Hamlet, Resort Residential, Endangered Species and Natural Environment Areas without the need for a zoning by-law amendment. • MTO permits required if within a control area. • Wind farms comprising of two or more turbines or wind turbines producing more then 500kW or more may be permitted through a zoning by-law amendment in the Agriculture, Major Industrial, Industrial and Rural Industrial designations. • Wind farms shall be designed, built, operated and maintained by persons qualified. • Zoning By-law Amendment will ensure off site impacts are minimized including safety, noise and visual. • Wind farms will be permitted on large parcels of land 5 hectares or greater designated Agricultural, Major Industrial, Industrial or Rural Industrial that are appropriately separated from residential development. The sites will be separated appropriately from Urban, Hamlet and Resort Residential nodes in Lakeshore areas in order to reduce impacts. • EA documentation to be submitted. • Access to improved public roads. • Located in lower class agricultural soils. • Application requirements include noise impact study, visual impact study, EIS, if required, airport/telecommunication siting report, grid analysis to the satisfaction of the local power distributor, and geotechnical report if close to mined areas. • May be subject to Site Plan Control (with Agreement).
Norfolk County (single tier)	• Norfolk County adopted a site specific Official Plan and Zoning By-law amendments which have since been appealed to the Ontario Municipal Board by opponents to the project. These planning policies and provisions represent possibly the first ones in the Province to deal with a large scale solar land use. Highlights of the Official Plan and Zoning By-law Amendments include: i. In addition to other permitted uses, allowing a solar farm to be permitted with a site-specific zoning by-law amendment.

	ii. Designation of the site for site plan control. iii. Definition of a "Solar Farm". iv. Zoning provisions specifying: o Maximum lot coverage of 95%. o Setbacks of 10m and 20m. o Maximum height of trackers of 10m and 7m for all other structures. Information requirements of the County and the Ontario Ministry of Agriculture, Food, and Rural Affairs included: v. Reflection Analysis. vi. Specialty Crop Assessment and Agricultural Impact Study. vii. Alternative Location Study. viii. Planning Impact Analysis. • Have been in pre-consultations with a renewable energy developer for a solar farm. • Permitted in Agricultural designation with one exception. Permitted in Hazard designation by site specific zoning by-law amendment. • Wind farms shall generally be on large parcels in order to contain impact on site. • Suitable access required from a public road. • Sites shall be of a size to provide setbacks to residential and institutional uses and to provide safety for topple and ice throw. Technical reports required include: noise impact study, MTO approval if required, visual impact study, natural heritage (EIS), siting if in close proximity to airports/aerodromes.
Prince Edward County (single tier)	• With regard to wind specifically, there has been a delay due to the pending OMB Hearing (OPA & ZBA). • The Comprehensive Zoning By-law incorporates setbacks for small independent wind turbines and specific zones for as of right. • A future wind project (3 or more turbines) will require a ZBA and OPA. • The County Official Plan does contain energy conservation policies to encourage development which minimizes energy consumption and emphasizes the use of renewable energy sources. • Electric power facilities (Hydro One or another hydro utility) are permitted in all land use designations without a Plan amendment provided that the planning of all such facilities is carried out having regard to the other policies of this Plan. • Comprehensive Zoning By-law provides the following setbacks:

	• RR1 zone = one turbine, 15kW, front yard 1.25xheight of turbine, interior side yard height of turbine, exterior side yard 1.25xheight of turbine, rear yard 12 metres, distance from nearest neighbours dwelling 45.7 metres. • RR2 zone = one turbine, 15kW, front yard 1.25xheight of turbine, interior side yard height of turbine, exterior side yard 1.25xheight of turbine, rear yard 12 metres, distance from nearest neighbours dwelling 45.7 metres. • RU1 zone (<25 acres) = two turbines, 150kW, front yard 61 metres, interior side yard 53.3 metres, exterior side yard 61 metres, rear yard 76 metres, distance from nearest neighbours dwelling 106.7 metres. • RU1 zone (>25 acres <50 acres) = two turbines, 300kW, front yard 91 metres, interior side yard 61 metres, exterior side yard 91 metres, rear yard 76 metres, distance from nearest neighbours dwelling 122 metres. • RU2 and RU3 zone (>50 acres) = two turbines, 6000kW, front yard 122 metres, interior side yard 61 metres, exterior side yard 122 metres, rear yard 76 metres, distance from nearest neighbours dwelling 182.9 metres. • Additional: any accessory tower anchorage shall be no closer than 3.05 metres from the interior, side or rear lot line. • Additional: in the RU2 and RU3 zones each turbines shall be a maximum of 300 kW.

While land use planning examples from other jurisdictions can be a useful tool when examining planning policy options, they can be limiting in that every municipality has some form of policy framework that is unique to their physical, social and economic characteristics. The above chart identifies policy undertakings, policy direction and status of several counties and local municipalities within Ontario. Commonalities exist between Essex and other several other municipalities in regard to the preservation or protection of prime agriculture lands, the consideration of environmentally sensitive areas and the protection of shoreline corridors. The following is a list of common processes and requirements that other municipalities within Ontario are requiring as part of the wind and renewable energy policy framework:

- County and local undertakings to complete a comprehensive review and policy formulation.
- Generally encouraging development of renewable energy systems.
- Micro scale and small scale energy systems are generally permitted if meeting siting requirements.
- Medium scale projects are generally permitted, subject to a zoning by-law amendment and siting requirements.

- Large scale projects sometimes require an Official Plan Amendments, and almost always require a zoning by-law amendment and site plan control.
- Requirements for technical reports include, noise study, visual impact study, natural heritage study, bird migration study, light reflection study, shadow flicker study, airport/aerodrome report, engineered drawings, decommissioning plans and detailed site planning.
- Each municipality has adapted policies to reflect local characteristics and concerns relating to the physical environment, economics and social well being.

4.3 Scales of Renewable Energy

The determination of scales is one of the key elements of policy writing. The use of scales allows the authors of policies and zoning by-law provisions to determine if certain types/sizes of renewable energy facilities should be prohibited in certain areas, or require an Official Plan Amendment or Zoning By-law Amendment. The principal determinate of the scale of a renewable energy facility should be the anticipated land use impact. However, when the land use impact is unknown, other criteria may need to be used to define the scale of the facility.

The purpose of this section is to provide an outline of the options available to the County and local municipalities in determining scale.

There are many examples of scales for wind energy facilities in the province; however, there are very few examples of the scales of renewable energy facilities. In the Municipality of Grey Highlands, the scales of renewable energy facilities have been broken down according to Micro, Small, Medium and Large categories that apply across all renewable energy types. For example, a large scale facility in Grey Highlands is defined as being any project that is classified as a Category 'B' or 'C' under the Environmental Assessment process or exceeding 61 metres in height.

Based upon our background review and discussions in the County of Essex we feel that an alternative approach may be more suitable. We propose that the scales of renewable energy facilities be determined based on the type of facility. This would mean that scales would vary based on whether a facility was wind, solar or biomass based. For the purposes of this Background Research Paper, we will outline option on this basis, and provide a recommended approach.

4.3.1 Scale Options for Wind Energy Facilities

Although there are no universally applied definitions for wind energy facilities, there are planning considerations that can assist in defining the scales for the County or local municipalities. The considerations include:

- **Physical turbine characteristics:**

There are a number of physical turbine characteristics that could be used to define the scales of turbines including (i) nameplate generating capacity, (ii) height, (iii) blade dimensions (i.e. length, style, material), (iv) tower style (i.e. monopole versus lattice tower construction), (v) location: (i.e. urban versus rural location) (vi) consumption (i.e. back-up versus primary or off-site versus on-site consumption) (vii) clearance between the blades and the ground. We recommend focusing on those characteristics that are directly related to land use compatibility and in which there are definable land use impacts such as height, blade dimensions, and tower style. The height of the turbine, rather than capacity, is generally considered to be the primary issue with respect to potential impacts and has typically been the focus of land use controls. However, the capacity of the turbine and its corresponding rotor size may also create unexpected land use conflicts such as noise, shadow flicker, visual massing and appearance.

- **Unique characteristics of the municipality**

In addition to the physical characteristics of the turbine, the scale of the wind facilities also depends in large part on the unique characteristics of each municipality. These characteristics include (i) location (i.e. rural, urban, tourist, recreational, agricultural), (ii) vegetation, (iii) topography, (iv) parcel fragmentation, and (v) how modified the landscape is.

- **Off-site Impacts**

One of the defining characteristics of the large modern turbines being erected across the province from smaller farm related wind turbines is the extent of off-site impacts. Large scale turbines, for example those with a height to the tip of the blade of 120 metres, have several impacts ranging from natural heritage to noise to visual that will extend well beyond the property line and onto off-site land uses. In many cases these impacts have the potential to extend for hundreds of metres up to and even beyond one kilometre. The extent of off-site impact should be a determining factor in the consideration of scales of wind energy facilities.

4.3.2 Recommended Scales for Wind Energy Facilities

A common set of definitions has not become widely used throughout the province. Although many municipalities use common terms such as micro, small, medium and large, there are significant variations in what these terms mean in the context of wind energy systems.

The Town of Lakeshore has posted its second draft of their new Official Plan dated July 4, 2007. They have defined scales as being either small or large scale depending on whether the electricity generated is used on-site or sold into the grid. While this is an easy to understand distinction, we recommend an increased number of categories in order to provide flexibility in the policy and implementation stage.

At the County level of planning, we recommend that the primary consideration would be turbine sizes that would have significant impacts on the landscape and that extend well off-site. This approach suggests that the smaller turbines are not a County level issue and are left to the local municipalities to manage. However, given that the purpose of this Study is to outline options for both County and local policies, we are recommending the following scale breakdown.

4.3.2.1 Large Scale

We recommend that consideration be given to defining 'large scale' as being any turbine that has a potential significant impact on the landscape as well as capturing those turbines with significant off-site impacts. We undertook a similar study in the Region of Niagara where the draft policies are recommending the definition of Large Scale as any turbine with a nameplate capacity of greater than 500 kilowatts or exceeds 100 metres in height to the tip of the blade. This definition would capture all of the modern large scale monopole turbines being constructed across the province.

4.3.2.2 Medium Scale

In our experience it is important to define the largest and smallest turbines within a particular scale. We recommend that the residual amount between large and small facilities (i.e. if based upon height or capacity) be used to define medium scale facilities. As a result, we recommend that medium facilities be defined as any turbine greater than 36 metres and less than 100 metres with a maximum nameplate generating capacity of 500 kilowatts.

4.3.2.3 Small Scale

In other Municipalities, we have recommended that small scale facilities be permitted up to a maximum of 50kW, which was the size limitation of the Province's 'net-metering' program until the fall of 2005. Since that time, the 'net-metering' program has been upsized to 500kW. However, the 50kW limitation is considered a better benchmark due to the fact that this would permit a single tower that would provide sufficient generating capacity for a single dwelling. In our opinion, the turbines illustrated in the following figure that are 50kW or less represent facilities with minimal negative land use impacts. We also feel that height is a good mechanism to primarily define the potential land use impact of a facility. Typical height ranges for small scale facilities are between 25 and 38 metres. We therefore recommend that small scale facilities be defined as being greater than 17 metres and less than 36 metres with a maximum nameplate generating capacity of 50Kw.

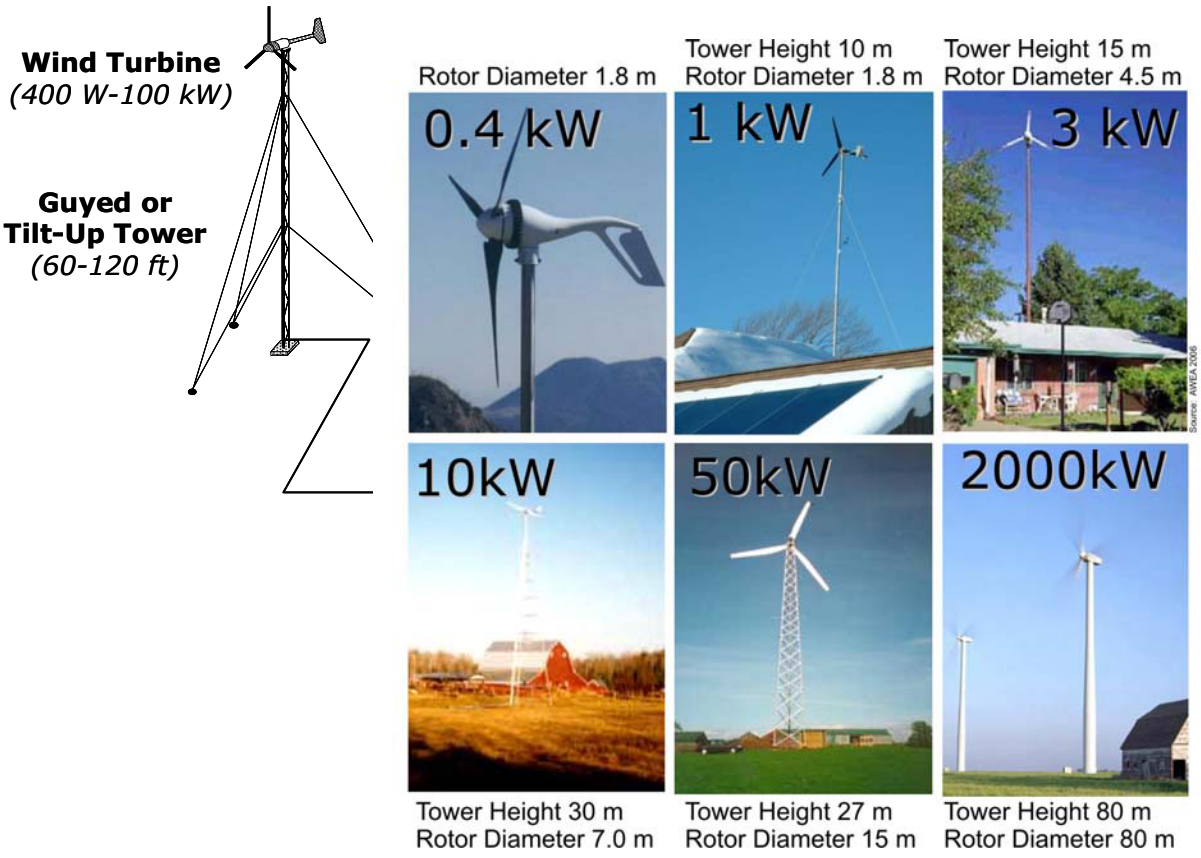
4.3.2.4 Micro Scale

We recommend that the smallest level of turbine considered for policy and regulatory provisions be identified as micro facilities. Facilities of a micro nature would typically be accessory to an existing permitted use. While these types of turbines may have little impact in a rural landscape, their location in urban settings, particularly in multiple numbers, could have land use impacts. More detailed provisions, particularly location criteria and height restrictions would then be necessary to avoid potential impacts. These should be developed with local public and agency input.

The most widely available example of a micro facility would be a rooftop turbine similar to the mass produced models sold at Canadian Tire. These facilities could also be mounted on a single pole or attached to the roof structure. In the Municipality of Grey Highlands we recommended a maximum height for micro facilities of 17 metres because that would allow approximately 6 metres above the maximum building height of 11 metres.

For the purposes of this study, we recommend that micro facilities be defined as being any turbine less than 17 metres in height with a maximum nameplate generating capacity of 1Kw. An illustration of scales is presented in Plate 8 below.

Plate 8: Wind Turbine Size Comparisons



4.3.2 Scale Options for Solar Energy Facilities

Based upon our review of renewable energy facilities, solar energy facilities produce the least amount of off-site impacts regardless of the scale of the operation. However, unlike wind facilities, solar energy can have significant adverse impacts on the use of agricultural land. As a result, we recommend that the primary differentiation be those facilities that are building mounted versus ground supported facilities. Building mounted solar array's could be very extensive, but could locate on an industrial building with little or no impacts. However, the same array on prime or specialty agricultural lands will render most of the land unusable.

4.3.3 Recommended Scales for Solar Energy Facilities

We recommend that large scale solar facilities be considered ground installed facilities that impact 2 hectares or more of land. The 2 hectare size limit is recommended for discussion purposes because that size has been used to define large scale greenhouse or mushroom operations (the amount of land under glass), in other areas of the province, so the association with agricultural impacts appears appropriate. Facilities that are building mounted (unlimited in size) or ground mounted that impact less than 2 hectares of land would be small scale.

4.3.4 Scale Options for Biomass Energy Facilities

There is a significant diversity in the type and nature of biomass facilities that potentially could be developed in the County. We understand that greenhouse operators in the County are exploring biomass because of their need to off-set high electricity costs with a more stable and consistent generator than wind or solar. We consider there to be several ways to define the scales of biomass facilities including the following:

i) **Environmental Assessment**: Ontario Regulation 116/01 for Electricity Projects identifies that some biomass projects that are less than 5 megawatts are considered Category 'A' projects. Please refer to the Environmental Assessment Act in this Paper for clarification on the Categories. As a conservative measure, large scale biomass projects could be considered any project that is 5 megawatts or greater. Based upon our research, a biomass facility exceeding 5 megawatts would require a significantly larger agricultural building and potential off-site impacts such as trucking and odour over projects less than 5 megawatts. Small scale biomass projects would be less than 5 megawatts.

ii) **On-site vs. off-site product supply:** Biomass facilities require a fuel source in order to generate electricity. One possible method of differentiating between large and small scale would be to set the limit based on whether the fuel source is from an on-site agricultural or industrial use versus an off-site supply.

iii) **On-site vs. off-site electricity use**: Biomass facilities can be developed to generate electricity to be sold into the grid or used on-site. This is another possible method that could be used to define large versus small scale, because it is likely, although certainly not guaranteed, that an on-site use would be less intensive than a biomass facility that sells its power into the grid.

iv) **Building/storage size**: Biomass facilities range in size depending on the scale of the operation. Large biomass facilities require large buildings and large storage areas for their fuel. Scale

differentiation based on the size of the building and storage could be used. For example, a facility comparable in size to a typical stand alone 10,000 square metre industrial building would be considered large scale.

4.3.5 Recommended Scales for Biomass Energy Facilities

For discussion purposes, we recommend that large scale biomass facilities be defined as exceeding 5 megawatts, and anything less than 5 megawatts would be defined as small scale. This scale structure would allow a greenhouse operator to generate 5 megawatts of electricity to offset their electricity needs.

4.3.7 Summary

In all cases, we recommend that the most comprehensive review occur for Large Scale facilities, and that a much less rigorous planning review occur for the small facilities.

4.4 Renewable Energy Lexicon

An understanding of several relevant definitions assists in interpreting the way in which local municipalities must be consistent with policies relating to renewable energy generation facilities.

- **Adverse Effects** – Based on the Provincial Policy Statement 2005, Adverse Effects means one or more of the following: impairment of the quality of the natural environment for any use that can be made of it, injury or damage to property or plant or animal life, harm or material discomfort to a person, an adverse effect on the health of any person, impairment of the safety of any person, rendering any property or plant or animal life unfit for human use, loss of enjoyment of normal use of property and interference with normal conduct of business.
- **Alternative Energy System** – Based on the Provincial Policy Statement 2005, Alternative Energy Systems means sources of energy or energy conversion process that significantly reduce the amount of harmful emissions to the environment (air, earth and water) when compared to conventional systems.
- **Anaerobic Digestion –** A system that uses the natural process of anaerobic degradation to treat waste and produce biogas that is converted to heat and electricity.
- **Biogas –** Gas derived from biomass resources that is used to generate electricity.

- **Biomass Energy System (BES) -** Means a renewable electrical generation facility using renewable biomass resources and/or waste products that produces electrical power for needs of a user or to feed into the transmission or local distribution grid. "Biomass" means any plant derived organic matter available on a renewable basis.

- **Built Heritage Resources** - Based on the Provincial Policy Statement 2005, Built Heritage resources means one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic or military history and identified as being important to a community. These resources may be identified through designation or heritage conservation easement under the Ontario Heritage Act, or listed by local, provincial or federal jurisdictions.

- **Cultural Heritage Landscape** – Based on the Provincial Policy Statement 2005, Cultural Heritage Landscape means a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and the village, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways and industrial complexes of cultural heritage value.

- **Electrical Generator** – A device that produces electricity by spinning electro-magnets inside a coil of wire to create a flow of electrons.

- **Energy from Waste –** The incineration of municipal solid waste (garbage) to produce electricity. Energy from waste is primarily to provide a means for waste reduction and disposal. Electrical generation is a secondary consideration of this process.

- **Photovoltaic Cell –** A device that converts light energy into electrical energy.

- **Photovoltaic (PV) Array –** A collection of photovoltaic cells on a structure, fixed or moving, to maximize solar orientation.

- **Point of reception** – The Point of Reception refers to the Ministry of Environment publication "Interpretation for Applying MOE NPC Technical Publications to Wind Turbine Generators" (V1) which defines a point of reception as any point on the premises of a person within 30 metres of a dwelling or camping area, where sound or vibration originating from other than those premises is received.

- **Renewable Energy System** – Based on the Provincial Policy Statement 2005, Renewable Energy Systems means the production of electrical power from an energy source that is renewed by natural processes including, but not limit to, wind, water, a biomass resource or product, or solar and geothermal energy.

- **Sensitive Land Uses** – Based on the Provincial Policy Statement 2005, Sensitive Land Use means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built up environment. Examples of sensitive land uses may include residences, education or health facilities.

- **Setback -** The distance between the edge of the turbine base and the lot line or feature.

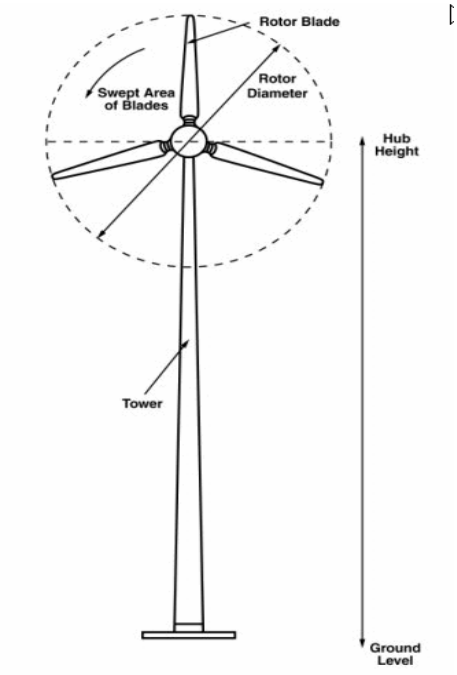
- **Site Alteration** – Based on the Provincial Policy Statement 2005, Site Alteration means activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site.

- **Solar Chimney –** A renewable energy power plant where air is heated at ground level in a greenhouse type structure. The resulting convection effect causes the air to rise and exhaust through a tall tower.

- **Solar Energy System (SES) -** Renewable electrical generation facility that produces power from the sun using photovoltaic technology to provide all, or a portion of, the electrical power needs for a user or to feed into the transmission or local distribution grid.

- **Solar Thermal –** The process of capturing the sun's heat energy for the generation of electricity.

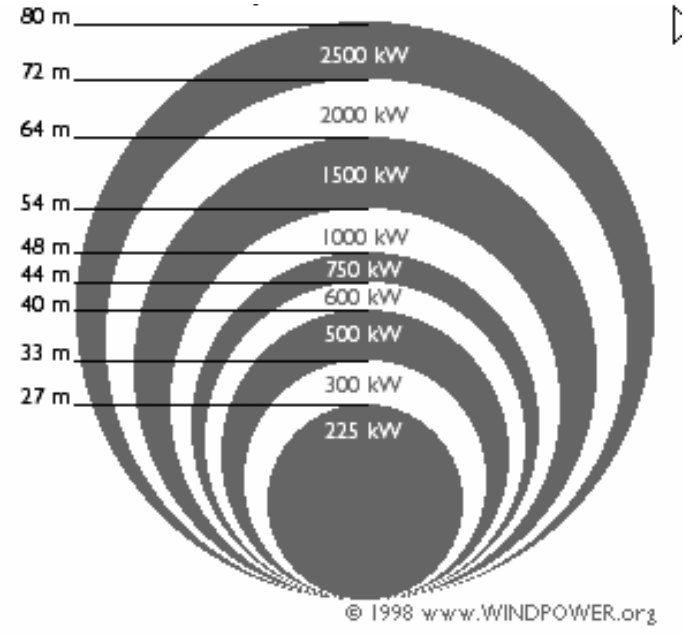
- **Turbine Components** – Modern wind turbines typically consist of blades, a three bladed rotor, nacelle, tower and concrete footing. Footings on larger turbines can be up to 15 metres in diameter and 2.5 metres thick and are generally located below ground. The towers mounted on the footing are pre-constructed mostly from steel, but sometime concrete and range between 3 and 5 metres in diameter at the base tapering up to 2 metres diameter. Total height of the towers is generally increasing with technology with larger towers approaching 130 metres.



Basic components of a wind turbine

(courtesy of Ontario Ministry of Agriculture & Food)

On top of the Tower is the Nacelle which contains the generator and turbine control equipment onto which the rotor is mounted. The amount of energy that a turbine is capable of generating is directly dependent upon the size of the rotor. The following diagram illustrates this relationship:



Relationship between rotor diameter and generation capacity.

The turbines blades that are mounted together to form the rotor can each be up to 50 metres long and made from reinforced plastic or wood epoxy. The rotor sits in front of the nacelle and a shaft connects it through large bearings to the generator inside. The entire rotor assembly and nacelle rotates on top of the tower to constantly face the wind.

A small substation or transformer is required at each turbine (either internally or externally) to step up the voltage of the electricity in order for it to be transported. The electricity is then sent from each tower, generally via underground cables, to a central substation usually located at the closest suitable point for connection into the wider electricity grid.

- **Turbine Height** – The height above grade to the tip of the rotor blade at its highest point.
- **Volt –** The amount of 'pressure' required to transport electricity and push electrical energy through a wire. A measure of the Potential Difference between two points of an electrical field.
- **Watt –** A unit to describe the size of an electrical generation system. One megawatt (1,000 kilowatts or 1,000,000 watts), of electrical energy can supply the power needs of about 500 homes for a year. Watts of energy is the amount of electricity produced.
- **Wind Energy System** - A Wind Energy System (WES) means a renewable electrical generation facility that produce power from wind primarily to provide all or a portion of the electrical power needs for a user or to feed into the transmission or local distribution grid. A wind energy system includes all supporting infrastructure, outbuildings and access roads.

5.0 Renewable Energy in the County

Section 4 of this Paper provided an overview of renewable energy facilities. This overview is refined in this Section through the consideration of their applicability in the County of Essex.

5.1 Renewable Energy Viability

Potential sources of renewable energy likely to be considered within the County of Essex include the following:

- All scales of wind energy facilities
- All scales of photovoltaic solar energy facilities.
- All scales of biomass energy facilities including: purpose grown fuels, agricultural and industrial waste, and processed and pre-processed municipal solid waste.

Renewable energy sources not included as part of this review for Essex County include:

- **Geothermal** – It is noted that geothermal resources may be used for heating and cooling purposes for specific land uses, however, the County of Essex has limited geothermal resources and they are unlikely to support the generation of electricity. Geothermal mapping was reviewed in the preparation of this report.

  Areas of higher and more accessible (i.e. shallow) geothermal activity tend to be located in areas on the globe with higher levels of tectonic activity such as the Pacific Rim including the west coast of North America. The sedimentary and stable nature of Essex County has much lower geothermal values. A map showing geothermal resources is included in Plate 9.

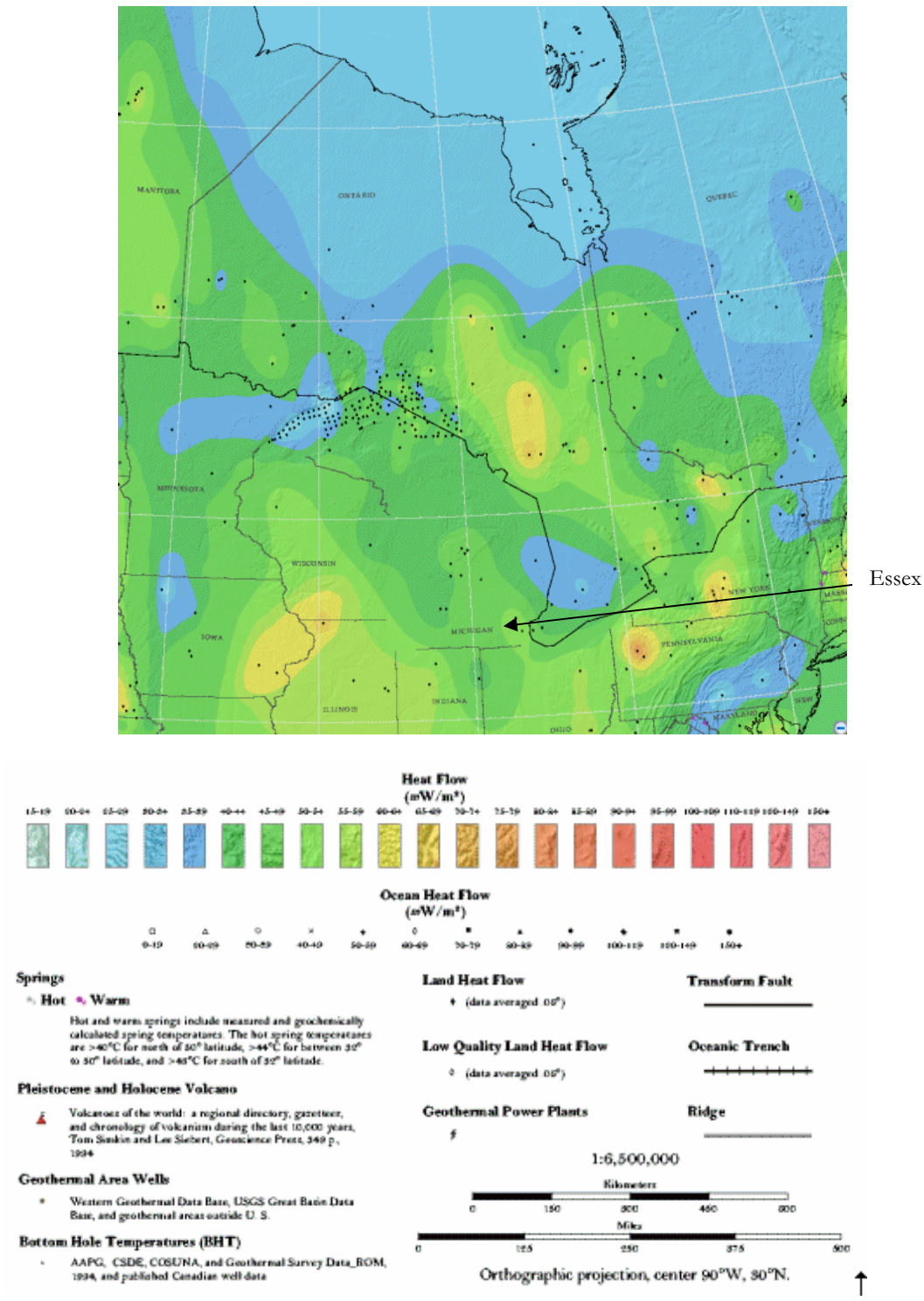


Plate 9: Geothermal resources.
Source: http://www.smu.edu/geothermal/2004NAMap/Geothermal_MapNA_7x10in.gif

- **Hydro** – The topography of the County is not well suited for hydro electricity generation projects. The lack of topographical relief makes it difficult to hold back large quantities of water and provide sufficient drop to efficiently produce electricity. The generation of electricity from the diversion of larger rivers is also not considered likely both from a physical point of view and from a planning jurisdiction point of view. For example the diversion of a portion of the Detroit River would be a project with international implications and concern matters of federal and provincial interest. It is not considered that local planning policies need to consider this eventuality.

  Electrical generation from wave and tidal resources is also unlikely due to the negligible tidal effect on the Great Lakes and relatively small waves on Lake Erie and Lake St. Clair.

5.1.1 Solar

Solar energy has the potential to generate large amounts of electricity throughout the world. While the traditional focus has been in sunny and dry climates closer to the equator, recent government programs particularity in Germany, Japan and Ontario are resulting in many projects in areas once considered marginal for this form of generation.

5.1.1.1 Solar Resources & Essex County

Global solar mapping indicates a potential source of electricity generation anywhere on the globe, however a variety of physical factors determine the amount of solar energy available. These factors include local atmospheric conditions, climate, and latitude. Other factors that affect the penetration of solar electricity generation projects include the availability of traditional generation sources, government programs, and technological availability.

A global map of world solar availability is shown in Plate 10.. This map shows the power irradiance at the earth's surface and does not depict the actual power that can be generated through photovoltaic cells since these cells are not able to convert 100% of the sun's energy. However, this map does provide a comparison of global solar resources. Essex County has comparable and potentially better solar resources than both Germany and Japan where successful solar generation programs are in operation.

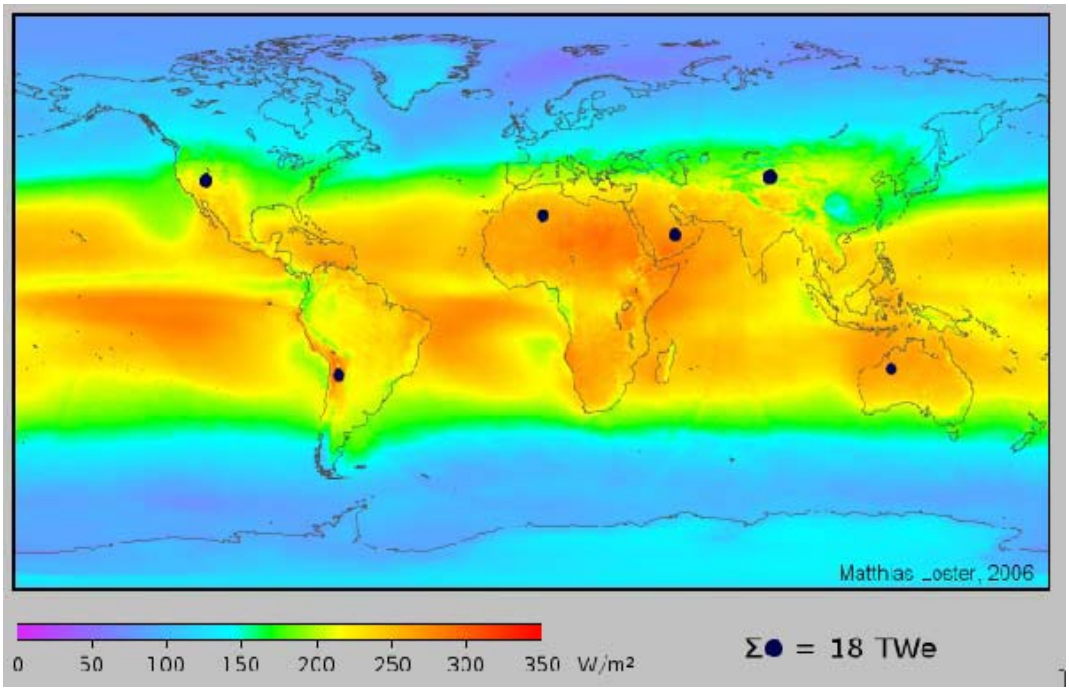


Plate 10: Global Solar Irradiance shown in watts per square metre averaged over 3 years and 24 hours per day (including cloud cover). Source: Loster, 2006.

In the past, climatic conditions in proximity of the Great Lakes (i.e. greater cloud cover) and higher latitude locations have discouraged the development of larger solar generation projects. In Ontario these hurdles are being overcome through improved technology and a significant Provincial Standard Offer Contract that provides solar generation projects with a price of 42 cents per kilowatt hour compared to 11 cents for wind and biomass projects.

In 2000, Germany implemented a similar standard offer contract resulting in the world's most successful solar generation uptake with 300,000 photovoltaic systems now in operation generating approximately 3% of that country power demand.[43] Canada is considered to have better climatic conditions then Germany, which together with the Standard Offer Contract, is creating strong interest in large scale solar projects. As the price of technology increases this interest will only grow.[44] As a result, land use policies should begin to recognize this emerging land use.

Multiple large scale solar generation projects are being proposed in south western Ontario. Three projects have been recently announced for around the Sarnia area while a fourth project was recently approved by Norfolk County. As recently as 2 months ago, a large real estate firm was making land availability inquiries within the County for a large scale solar project.[45]

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[43] Blackwell, Richard. Here comes the sun: Ontario pushing solar power, Globe & Mail, May 30, 2007.
[44] Estill, Glen. Personal discussion, 2006.
[45] Stark, Wendy. Personal discussion. August 9, 2007.

5.1.1.2 Solar Energy Systems in Essex County

Solar energy systems (SESs) are already widely used at a variety of scales throughout the world. On this basis, land use policies should be established to consider this potential land use throughout the County.

Small scale facilities for domestic uses can be attached to existing roof structures or on a stand alone structure. Provincial programs that offset home consumption or pay 42 cents per kilowatt hour, together with improved technology (i.e. better conversion of sunlight into electricity, lighter and more flexible cells) and increased public environmental awareness will increase the use of smaller PV systems. Similarly, as electricity prices increase solar applications may expand to larger commercial and industrial applications. Plate 11 illustrates solar radiation in the United States for PV arrays. While values for Essex County are not specifically shown, they can be interpolated from the surrounding values for the Great Lakes.

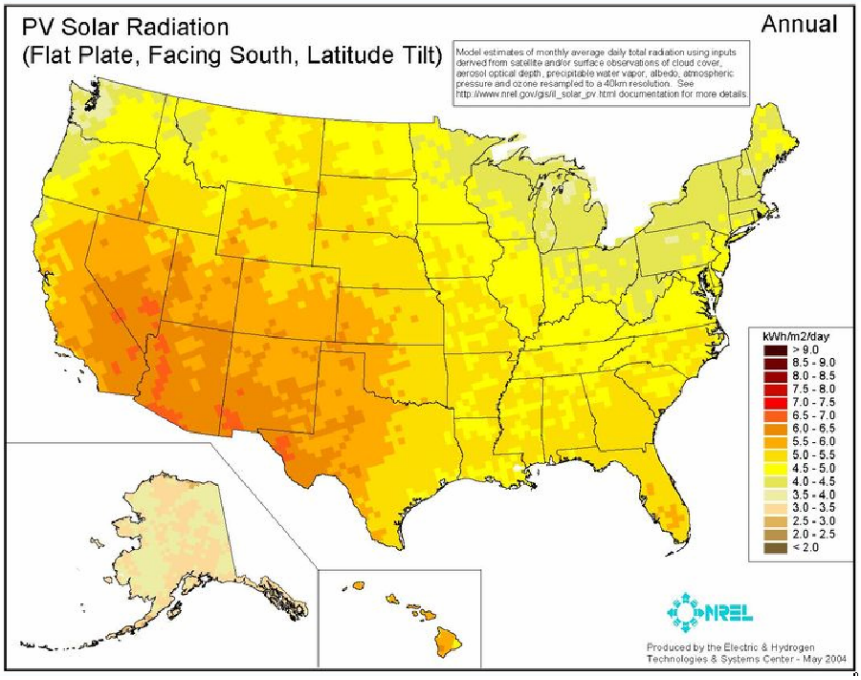

Plate 10: Solar radiation available for photovoltaic (PV) cells. Note how the inclusion of atmospheric variations reduces the power available for conversion in a PV cell.
Source: Electric & Hydrogen Technologies & Systems Centre, 2004.

SESs are the most cost effective for larger ground based projects.[46] Current technology generally allows for a 10MW project to be contained on between 100 to 200 acres of land depending on the characteristics of the site.[47] The current cap on the Province's Standard Offer Contract will likely promote solar projects of this size since only projects up to 10MW are eligible for the 42 cents per kwh guaranteed price. This size of project is also generally compatible with the underlying 200 acre farm parcels prevalent throughout the county. Solar projects tend to have a greater longevity than other renewable energy projects due to the lack of mechanical equipment and moving parts. On this basis, a SES can be expected to occupy a site for 25 to 50 years.

The process for siting solar facilities is much like other renewable energy projects in terms of trying to locate as close as possible to transformer stations and feeder lines for connection to the grid. In addition, there is a preference to locate closer to settlement areas as those areas generally have better and more robust distribution infrastructure more capable of connecting the project.[48] Because of the large areas of land required for SESs, the quality of agricultural land is also siting consideration since land will be taken out of production.

5.1.2 Wind

The availability of wind resources in Essex County and the viability of this form of renewable energy is fully discussed in Section 5.7.1. and shown in Figures 6 and 7.

It should be no surprise that the wind resources for Essex County range from Acceptable to Very Good according to MNR wind mapping. The flat topography of the area, significant shoreline interfaces and cleared agricultural areas result in above average wind conditions compared with other parts of Ontario.

It is considered that existing wind speeds will make most forms of wind energy viable in the County.

5.1.3 Biomass

The availability of biomass resources within the County of Essex is less dependent on natural resources then wind or solar energy. While the local proximity of high quality agricultural lands is certainly a benefit when local crops are to be used for biomass fuels (i.e. local production of oilseeds reduces transportation costs), other sources of biomass energy are commonly shipped over larger

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[46] Discussions with Ron Truman and Peter Carrie, OptiSolar Farms Canada, August 2007.
[47] Blackwell, Richard. Here comes the sun: Ontario pushing solar power, Globe & Mail, May 30, 2007.
[48] Discussions with Ron Truman and Peter Carrie, OptiSolar Farms Canada, August 2007.

distances. Thus the primary locational preferences for a biomass facility may be the proximity to major roads or rail lines rather than transmission infrastructure.

A proposed biomass plant in the County is proposing to use energy from waste pellets produced in the GTA. In the future, it is conceivable that pre-processed pellets with higher energy content could be economically shipped to biomass facilities throughout the Province.

Locally produced biomass fuels and wastes can be pre-processed or stored at purpose built facilities to sell to the wider market or for local use (i.e. agricultural cooperative). The constraints for these types of developments and their potential impacts would be much the same as more traditional land uses, particularly industrial ones.

5.1.4 Transformer Stations

The supply of electricity to the Essex County area is carried out by a series of transformer stations that are linked to the wider Provincial transmission network managed by Hydro One. These stations include:

- Belle River
- Kingsville
- Windsor Lauzon
- Windsor Malden

Transformer stations were originally established for the purposes of supplying electricity to the local distribution grid. Since that time, there have been fundamental changes in the generation and supply of electricity in the Province. As a result, transformer stations now have to accommodate the supply of electricity as well as the local generation of electricity.

Hydro One has identified the capacity of each transformer station in the Province to accommodate electricity going back into the transmission system. As of July 31, 2007 there were 28 projects applying for connection in Essex County that cannot be provided for by existing transformer station infrastructure based on capacity at the above listed transformer stations. The majority of these projects seek to connect to the Kingsville transformer station. Twenty-one projects have been approved for connection or are in the process of being approved. Once a project is approved, it has one year to enter into a Connection Agreement with Hydro One. If this agreement is not signed within one year then the project will be placed at the bottom of the queue behind other projects waiting to connect unless the reason for a delay is agreed to by Hydro One. No extensions beyond

the one year time limit have yet been applied for by proponents, however, it is understood that Hydro One does not want delayed projects tying up capacity for other projects.[49]

The upgrading of transformer stations for the purposes of accommodating decentralized generation has not historically been a priority for Hydro One. This position has appeared to have changed on August 29, 2007 with the filing of the Ontario Power Authority's Integrated Power System Plan to the Ontario Energy Board. The purpose of the Plan is to provide an adequate, sustainable and reliable electricity supply for the Province. A key component of this study is the use of renewable energy technologies of which the Plan identifies a potential of 844 MW of wind energy potential in the near to medium term for southwestern Ontario. To assist in the realization of these resources, the Windsor-Essex region has been specially identified for a reliability assessment and upgrade. Furthermore, the area east of Windsor and north of Kingsville was one of the few areas of the Province identified for a new transformer station.[50] The timing of the project will not be specifically known until the Plan is approved by the Ontario Energy Board, however, a new transformer station should be expected in the short to medium term if the wind resources in the region are going to be relied upon as part of the Province's energy supply.

5.1.5 Summary

In summary, meaningful renewable energy sources on a large commercial scale within the County of Essex appear to be limited to wind, solar and biomass. It is unlikely that hydropower and geothermal energy sources could be realized given local conditions.

Solar mapping shows resources that are comparable with other countries with the same or worse availability. Together with the Provinces Standard Offer Contract, flat open lands, and transmission infrastructure, more projects can be expected to locate in Essex County.

Biomass facilities wishing to locate in Essex will be supported by good transportation networks, productive agricultural land and local users.

The geographic location of the County of Essex, the reduced cost of wind energy technology and Government Policy are likely to result in wind energy proposals coming forward prior to the other renewable energy options outlined above. Evidence of this is demonstrated by recent wind energy proposals in Ontario and the Province's recent announcements supporting renewable energy facilities.

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[49] Navo, Mo. Hydro One. Personal discussion. August 24, 2007.
[50] http://www.powerauthority.on.ca/IPSP/Storage/49/4439_IPSP_Web_Teleconference_Aug29_2007.pdf

Given that viable wind, solar and biomass energy is now a reality, local planning policy should focus on these renewable resources in a proactive manner to achieve good land use outcomes.

5.2 Land Use Issues

An initial review of the characteristics of the County identifies potential land use issues relating to agriculture, specialty crops, cultural heritage landscapes, significant built heritage resources, and shoreline, which became more apparent when looking at the constraint figures. Further consideration of these issues will occur through the public consultation process, policy development stage, and areas of further study if required. In addition to these land use issues, there are still significant technical issues that would need to be addressed by projects including dwelling setbacks, airport height limitations and visual impact.

The following is an examination of issues associated with energy from wind, solar and biomass. Issues associated with wind are based primarily on large scale turbines since they have the most potential for land use impacts, particularly over a wider area. These impacts may be reduced and even eliminated as the size of the turbine is reduced for small scale and micro applications. It is difficult to differentiate between the following issues and turbine size in the absence of specific detail regarding a particular turbine design. Issues associated with wind and solar also focus on larger scale facilities since these have the greater potential for land use impacts. When assessing smaller facilities, the potential impacts can be scoped down accordingly.

5.2.1 Wind

Based upon our experience and consultation with stakeholders and agencies, we have listed below the perceived issues associated with wind energy facilities.

5.2.1.1 Visual

During discussions with local planners within the County, the effects of turbines within a flat landscape and with extensive shoreline interfaces were among the concerns of staff. The issue of visual is one of the most difficult land use issues to address. Visual is subjective in nature, determining existing landscape values, the appearance of wind turbines on the landscape, and whether the turbines have a negative or positive impact on that landscape. In flat terrain visibility is

relatively high and a large turbine can be seen up to 30 km away.[51] Field inspections of an existing site in Melancthon Township confirmed a high visual impact within 1km and a dominant feature at 3km.[52] Therefore, the value of the landscape and degree of impact should be assessed and considered. These considerations would need to be incorporated at the land use threshold issue assessment phase if required.

Landscape evaluation is generally concerned with rating the scenic or visual aesthetic value of an existing landscape and then examining the ability of the landscape to absorb visual change based on viewer sensitivity.[53] Traditional approaches (i.e. landscape ranking criteria) undertaken by professionals have been criticized for lack of community input, bias towards natural areas, poorly defined viewer groups and inability to capture the intangible and emotional values of a landscape.[54]

If an application is to be considered by the County and local municipality, it is recommended that a visual impact assessment be prepared that includes the following components based on the size of the turbine:[55]

- Landscape assessment of the potentially affected area.
- Visibility analysis.
- Assessment of key viewpoints and views within the affected area and consider visibility including the consideration of cumulative impacts.
- Computer generated or photo-montage visualizations of the project from key locations.
- Public consultation.
- Design guidelines for site plan review.

Based on experiences at other wind turbine sites, the County may consider the following minimum criteria for mitigating visual impacts of turbines and supporting infrastructure:

- Siting turbines to minimize visual impacts particularly from residences and higher landscape value areas (i.e. tourist routes, wine routes, cultural heritage landscapes).
- Ensure that the density of turbines is compatible with the surrounding landscape.
- Ensure that all turbines are of consistent appearance.
- Where appropriate, encourage larger and fewer turbines that are of 'monopole' construction and are finished in an appropriate colour of matte finish.

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[51] University of Guelph. Landscape and Visual Assessment Guidance for Wind Energy Farm Development. Municipality of Grey Highlands. March 24, 2006.
[52] Ibid. P27.
[53] Ibid. P11.
[54] Ibid. P11.
[55] University of Guelph. Landscape and Visual Assessment Guidance for Wind Energy Farm Development. Municipality of Grey Highlands. March 24, 2006.

- No artificial lighting except for minimum aircraft safety requirements.
- Prohibit any form of signage or identification on the turbines or supporting infrastructure.
- Minimize disturbance to the natural environment including watercourses, vegetation removal and earthworks.
- All cabling for the turbine, both on and off-site, to be located below grade.
- Outdoor storage of materials shall only occur in one location co-located with the maintenance building and appropriately screened to the satisfaction of the municipality.
- All applications will be referred to the relevant agencies.

5.2.1.2 Noise

Wind turbines emit noise primarily through two sources. The first source is the turbine blades as they pass through the air while the second source is the actual mechanical equipment housed in the nacelle of the turbine.

The general practice of local municipal and county level governments is to require any wind turbine application to meet the Ministry of the Environment (MOE) noise guidelines. There are a few, but very limited number of municipalities that have more detailed requirements than the MOE. The Canadian Wind Energy Association and proponents of wind energy facilities generally oppose the insertion of municipal noise policies and provisions that may be more restrictive than the MOE requirements. In our experience, this is to avoid the development of a patchwork set of policies across the Province. The concern of some residents groups is that the MOE requirements are insufficient in protecting against adverse noise impacts and therefore, County and local policies need to be more specific to compensate.

One specific noise related issue that has been identified by a number of resident groups is that there will be times during the year when the wind speeds at the turbine hub height will be substantially higher than at ground level where there is less background noise (i.e. summer evenings when the ground cools). This atmospheric condition is known as wind sheer, and it potentially results in higher noise impacts at points of reception than what is permitted by the guidelines. The issue of wind sheer was recently tested at an OMB hearing in Kincardine. The OMB ruled in favour of the proponent on the basis that the MOE is responsible for issuing the Certificate of Approval for noise and the County requirements only stipulated that applicants meet the requirements of the MOE, with no higher or more specific test.

The most significant MOE publications are NPC-205 and NPC-232 which prescribe noise limits for rural and urban areas. In addition, the MOE has published an interpretation document specifically for wind which permits an increase in noise levels off site based on increased wind speeds.

Proponents are required to demonstrate compliance with applicable sound level limits as part of the Certificate of Approval process. For rural areas (Class 3), these noise limits range between 40 and 53 db(A) depending on wind speed.

Factors that will determine the amount of noise include:

- Turbine design (including blades and mechanical equipment).
- Wind speed and direction.
- Topography and landscape.
- Atmospheric conditions.

MOE noise requirements for a Certificate of Approval do not apply to turbines for agricultural or residential uses. Therefore the County may wish to apply MOE requirements to all wind turbines in the absence of other technical guidelines.

5.2.1.3 Local Economics - Tourism

While planning policy regarding local economics and tourism impacts is limited at the Provincial level, it falls upon county and local planning policies and provisions to minimize land use conflicts and resultant negative impacts on tourism. Figure 5 shows trails and tourist routes in the County that should be considered in policy development. Potential tourism impacts can be positive or negative depending on personal opinion. Wind energy associations and proponents of wind energy projects generally bestow the positive aspects of turbines on tourism on the basis that they attract visitors to the area interested in wind energy projects. This may be true, particularly in the early days of wind energy development where these facilities are still relatively new and have a novelty with the general public. However, as more and more installations occur, it is reasonable to expect that people will grow accustom to these facilities. In the worst case scenario, tourists would be affected by cumulative visual impacts, thereby reducing tourist numbers to an area.

Because negative impacts are based on personal opinion or preference, it is difficult to establish real impacts versus potential or perceived impacts. Added to this difficulty is the subjective nature of visual impact and therefore avoiding the area. Landscapes and visitor perceptions of these landscapes can be a key motivator in determining choices of tourism destination.[56]

A significant consideration in tourism impact assessment is the degree to which a proposed wind farm is itself located at a specific tourist destination. The challenge of assessing visual impact and

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[56] Victoria Panel Report. Bald Hills Wind Farm Project. June 24, 2004. Page 251.

resulting tourism impacts is determining what degree of visual change is acceptable and the way in which visitors will perceive turbines.

5.2.1.4 Shadow Flicker

Shadow flicker is a well documented land use impact associated with wind turbine development. Shadow flicker occurs when the turbine blade is located between the sun and a point of reception, the result of which is a rotating shadow cast on surrounding areas (windows, porches, buildings). Shadow flicker has been described as the 'chopping' of the sunlight causing a flickering or blinking effect while the rotor is in motion.

There are no provincially adopted standards for shadow flicker; however, there are several standards that are used globally to regulate shadow flicker impacts:

- A receptor should be subjected to shadow flicker a maximum of 30 hours per calendar year and a maximum of 30 minutes per day. These maximum limits are based upon a worst case calculation of the astronomically maximum shadow, which is defined as the time between sunrise and sunset during which theoretically, the sun will shine continuously within a cloudless sky.
- Maximum of 30 hours per year based upon actual/real predicted values. This appears to be based upon a reference to a German court decision to tolerate 30 hours of actual shadow flicker per year and then applying the probably of sunshine for an area.
- Separation between the turbine and receptor a minimum of 10 rotor diameters.

In our opinion, variations of the maximum 30 hours per calendar year of shadow flicker has, in one form or another, become the prominent standard in use throughout the world. This best practice standard originated in Germany and is articulated in the document "Notes on the Detection and Assessment of Immissions Caused by Wind Power Plants – Notes on WPP Shadow Casting, March 12, 2002". The German language title of this document is "Hinweise zur Ermuittlung und Beurteilung der optischen Immissionen von Windnergianlagen" (WEA-Shattenwurf-Hinweise)".

The German guidelines indicate that a maximum of 30 hours per year and 30 minutes per day should be experienced at a sensitive land use based on the astronomical worst cast scenario. The worst case scenario is that the shadow flicker modeling will assume that the sun is always shining, there is sufficient wind to turn the rotor which is perpendicular to the sun's disk, and there is no intervening vegetation or buildings. The distance of shadow flicker should be calculated for receptors within 1300 metres for a 140 metre high turbine to the tip of the blade and shadow calculation should begin

and end when the sun is three degrees above the horizon. Where a wind farm proposal is modeled to result in 30 hours or more per year at a reception then an individual assessment should be conducted. This site specific assessment would consider amenity area locations on the exterior of the dwelling (i.e. porches, balconies), as well as opaque intervening vegetation and buildings.

One of the most commonly used shadow flicker modeling programs (WindPro) is based on this German guideline. This program physically models the impact and calculates the cumulative shadow impact based upon a set of inputs. The results of the modeling and calculations are not subjective and provide a definitive measure upon which to ensure adverse effects from shadow flicker are not experienced.

There have been several German court decisions that have tested the German guidelines. One decision in particular "Oberverwaltungsgericht in Hamburg" considered whether an existing wind farm was resulting in nearby dwellings experiencing 30 hours of shadow flicker per year. Although this court decision was based on an existing, rather than a proposed wind project, it nonetheless, has been used by consulting firms in many countries to model projected actual shadow flicker impacts up to 30 hours per year. To the best of our knowledge, this is the first instance in which the 30 hours was converted from worst case to actual projected. A number of consulting firms have used this court decision to justify increasing the threshold limit to 30 hours per year. The most common methods utilized to model 'actual' conditions incorporate bright sunshine or cloud cover statistics, which are posted by Environment Canada.

Factors that will determine the actual amount of shadow flicker include:

- Prevailing wind direction and the resulting location of the spinning blades.
- Height of the wind turbine.
- Distance between the turbine and receptor.
- Intervening vegetation and development particularly at low sun altitudes.
- Angle of the sun in relation to the ground and the direction of the sun. Low sun angles in the winter have the capability of producing long shadows capable of affecting a greater number of properties.
- Amount of bright sunshine days.
- Rotational Speed

5.2.1.5 Blade Glint

Sunlight reflecting from turbines blades is a potential impact, however, in our experience and review of large scale wind turbine projects, the use of matte finish, non-reflecting surfaces on turbine blades significantly reduces this effect.

5.2.1.6 Electromagnetic Interference

Electromagnetic emissions (EME) from wind turbines and their transmission infrastructure are comparable to existing transmission facilities. The primary impact of wind turbines (particularly larger scale ones) is potential interference of electromagnetic signals in the surrounding area.

Communication companies may have broadcast infrastructure in place that could be affected by wind turbines. Problems with EMI are usually associated with microwave facilities that rely on line of sight for them to function. However, smaller scale problems associated with TV and radio reception have also occurred at previous developments, particularly in rural areas that rely more on antennae receivers.

Factors that will determine the degree of EMI include:

- 'Sight' lines between transmitters and receivers.
- Transmitting frequencies.
- Atmospheric conditions.
- Topography and landscape.

The effects of EMI can be reduced by:

- Siting of wind turbines outside 'lines of sight' between transmitters and receivers.[57]
- Consultation with relevant private, commercial and government bodies prior to the final siting.
- The Ontario Ministry of Government Services recognizes the potential for wind turbines to interfere with the Government of Ontario's Public Safety Network. Therefore, circulation of the project should be completed prior to final siting.

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[57] Sustainable Energy Authority Victoria. Policy & Planning Guidelines for Development of Wind Energy Facilities in Victoria. May 2003. Page 26.

- A wind turbine proposal shall include measures to monitor the effects of the development on transmission facilities and procedures to remedy any interference when the facility becomes operational.

5.2.1.7 Ice Throw

Wind turbines in cold climates are exposed to potential icing and actual icing conditions. The extent of icing is often unknown due to lack of regular icing measurements.[58] Falling ice from the actual turbine tower tends to be a lesser issue, depending on setbacks, wind speeds and climactic conditions, as the ice is purported to fall near the turbine footprint. However, if public access is permitted within this footprint, measures to reduce risk should be undertaken. Ice that is thrown from turbine blades or that falls from the tower can be quite dangerous and cause serious damage.[59]

The larger issue is that of ice being thrown off the turbine blades while they are in motion. In most cases, the majority of ice throw situations will occur within the buffers established by provisions related to noise and shadow flicker.

Two options exist for ice throw mitigation. The first is a management plan for ice conditions that can shut down individual turbines if wind speed, direction and weather conditions **may** result in icing conditions. The management plan may also provide for anti-icing or de-icing procedures. The second is to implement ice throw buffers around each turbine.

Options for mitigating ice throw can include:

- Signage mounted on the tower and within proximity of the turbine warning of falling ice dangers.
- Modeling potential ice throw and undertaking risk assessment.
- Where "risk circles" overlap public roads or abutting property boundaries, a management plan should be prepared confirming how the operation of the turbine will be controlled to avoid ice throw.[60]
- To deal with ice falling from a non-operating turbine, a minimum setback equivalent to the total turbine height (including the rotor) shall be applied to any public road, abutting property boundary, and on-site residence, or commercial/institutional building accessed by the public.

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[58] Timo Lasko Ed. Wind Energy Projects in Cold Climates. Finland. 2005. Page 11.
[59] Ibid. Page 26.

- Ensure that emergency management and operational protocols ensure that the turbines shut down during icing conditions and inspected prior to start up.

5.2.1.8 Health & Safety

Health and safety concerns associated with wind turbine development are commonly expressed by residents surrounding project wind energy facility projects. Both the Planning Act and Provincial Policy Statement speak to the protection of public health and safety.

Safety issues associated with wind turbines can relate to a variety of circumstances such as ice throw and turbine failure. The formation of ice on turbines has the potential to impact on public safety when it becomes dislodged. The safety impacts can occur on the turbine site itself or extend into public spaces such as roads, depending on the location of the turbine.

Similarly, turbine failure can occur. Failure may be the dislodgment of turbine pieces as a result of malfunction, lightning or collapse of the tower itself. In our experience, turbine failure is a rare event; however, they have occurred. In Oklahoma in 2005, a large scale wind tower collapsed. In Ontario in 2006, lightning strikes shut down the Huron Wind Farm and Ferndale Wind Farms for blade repairs. In April 2007, a lightning strike in Ontario resulted in the folding of a turbine blade and the dislodgement of the sheathing from the blade.

The largest safety issue for wind turbines is where there are opportunities for frequent numbers of the general public to come within the area of potential risk for various icing events and turbine failures. These eventualities should be included in land use policies consistent with the PPS.

Health effects are not considered to be the same as safety effects. Health effects are associated with long term exposure versus one-off or discrete events.

The health effects of electromagnetic interference, generally associated with transmission lines, has been studied extensively with no conclusive evidence of health effects.[61] The impacts of shadow flicker are limited to nuisance impacts as opposed to health effects due to the low rotational speed of large scale turbines. Finally, a variety of measures to reduce injury from ice throw have been put forward.

There is also information readily available from difference sources on the internet, most notably a medical doctor in New York, Dr. Nina Pierpont, who has attributed negative health impacts due to large scale wind turbines. The reality with Dr. Pierpont's work and other similar work, is that the

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[60] Ibid. Page 4.

findings have not been clinically proven to be accurate. Instead, the results posted have been based on interviews with persons who feel they have been impacted by a wind turbine.

In our opinion, until more conclusive clinical and scientific information is available we do not consider health impacts in the form of medical problems (i.e. cardiovascular disease, heart palpitations) to have a correlation to turbine development.

5.2.1.9 Construction Management & Operational Management

Construction of wind turbines, particularly large scale models, has significant potential for impacts during construction and operation. To minimize potential impacts, consideration should be given to the need for management plans during both the construction and operational phases.

The extent and scope of management plans will be directly dependent on the size and scale of a turbine. Possible contents of management plans could include:

- Staging and siting to ensure the minimization of vegetation loss, habitat destruction, soil erosion and bird and bat mortality.
- Preparation of an Environmental Management Plan addressing:
    - Procedures for noise, access, materials storage and pollution management.
    - Identification of all possible contaminants on the land during construction and post construction.
    - Identification of construction and operational activities that could lead to site contamination and methods to control these risks.
    - Procedures for the rehabilitation and reinstatement of areas for construction including, but not limited to, access and staging areas.
    - Surplus lands required for the construction of the turbine be rehabilitated to the maximum extent that still allows for ongoing maintenance requirements.
- Preparation of a traffic management plan during construction and decommissioning to the satisfaction of the County, Municipality and Ontario Ministry of Transportation including details of:
    - Vehicle access points to the turbine.
    - Haul routes, vehicle numbers and frequencies of material/equipment deliveries.
    - Details of oversized vehicles, their routing and escort procedures.
    - Need for road upgrades (including intersection and private access points).

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[61] http://www.who.int/docstore/peh-emf/publications/facts_press/efact/efs183.html

- Provision of directional and tourist signs.
- Designation of car parking areas and bus facilities as appropriate to support any public information and viewing areas.

- All private access roads to turbines shall be gated to prevent vehicle access as close to the public road as possible without hindering existing landowners.
- Fencing of the turbine is optional depending on the operational and legal requirements of a particular operator. Signage may be used to warn visitors and staff of any potential dangers and provide emergency contact numbers.
- All wind turbine components shall be secured to prevent unauthorized access.
- The locations on on-site hazardous materials (i.e. lubricants, coolants, etc) will be appropriately identified externally.
- Prior to the start-up of the facility, an emergency services introduction and initiation will be carried out for relevant municipal staff and firefighters. These sessions will be carried out annually or at the request of Council if more immediate staff initiation is required.

The above list provides a summary and starting point for any future planning policies to address potential construction and ongoing operational issues.

5.2.1.10 Decommissioning

The decommissioning of wind turbines is not a common issue for many existing planning approval frameworks in Ontario. However, it is not uncommon in other jurisdictions to impose decommissioning conditions and request plans as part of the planning approval. Taking this one step further are Californian municipalities that also require securities to not only cover decommissioning costs but also to address potential performance issues (i.e. funding additional noise investigations if complaints are received).

Decommissioning involves the removal of wind turbines and reinstatement if they remain unused for a specified period of time. This ensures that non-active wind farms do not have a negative impact on the landscape or environment. Timeframes vary by municipality ranging between 3 months and 2 years. Any timeframes should be cognizant of repair delays due to current high demand for wind turbines and components.

If the wind energy facility operator is unable to repair or remove unused turbines, securities could be used to restore the site. A review of the literature suggested that the value (even their scrap value) of today's modern turbines is sufficient to recover the costs associated with decommissioning. A local

example that does not support this theory is the existing tower on Boblo Island that has never been removed, likely due to economic reasons.

Options to consider for decommissioning include:

- Ongoing communication between the operator and municipality to monitor performance of a wind energy facility. This could be informally through on-site meetings or more formal regular reports.
- Providing a security for decommissioning in the event that the market value for scrap turbines changes thus leaving municipalities holding the bill for their future removal. However, it is still uncertain if municipalities have the statutory authority to require the posting of securities but could form part of the Amenity Agreement. Further consideration of this issue is warranted.
- Rehabilitation/decommissioning plans be approved as part of the planning approval process.

5.2.1.11 Monitoring

Good land use planning practice dictates that the establishment of planning policy for new and unique land uses such as wind turbines requires some sort of feedback or monitoring to ensure effectiveness and promote continuous improvement.

Planning policies in Ontario are generally silent on future monitoring requirements both for individual projects or for potential cumulative impacts of multiple projects. While the Township of Melancthon approved a monitoring program as part of Phase 1 of a development, political direction and staff resources did not pursue this requirement as part of the consideration of Phase 2. A broader example of monitoring the potential cumulative impacts of multiple projects can be seen in the planning provision of Pincher Creek Alberta. This municipality stipulated a municipal wide review after the installation of 300 turbines to examine topics such as density, permit compliance, visual impacts and public opinion.

Monitoring requirements can be based on completion of individual or multiple projects, or with respect to a defined time period. Consideration should be given to the length of time between these comprehensive reviews if there is a number of wind turbines being constructed in a short time frame. The length of time may also be a drawback in terms of compliance monitoring in the early days of a project if the municipality wanted to ensure conformity with the supporting application studies.

5.2.1.12 Siting

In addition to the setbacks discussed above with respect to land use issues, it is considered appropriate to discuss other siting guidelines that could be applied to ensure the compatibility with surrounding land uses.

Many jurisdictions impose standard minimum setbacks for key interfaces of a wind energy facility to help ensure that any potential land use conflicts are minimized. We feel that the incorporation of a site specific setback is necessary for large scale facilities because the site specific support studies will determine the setbacks and those would be incorporated into the approval process. However, there are a number of common siting provisions for turbines that support possible minimum setbacks:

- Wind turbines setback a minimum of 1.25 times the height of the turbine from any public road, abutting property boundary, permanent and seasonal residences, hotels/motels, hospitals, camp grounds, schools, places of worship, and commercial or industrial facilities accessed by the public. This distance is the result of a review of other municipal setbacks for wind energy facilities and reports addressing risks from turbines.
- Wind turbines could also consider setbacks to settlement areas to minimize land use impacts and provide for future growth.
- Prohibit wind turbines that will result in the loss of specialty crops and discourage turbines on high quality agricultural lands to maintain the finite production areas of the County. Any component of a turbine (including access roads) located on prime agricultural lands would have to justify why it cannot be positioned in an alternative location.

5.2.1.13 Property Values

Many opponents to wind turbines cite decreased property values as a negative impact. However, case law at the Ontario Municipal Board (OMB) has determined that property values are not a land use planning consideration. During discussions with local planners within the County indicated that this was a concern of ratepayers.

Any opportunity for decreased property values are minimized if turbines are responsibly sited using best practice techniques to respect abutting land uses. An effective and thorough planning approval framework will help achieve this.

5.2.1.14 Groundwater

Impacts on groundwater have been expressed during our consultation with stakeholders. During the course of our research over the past 4 years, we have found very little information devoted to this subject. Groundwater impacts from small scale renewable energy facilities are not expected to be a constraint to their development because their nature and size. Large scale facilities have the potential, in theory at least, to question whether there would be potential groundwater impacts. However, these effects would not likely differ from those of more traditional land uses requiring foundations.

Examples of ground water impacts could include foundation piles for a wind turbine constructed on unstable soils. The reality is that any new biomass facility would be subject to strict environmental controls to prevent run-off, and large scale turbine development typically occurs on lands with more favourable soil conditions with foundation depths being approximately 6 metres.

In our opinion, these issues are more question marks than verified land use planning impacts. This is not to say that impacts are not possible, but we feel that in the case where a proponent is proposing a facility that could potentially have groundwater impacts that this item be addressed through the approval process. We certainly do not expect this to be a threshold issue that would preclude large scale facilities throughout the County.

5.2.1.15 Stray Voltage

Based on limited information, it would appear that there is lack of credible scientific evidence to verify that stray voltage currents from wind turbine affect livestock. There is nothing different or unusual about managing the electricity flow from an operating wind project. Standard electric wiring requirements are adequate to prevent stray voltage from occurring.

A discussion with Ontario's Electrical Safety Authority (ESA) confirmed that in most cases stray voltage is the result of improper grounding of the complainant's own electrical system. In other cases, stray voltage is the result of aging distribution infrastructure. The ESA is not aware of any stray voltage events at wind energy systems.[62]

[62] Personal discussion, Jeff Thomas, Electrical Authority, August 17, 2007.

5.2.1.16 Birds and Bats

Birds are affected by wind farm developments in two ways: directly and indirectly. Direct effects include being injured or killed by collision with the turbine blades, the turbine towers, guy wired, maintenance building and other associated structures. Direct effects also include electrocution by the wind farm transmission lines and dying from exhaustion from lighting induced disorientation during migration. Indirect effects are caused be being displaced from an area due to habitat loss plus avoidance of an area due to noise, structures and human activity leading to an increase in energy expenditure in order to circumnavigate the wind farm. [63].

The Dougan & Associates Report 2007, provides that besides specific turbine design factors three main general factors affect the number of bird fatalities at wind farm developments: the density of birds in the area, landscape features and poor weather conditions. For more details on birds and bats, see the Dougan & Associates Report, Windpower & Renewable Energy Planning Study: Wind Turbines & Wildlife: A Literature Review, August 15, 2007.

5.2.1.17 Off-Shore Facilities

Large scale wind turbines are being used in off-shore areas where larger turbine sizes can be used and there is the potential for less land use impacts. In addition, off-shore areas offer enhanced wind resources due to better wind speeds with less interruptions to air flow.

The location of turbines within the Great Lakes falls within the jurisdiction of the Ministry of Natural Resources that manages Crown Land holdings. At this time, the MNR is not entertaining applications for large scale wind turbines in off-shore areas. The reason for this moratorium is to fully assess potential impacts. Potential impacts can include:

- Natural heritage and fish habitat issues;
- Effects on cultural heritage landscapes;
- Noise;
- Visual impacts/tourism;
- Navigation/safety.

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[63] Kingsley and Whittam, 2005.

The role of the County in the consideration of an off-shore wind project would likely be limited to that of a commenting agency as the site of the development would fall outside of the jurisdiction of the County and its member municipalities.

5.2.1.18 Hazard Lands

The Provincial Policy Statement generally prohibits site alteration within areas that would be rendered inaccessible to people and vehicles during flooding hazards, erosion hazards and/or dynamic beach hazards unless it has been demonstrated that the site has safe access appropriate for the nature of the development and the natural hazard (Section 3.1.2c).

In our experience, new large scale turbine construction is rarely proposed in hazard land areas; however, in many instances, access roads and underground cabling often must cross stream corridors or other low lying hazard lands. In these cases, approval generally rests with the Conservation Authority and their permitting requirements.

In the County of Essex, an additional issue for consideration includes the floodplain of the Detroit river. Site alteration in the Detroit river floodplain associated with the 100 year flood is not permitted according to the Provincial Policy Statement. Figure 4 displays the floodprone areas in the County as per information provided by the Essex Region Conservation Authority. There are flood areas along the western borders of LaSalle and Amherstburg. The area in Amherstburg includes Holiday Beach Conservation Area which is an important bird area.

5.2.1.19 Best Practices

The preceding sub-sections detailed the potential land use issues associated with wind energy facilities. To assist in the development of policies at the County and local level, we recommend the consideration of the following best practices:

i) **Pre-consultation**: Bill 51 permits approval authorities to require pre-consultation on new applications. Accordingly, it is a best practice to ensure that the proponent of any new renewable energy facility pre-consult with the approval authority to clarify the submission requirements and coordination requirements with the Environmental Assessment Act, if applicable.

ii) **Single Planning Act application for wind farm proposals**: Approval authorities must decide whether one application should be submitted per project, or if separate applications should be received for each parcel of land subject to the wind project. In our opinion, the best planning practice is to receive and process a single application per project. The use of separate and individual applications duplicates planning and administration staff time at the municipality, creates confusion among resident groups, and

results in individual applications being considered out of context of the entire project and cumulative impacts.

iii) **Integration of Planning Act and Environmental Assessment Act processes:** Integration of these processes is a best practice that eliminates duplication of work (i.e. reports and meetings), confusion among residents when multiple separate projects are running, and reduces costs for proponents.

iv) **Approve Planning Act applications after Environmental Assessment (EA) is complete**: Due to the integration of both processes, there will be reliance on the combined information undertaken in support of an application. As a result, a best practice is to ensure that the EA process is complete prior to the approval authority rendering a decision on the Planning Act application(s).

v) **Additional circulation/notification for large scale projects**: The notice requirements of the Planning Act represent the minimum standard. However, given the off-site impacts of large scale renewable energy facilities, a best practice is to increase the circulation/notification requirements beyond the minimum requirements of the Planning Act.

vi) **UTM coordinate identification in zoning by-law amendments**: One of the principal issues that arises when new wind farm projects are proposed is that concerned residents do not have a guarantee of the exact location of the turbines. Proponents legitimately need time to refine the locations based on their technical analysis; however, by the time the Environmental Assessment process is completed and Planning Act approvals are being considered, turbines placement should be fixed. Best practice is to identify the location of each wind turbine using a UTM coordinate in both the text and schedule. This practice has recently been incorporated into OMB hearings in Kincardine, Melancthon and Wolfe Island.

vii) **Detailed operational/management protocols**: A number of issues associated with renewable energy development can be partially or entirely addressed through the use of appropriate operational and management protocols. Best practice for renewable energy projects is to ensure that these protocols are incorporated into the approval process by way of either conditional zoning (when the regulations are issued), a development agreement or Site Plan approval.

viii) **Use of an Ice Detection System for large scale wind projects**: Ice throw is a land use issue that has been detailed in Section 5.2 of this Paper. Best practice is to install an ice detection system that will shut down the turbine(s) during potential icing conditions.

ix) **German guidelines for shadow flicker:** International best practice on shadow flicker has developed largely as a result of a report prepared in Germany entitled "Notes on the Detection

and Assessment of Immissions Caused by Wind Power Plants – Notes on WPP Shadow Casting, March 12, 2002". This document essentially outlines the standards upon which shadow flicker should be modeled.

x) **Vacant lots of record:** As noted in this Section, new large scale wind energy facilities have the potential to generate adverse impacts off-site of the facility. In most cases, adverse effects from a proposed large scale wind project are measured against existing points of receptions and sensitive land uses. However, the work undertaken in support of a project often does not consider the impacts on vacant lots of record. For example, a noise study undertaken for a project is often measured against the Ministry of the Environment's issuance of a Certificate of Approval. If the project obtains the approval, then the project can proceed – assuming of course all other land use issues have been addressed. However, if a person were to build on an existing lot of record in accordance with the existing zoning, then there could be a conflict with the Certificate of Approval and the potential for that sensitive land use to be subject to adverse effects.

We recommend that all new wind projects consider potential adverse effects on vacant lots of record. The consideration of these effects should be tempered by only considering typical uses that would be permitted by the existing zoning on the property, rather than assessing adverse effects against potential land uses such as the subdivision of the land or any land use that requires Official Plan or zoning amendments.

In our experience, the Township of Melancthon has adopted the most proactive approach to address this issue by requiring all new large scale wind facilities to be located a minimum of 400 metres from all vacant lots of record less than 4 hectares in size.

5.2.2 Solar

The passive nature of Solar Energy Systems results in less potential for land use impacts. However, future policies should consider the potential for the following potential impacts:

5.2.2.1 Prime Agricultural Land Loss

The space extensive nature and high site coverage of greenfield SESs has the potential to remove large areas of agricultural land from production. In the case of Essex County, where most lands are prime agricultural, it may not be possible to locate SESs on less productive lands.

Care should be taken to avoid Specialty Agricultural land uses as these are considered the most important for protection. The County may wish to undertake future studies to identify specialty

agricultural lands to ensure their protection. In addition, any locational analysis for a project should consider brownfield, greyfield or large existing structures as potential locations for PV arrays.

While SESs may theoretically occupy lands for between 20 and 50 years, it is possible that compatible agricultural/grazing activities take place between rows of PV arrays and/or that the solar array is removed at the end of its lifespan and agricultural lands reinstated. It appears that the structures supporting the PV arrays are relatively lightweight and can be removed more easily than other types of buildings or structures. It could also be argued that prime agricultural lands left fallow during the lifespan of the SES will actually increase the land's productivity once the SES removed.

Future policies should consider the benefits of locating space extensive SESs on serviced lands within or close to settlement areas versus the loss of lands from agricultural production.

5.2.2.2 Agricultural Compatibility

Space extensive SESs are likely to be located in active working landscapes such as agricultural and rural lands. While the passive nature of SESs themselves are unlikely to result in conflicts with adjoining land uses, there may be impacts from existing agricultural operations. Dust and pollen from nearby agricultural operations may result in efficiency loses on nearby PV arrays. Another potential issue may be herbicide use on a SES site to control weeds/pollen for optimum generation that migrates off-site onto adjoining lands or affects the long term productivity of the site itself after the SES is removed.

Future policies could encourage complementary land uses on the SES site or alternatives to herbicide use such as grazing. Spacing between rows of PV cells (approximately 30ft) could possibly support some form of cropping. Specialty crops not previously considered in an area may become viable when sheltered by rows of PV arrays.

5.2.2.3 Reflectivity

Large expanses of reflective glass create opportunities for significant reflections particularly in east/west directions. Much like the issue of shadow flicker for wind turbines, a technical analysis of this impact can be modeled to reduce the potential for adverse effects and public safety impacts (i.e. reflections onto roads).

A secondary impact to mitigate potential reflectivity issues is the erection of large fences around the site. While these fences also provide security for expensive infrastructure, they also have the potential to alter the character of rural and agricultural landscapes.

5.2.2.4 Noise

PV arrays themselves have no moving parts and create no noise. However, as demonstrated at the Melanchthon Wind Farm, the transformer connecting the renewable energy system to the electrical grid can generate significant noise. Even though no electricity is generated at night and one would intuitively think that there would be no transformer noise impact, the Ministry of the Environment (MOE) has indicated that the noise is more likely to occur when there is a difference in energy on either side of the transformer. When there is a more even load on each side of the transformer (SES on one side and the distribution/transmission grid on the other side), potential noise is reduced. On this basis, noise may be an issue at night when there is no generation from the SES and the transmission/distribution grid is fully loaded.

As of 2006, MOE was uncertain of whether transformer stations were exempt from the requirements of a Certificate of Approval for noise emissions. Future policies should clarify this requirement and respond to any potential for noise impacts.

5.2.2.5 Visual/Cultural Heritage Landscape

Depending on the height of the PV arrays, larger scale SESs could have a visual impact on the landscape. This may be a visual bulk issue or the industrialization of an agricultural landscape.

Another similar impact may be on any identified Cultural Heritage Landscape (CHL). If a CHL has been identified, then policies may have to respond that conserve that landscape.

5.2.2.6 Solar Land Use Experience in Ontario

During the preparation of this background paper, only 2 other counties in Ontario appear to have specific policies for large scale SESs – the Counties of Norfolk and Lambton.

Norfolk County adopted a site specific Official Plan and Zoning By-law amendments which have since been appealed to the Ontario Municipal Board by opponents to the project. These planning policies and provisions represent possibly the first ones in the Province to deal with a large scale solar land use. Highlights of the Official Plan and Zoning By-law Amendments include:

- In addition to other permitted uses, allowing a solar farm to be permitted with a site-specific zoning by-law amendment.
- Designation of the site for site plan control.
- Definition of a "Solar Farm".
- Zoning provisions specifying:

- Maximum lot coverage of 95%.
- Setbacks of 10m and 20m.
- Maximum height of trackers of 10m and 7m for all other structures.

Information requirements of the County and the Ontario Ministry of Agriculture, Food, and Rural Affairs included:

- Reflection Analysis.
- Specialty Crop Assessment and Agricultural Impact Study.
- Alternative Location Study.
- Planning Impact Analysis.

At the time of this background paper being issued, information regarding Lambton County is still outstanding.

5.2.3 Biomass

Land use impacts associated with larger scale biomass facilities can be considered comparable with other types of industrial land uses. Smaller biomass operations associated with agricultural operations and co-generation facilities are likely to have less of a land use impact, although these facilities are primarily used for heating purposes.

5.2.3.1 Noise

Large biomass electrical generation facilities have the potential to generate noise. The Ministry of Environment has established noise guidelines for industrial facilities that would have to be met in order for a Certificate of Approval to be issued. The Certificate of Approval process would identify if mitigation measures need to be undertaken to ensure ongoing compliance.

Biomass facilities may not be subject to the MOE Certificate of Approval process particular if they are associated with an agricultural operation. Future policies should consider possible exemptions in consultation with MOE and determine if noise policies need to be established at the County of local level.

5.2.3.2 Air Quality

Air quality impacts from biomass facilities can come from air emissions and dust. Air emissions typically encompass odour issues as well.

Like noise, air and dust emissions from industrial facilities require a Certificate of Approval to ensure that Provincial standards will be met. Provincial standards seek to ensure that minimum air quality targets are met at the boundary of the site containing the industrial facility. Compounds contained in the emissions contributing to odour would also subject to Provincial guidelines. The County or its member municipalities may wish to consider the application of MOE standards for smaller and agricultural related biomass facilities that may be exempt from the Certificate of Approval process.

5.2.3.3 Traffic

Because of the less efficient heating properties of biomass fuels compared to fossil fuels, biomass energy systems require larger amounts of fuel that in most cases will not be available on-site. The result is the need for potentially significant truck or rail deliveries that may have an adverse effect on surrounding land uses. Depending on the scale of a facility, a traffic impact analysis would assist in determining if traffic will be an issue. To reduce truck traffic, large biomass facilities could be encouraged to locate in close proximity to rail lines or Highway 401.

5.2.3.4 Water/Infrastructure

Larger scale BESs have the potential to use significant amounts of water and tax the existing capacity of other infrastructure.

Functional serving reports for BESs facilities would need to establish that sufficient water supplies exist and that existing infrastructure or future upgrades will be able to accommodate the facility.

The desire for BESs to use established infrastructure, typically located in settlement areas, may create situations where facilities with the potential for large land use impacts will be located in closer proximately to more densely populated areas.

5.2.3.5 Storage

Outdoor storage areas have the potential to come into contact with stormwater run-off and pests. Adequate facilities for outdoor storage should be considered for BESs of all sizes.

5.2.3.6 Management/Maintenance

Many land use impacts can be associated with improper management and maintenance of facilities. Odour and pest issues occur with improper storage techniques while noise may result from improperly maintained equipment. While the Ministry of the Environment and other government agencies may monitor some aspects of the operations of a BES, the County and its member municipalities may wish to consider other operational protocols through a development agreement/site plan control.

5.3 County Versus Local Issues

A meeting with the planners from the County of Essex area municipalities was held on June 25, 2007 at the Essex County offices to discuss the work programme commenced by Jones Consulting. The following persons attended the meeting:

- Bill King, County of Essex
- Enrico De Cecco, Town of Tecumseh
- Chad Jeffery, Town of Essex
- Larry Silani, Town of La Salle,
- Danielle Stevenson, Town of Kingsville
- Tracey Pillon-Abbs, Municipality of Leamington
- Matthew Child, Essex Region Conservation Authority
- Tom Storey, Town of Lakeshore

In addition, follow up telephone discussions were held with each of the above (with the exception of M. Child, ERCA) as well as George Balango, Town of Amherstburg and Brian Hillman, Town of Tecumseh.

Discussions during the meeting and follow up telephone conversations focused on defining the issues regarding renewable energy systems and the corresponding local and county policy responsibilities. Productive discussions have developed a general consensus that the role of the County is to generally support renewable energy systems in accordance with the Provincial Policy Statement, and to establish a broad framework guiding new facilities within the County. In addition to the items discussed during the planners meeting, we have included additional considerations

brought up during telephone conversations with each individual relating to the county vs. local context.

The following table lists the policy issue, and briefly outlines our consideration of the issue for the purposes of defining future responsibilities. Please note that the purpose of this table is to stimulate discussion for the purpose of determining an appropriate policy response at either the County or local level. The County "C" and Local "L" columns have intentionally been left blank for future discussions with stakeholders.

Issue	C	L	Rationale
Regulating large-scale wind energy facilities			We feel that the issue is significant at both the county and local levels, both should be involved and responsible for policy and process direction.
Regulating small-scale and medium wind energy facilities			Based on draft documents and discussions with the local planners, it appears that local municipalities may wish to deal with regulating small and medium facilities.
Defining the scales of wind energy facilities			Our experience suggests that defining scales is a local issue because the thresholds depend upon the individual characteristics and preferences of individual municipalities. Depending upon the policy approach, the County may choose to define all scales or only large scale.
Cumulative impacts			The County may be best suited to take a 'regional' approach to reviewing the cumulative impacts of renewable energy facilities.
Visual assessment/impact			Visual is the most subjective of issues associated with wind development specifically, yet the visual is the defining characteristic and usually one of the most important considerations for ratepayers. During discussions with planners, the issue of visual did not appear to be a key issue.
Wind Speeds			Given local wind resources, both the County and local municipalities should consider wind speeds in policy development. During discussions with planners, location of wind speeds was important in determining where policy should direct large scale projects.
Lot sizes			Although lot size was not an apparent issue during discussions, we recommend that lot size be considered a local issue because of the urban/rural split and the variations in lot sizes among municipalities.
Encouraging renewable energy development			During discussions with planners, it was apparent that there is support for the County to encourage renewable energy development and must be consistent with the PPS in promoting renewable energy. Based on our experience, it is also important for more detailed policy at the local level to also support

Issue	C	L	Rationale
			renewables and to be consistent with the PPS.
Specialty Crop lands and Agricultural Benefits and Impacts			In conformity with PPS, impacts and benefits should be considered for farmers and farming operations. Considerations include: (i) Significant prime agricultural land consumption, (ii) Impacts on specialty crop lands, (iii) Promote methods to improve the viability of farming – alternative income options (for example, solar opportunities to greenhouse operators) The mapping of Specialty Agricultural areas may be undertaken at the County level for reasons of consistency.
Technical issues o Noise/vibration o Tourism/Economic development o Shadow flicker o Blade glint o EMI o Ice Throw o Construction /Operational management o Decommissioning			The technical issues identified require policy guidance at the local level and modeling by qualified professionals during the detailed design and approval of an application for a renewable energy project, specifically wind energy facilities. Technical issues represent typical issues of serious concern to the ratepayers that cannot be addressed until the application is submitted. In addition, these issues do not generally have provincial interests associated with them. During discussions with area planners, local issues primarily include noise, vibration and tourism/economic impacts.
Cultural heritage/built heritage resources			In some cases, heritage resources can have provincial or even national importance. Although the county should ensure these features are protected, the local municipality is usually the most capable at identifying and protecting these resources because it requires local Council commitment.
Intra-county & cross jurisdictional issues such as natural heritage features, bird migration, Detroit River.			Issues that cross municipal boundaries or have broader intra-county implications should be the responsibility of the County.
Development Charges			Although this was not an issue during discussions with local planners, we would recommend that background studies and development charges by-laws be updated to levy a charge per turbine as permitted by the Province. The by-law can also include the costs associated with preparing reports etc. to develop policy.
Resources: Aggregate/Minerals /Petroleum			The County may wish to determine whether electrical power generation serves a greater long term public interest than resource extraction. It was identified that the County mapping is more generic, while local municipalities may have greater detail maps to provide local insight.
Processing/co-ordination			

Issue	C	L	Rationale
o Applications – 1 per project or property o Combining OPA's with EA o Establishing consistent terminology o Site Plan Control o Conditional Zoning			The County should ensure that all local municipalities process applications by project rather than by property. Filing and reviewing multiple applications for a project creates difficulties for the public, for staff and for ease of project review. Whenever an OPA is required, joint processing of the Environmental Assessment process is recommended. The County may wish to establish a framework, including terminology (i.e. defining wind energy facility) to ensure some level of consistency among local plans. Site plan control and conditional zoning are tools used by local municipalities to implement mitigation and site design measures.
Aircraft safety and airport expansion			Airports service and impact a greater area than just the host municipality. As such, this should be a county consideration.

5.4 Amenity Agreements

A recent trend in the wind development industry is to enter into 'Amenity Agreements' with the host municipality under Sections 8 and 130 of the Municipal Act. The use of Amenity Agreements appears to have originated in response to the negative public perception that large scale wind energy systems do not make a meaningful economic contribution to the local area in which they are located even though that same area may be subject to potential amenity impacts. Therefore the purpose of the Agreement is to provide certain amenities and assurances to the municipality to compensate for any adverse effect.

Terms of amenities agreements may include:

- The length of time the agreement stands (possibly up to 40 years and beyond).
- Reimbursement for any potential hearing costs.
- Deposition of a security deposit.
- Provision for repairs to municipal infrastructure as a result of the construction of the project to be paid by the proponent.
- Improvements to the transportation network by the proponent to accommodate the proposed construction.
- Requirement for underground electrical cables.

- Annual amenity fee to be paid to the municipality based either as a flat fee or a percentage of gross revenue per turbine.
- Emergency equipment and training.
- Provisions for dispute resolution.
- Indemnity and insurance.
- Operational commitments.
- Decommissioning requirements

5.5 Property Taxation

The following information was conveyed to the Canadian Wind Energy Association in a letter from Greg Sorbara, Minister of Finance, on the 17th August 2005:

> *Effective January 1, 2005, wind turbine towers will be assessed at a rate of $40,000 per megawatt of installed capacity. This fixed rate of assessment will apply only to the tower and its foundation and not apply to land maintenance buildings, transformer stations and other related buildings required for a WEF. The other lands, buildings and structures will be assessed by MPAC using their established methodologies.*
>
> *The wind turbine tower and related lands and buildings will be included in the industrial property class consistent with current practice. For stand alone wind turbine towers, MPAC policy is to include approximately 1 acre of land in the industrial class.*

In summary, Ontario's approach to taxation includes an assessed rate per megawatt, in addition to an assessment per hectare of land use and any other buildings. When combined, this total assessed value is multiplied by the local municipal mill rate. A sample calculation and a more detailed explanation can be found in a report prepared for the Canadian Wind Energy Association in October 2005 and titled "Taxing Wind in Canada – Property Tax Assessment Policies and practices in Canada". This report is available on the Canadian Wind Energy Association website (www.canwea.ca) and concludes that "Ontario projects (on average) face the lowest property tax levels across the County" (pages 11-12).

5.6 Opportunities & Constraints for Wind Energy Development

A review of the County's opportunities and constraints for windpower and renewable energy generation will provide a basis for future policy. In addition, it is important to keep in mind that what may be a constraint for one type of generation may be an opportunity for another.

The following constraints were considered to be applicable at the County level:

- Wind Speeds
- Natural Heritage
- Bird Migration
- Flood Prone Areas
- Specialty Crop Lands
- Visual
- Airports
- Aggregate Resources

This evaluation was completed at a macro level appropriate for the development of County planning policy options and on the basis that renewable energy projects will be assessed in greater detail at the local level. Complementing this 'desktop' review of the County's features were field observations taken during site visits/tours of the County on June 19, 20 and 25, 2007 and discussions during the start up meeting on June 25, 2007. The route of field observations is shown on Figure 2.

The scale of a facility will directly determine the degree of an opportunity or constraint. For example, a large scale wind project with multiple large turbines will face many more constraints for development than a small roof mounted micro turbine. Figure 1 represents the baseline for the constraint mapping and shows towns, streets, populated areas and lots. All other figures follow this page and will be referred to in the following sections.

5.6.1 Wind Speeds

Wind speeds have been mapped by the Ontario Ministry of Natural Resources (MNR) to a 100 metre by 100 metre resolution to provide a basis for and to encourage wind energy projects within Ontario. The wind resources maps, shown in Figures 6 and 7, are used by the wind industry as an initial prospecting tool to locate areas warranting further local investigation. While the wind mapping may be used to approximate the local resource in a given regions, MNR recommends a professional more

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FIGURE 1
PROVINCIAL AND REGIONAL ROAD NETWORK

NOTES

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LEGEND

- Municipalities
- Towns
- Streets
- Populated Areas
- Lots
- Water

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FIGURE 2
SITE EVALUATION MAP

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LEGEND

- DRIVE ROUTE
  July 19th, 20th and 25th 2007
- Towns
- Streets
- Populated Areas
- Lots
- Municipalities
- Water

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FIGURE 3
COUNTY OF ESSEX OFFICIAL PLAN MAP

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LEGEND

- Municipalities
- LandUse
- Natural Environment Areas
- Settlement Areas
- TOWNS
- Streets
- Populated Areas
- Lot
- Water

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FIGURE 4
FLOODPRONE AREAS

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LEGEND

- Municipalities
- Areas_Susceptible_To_Flooding
- Inland Floodplain Development Control Area
- Lake Erie/Detroit River Floodprone Areas
- Lake St. Clair Floodprone Areas
- Streets
- Lot
- 1:100 Floodline
- Water

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FIGURE 5
TRAILS AND TOURIST ROUTES

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LEGEND

- Golf Courses
- Wineries
- Points of Interest
- Trails (Essex-Proposed Recreationway)
- Trails (Leamington)
- Multi-Purpose Pathways (LaSalle)
- Trails (Lakeshore-Roadside/Park)
- Bed and Breakfast
- Heritage Houses (Kingsville)
- Wine Route
- Chrysler Canada Greenway
- Streets
- Populated Areas
- Lots
- Water
- Detroit River Heritage Parkway

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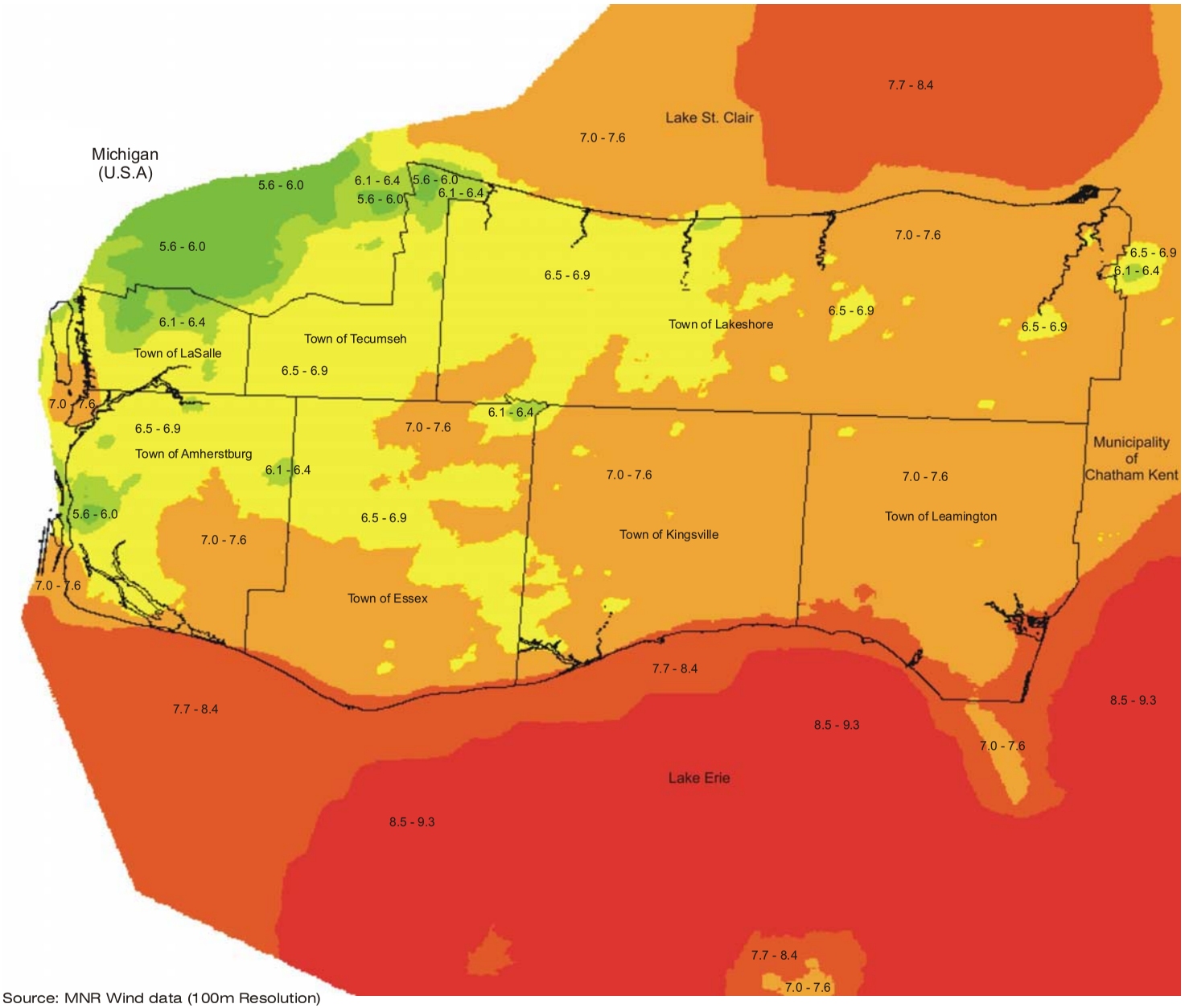

Source: MNR Wind data (100m Resolution)

FIGURE 6

AVERAGE ANNUAL REGIONAL WIND SPEED AT 80m HIGH

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LEGEND

- Municipal Boundaries
- 4.0 - 5.5
- 5.6 - 6.0
- 6.1 - 6.4
- 6.5 - 6.9
- 7.0 - 7.6
- 7.7 - 8.4
- 8.5 - 9.3

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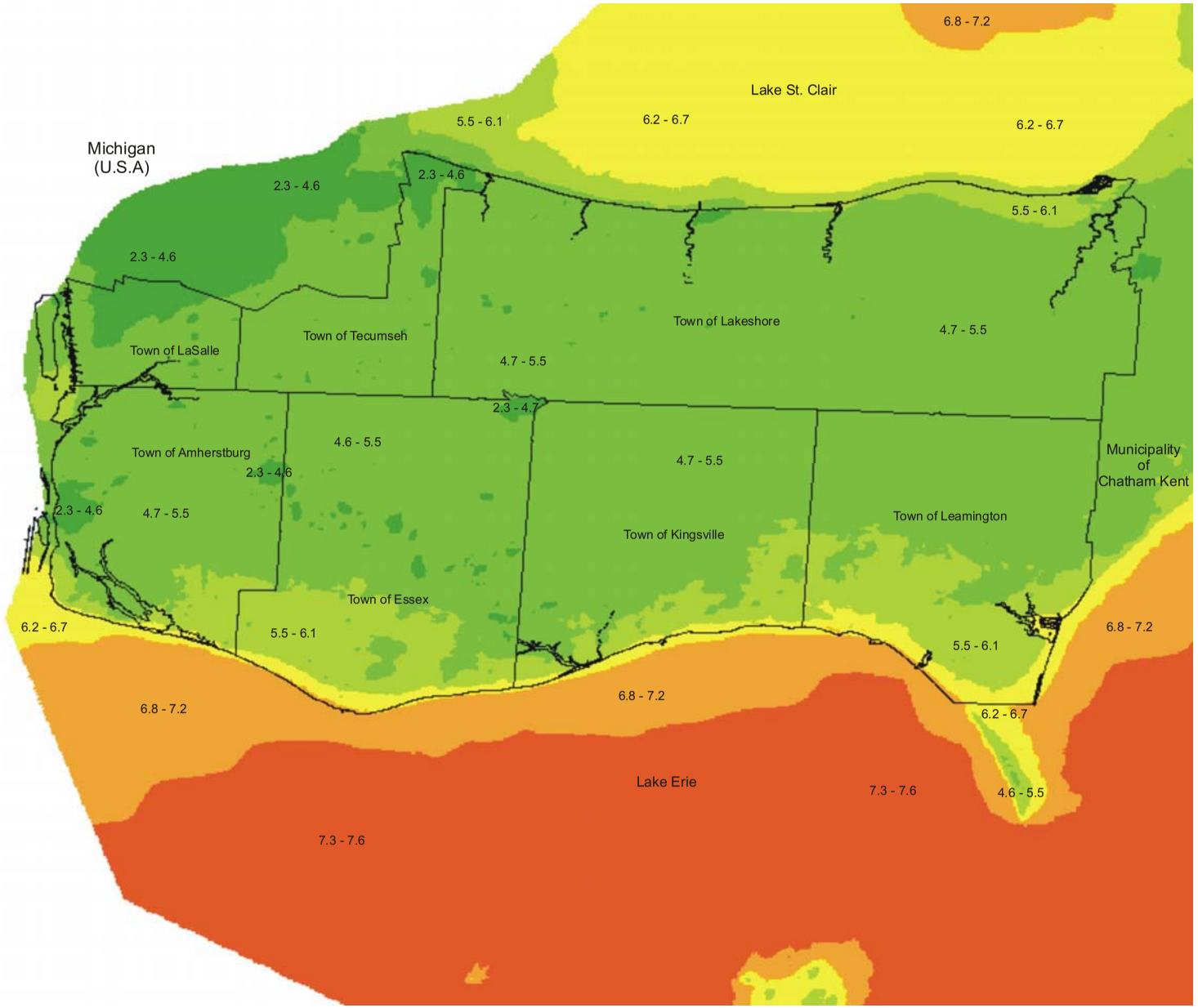

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FIGURE 7

AVERAGE ANNUAL REGIONAL WIND SPEED AT 30m HIGH

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LEGEND

- Municipal Boundaries
- 2.3 - 4.6
- 4.7 - 5.5
- 5.6 - 6.1
- 6.2 - 6.7
- 6.8 - 7.2
- 7.3 - 7.6
- 7.7 - 9.3

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FIGURE 8
REGIONAL NATURAL HERITAGE FEATURES

ESSEX REGION CONSERVATION AUTHORITY NOTE:
* Produced by The Jones Consulting Group Ltd.
*Woodlot and Conservation Areas data copyright ERCA, 2004
*The boundaries of Provincially Significant Wetlands (PSWs), Environmentally Significant Areas (ESAs), Areas of Natural Scientific Interest (ANSIs), and Significant Valley Lands (SVLs) as shown are approximate. The location and status of these sites are subject to verification by ERCA and/or MNR. Copyright MNR/ERCA 2004.;
* Solis data copyright OMAFA/AAFC, 1939

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LEGEND

- COE.ERCA.VALLEYS_2004
- COE.ERCA.PSW_2004
- COE.ERCA.ESA_2004
- COE.ERCA.FOREST
- COE.ERCA.EMS_CONSERVATION_AREAS
- ANSI
- TOWNS
- Streets
- Populated Areas
- Lot
- Municipalities
- Water

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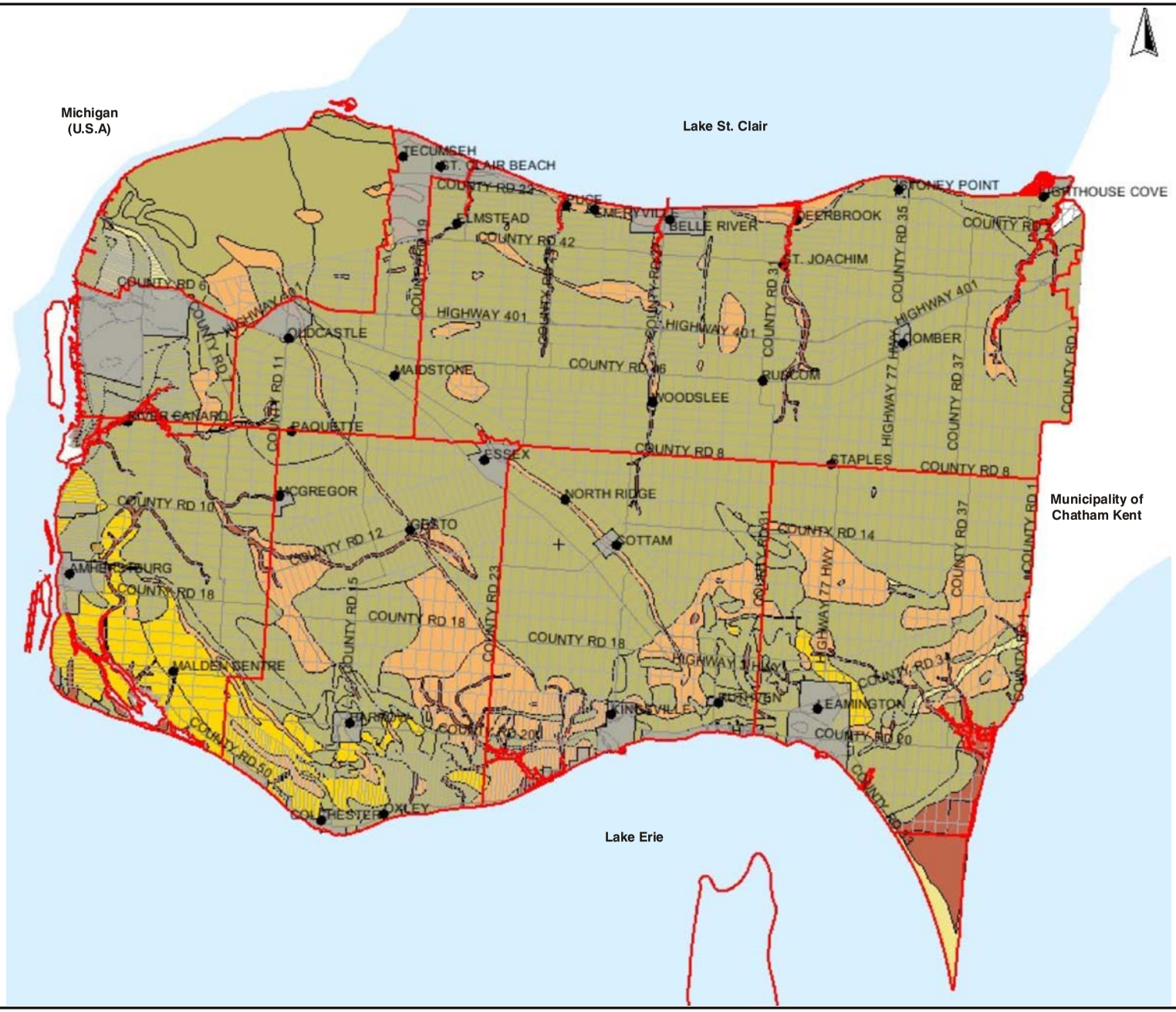

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FIGURE 9
SOIL MAPPING

ESSEX REGION CONSERVATION AUTHORITY NOTE:
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LEGEND
- Municipalities
- TOWNS
- Streets
- Populated Areas
- Lot
- Soils Essex
  - 0
  - Class 1
  - Class 2
  - Class 3
  - Class 5
  - Class 6
  - Class 7
  - Water

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FIGURE 10
REGIONAL AIRPORT LOCATIONS

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LEGEND

- Populated Areas
- Lots
- Municipalities
- Water
- Airport Locations (Approximate location only)
- Airport Buffers

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FIGURE 11
TRANSMISSION/UTILITY MAP

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LEGEND

- Municipalities
- Towns
- Streets
- Populated Areas
- Lots
- Water
- Transmission/Utility Lines

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FIGURE 12

MINERAL - PETROLEUM - AGGREGATE MAP

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LEGEND

- Mineral Aggregate Resources
- Petroleum Resources
- Salt Deposits
- Municipalities
- Towns
- Streets
- Populated Areas
- Lots
- Water

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detailed assessment of local meteorological conditions and technical feasibility prior to proceeding with any wind turbine installation.[64]

For larger scale windpower facilities, professionals specializing in the area of wind testing and feasibility will carry out a site specific wind feasibility study using specific wind testing towers or Meteorological Towers (MET Towers). Site specific wind measurements can also be taken with mobile sonar units. Once data is collected, micro-scale wind speed and energy density maps would be produced to confirm feasibility.

According to the MNR, wind speeds of 5 to 6 metres per second are required for small scale development while wind speeds in excess of 6.5 metres per second are required for large scale facilities.[65] Figure 6 illustrates general wind speeds at an 80 metre height based on the Ontario Wind Atlas.[66] The shorelines along the southern boundary of the County is primarily indicating offshore wind speed that range from 7.7 to 8.4, which are considered "very good" to "excellent". However, all of these areas are at shoreline.

Spanning east and west, the majority of the County is within the 7.0 m/s to 7.6 m/s, which is considered "acceptable to very good". These areas are large in size and are concentrated, as opposed to sporadic areas of greater windspeed as is often seen in areas with greater relief in topography. Amherstburg and Essex, as well as Kingsville, Leamington and stretching east beyond Essex boundaries, the wind speeds appear to be consistently "very good".

Lasalle, Tecumseh and two fingers stretching into Amherstburg and Essex indicate a more "acceptable" level of windspeed, as is slightly more sporadic then the previous area and represents wind speeds of 6.5 m/s to 6.9 m/s. The built up areas of Windsor and Amherstburg both represent "marginal" wind speeds at 4.0 to 6.4 m/s.

The Town of Lakeshore is fairly consistent with an "acceptable" to "very good" wind speeds of 6.5 to 7.5 m/s. This area represents an area of consistent wind.

Figure 7 illustrates general wind speeds at a 30 metre height. There appears to be less variation in wind speeds at the lower hub height elevation. The majority of the County is represented by a consistent 4.68 to 5.53 m/s wind speed. This is considered an "acceptable" wind speed for small scale development. The lands adjacent to the shorelines (within approximately 3 kilometres of the shoreline) of both Lake Erie and Lake St.Clair are represented by wind speeds of 5.53 to 6.05 m/s. These wind speeds are still considered "acceptable", but are in the low ranges for large scale facilities.

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[64] www.ontariowindatlas.ca/en, July 5, 2007
[65] www.ontariowindatlas.ca/en/about.php#production, July 5, 2007
[66] Ontario Wind Atlas, Queens Printer for Ontario, 2005

The shorelines at the 30 metre height are depicted by wind speeds of 6.05 to 7.23 m/s. This is considered "acceptable" to a low "very good" category.

Based on a comparison of Figure 6 and Figure 7, it would appear that at the 30 metre height there are areas that would be considered viable for small scale facilities. However, the 80 metre height wind speed data represents areas of wind speeds depicting significantly larger areas of "acceptable to very good" and "very good to excellent" for large scale wind facilities. The delineated mapping identifies some sporadic variation within the Town of Essex and the Town of Lakeshore, but identifies "very good" wind speeds for large scale facilities within the Town of Kingsville, Town of Leamington and the central to eastern portion of the Town of Lakeshore. There is also a relatively large pocket of "very good" wind speeds in the south portion of the Town of Amherstburg and Town of Essex.

This summary is a generalization of the Wind Atlas and should be considered a guide for viability. As wind turbines continue to evolve, technology changes and energy prices continue to escalate previously marginal projects may become more viable.

5.6.2 Floodprone Areas

Two policy documents need to be considered when addressing flood issues and the locations of wind turbines.

The County of Essex OP and Schedule C clearly identifies areas that are floodprone. These areas as shown in Figure 4 have existing policies related to development and site alteration. As a result, any turbine facility proposed in these areas would have to provide minimum information requirements and siting criteria.

The second policy document is the PPS 2005 that states that development should generally be located outside of hazard lands (i.e. shorelines of the Great Lakes, rivers and streams). This approach is consistent with County OP policy. However, the PPS further states that site alteration is not permitted within the defined portions of the 1oo year flood level along the Detroit River.

It is unclear from the County schedule whether the 100 year Detroit River flood level is shown. Once determined, future wind energy facilities would not be able to locate within these areas thereby creating a fundamental constraint. In addition, we recommend that dynamic beaches also be considered during the siting of turbines as the PPS also excludes these areas from site alteration.

Turbine locations within all other floodprone areas as shown on Figure 4 would be subject to the relevant local, County and Provincial policies.

5.6.3 Natural Heritage

Figure 8 depicts the natural heritage features identified by the ESRCA database and include valleys, PSWs, environmentally sensitive areas, forests, and conservation areas. Like other forms of development wind turbines shall not be permitted in PSWs, the significant habitat of endangered and threatened species, and significant coastal wetlands. These two latter areas are not specially shown in Figure 8 and must therefore be considered at the site specific application stage.

In the County Official Plan, environmental policies include regionally significant woodlands, ANSI's and locally significant sites. These areas represent potential constraints to the development of renewable energy systems. These areas are not identified in the County schedules and their identification would need to be undertaken in the presence of a specific project and in consultation with the ESRCA.

Provincial Policy, and as a result local planning approvals, requires an environmental impact statement in or adjacent to sensitive natural heritage features as shown in Figure 8 and additional areas to be identified. As a result, it is inappropriate to issue any planning approval prior to the EIS being completed. Inappropriate planning approvals would include relying on an Environmental Screening Process not scoped to address the statements of the PPS and the Environmental Screening Process not being completed before the planning decision.

5.6.4 Bird Migration

As part of our consideration of natural heritage features, Dougan and Associates has been retained to complete a Wind Turbines & Wildlife Review. The firm has researched whether bird migration could be considered a constraint within the County to the development of renewable energy facilities.

The report, specifically Figures 1 and 2, identifies that Essex County has many factors to consider when determining whether a proposed wind farm development will have an adverse effect on wildlife and their habitats. Given the current levels of technologies available to the wind energy sector, there are mitigative techniques available should a proposed wind farm development be shown to have potentially adverse effects on the environment. In some cases, mitigative measures may not be sufficient to allow wind turbines in a significant bird/bat area.

Therefore, it is important that for a proposed development, the steps outlined in the numerous government guidance documents be followed with regards to recommended wildlife pre-assessment and monitoring, turbine design, configuration, siting considerations and mitigation techniques. The

entirety of the Dougan Review is included in Appendix B. Section 6 explores further research in this area that may be appropriate for policy development.

5.6.5 Specialty Crop Lands

The Agricultural Areas designation within the County Official Plan pertain to all lands that are not otherwise designated as Settlement Areas or Natural Environment Areas. While Figure 6 identifies soil capabilities within the County, it is unable to discern specific areas that may be considered to be Specialty Agriculture.

The overall vision in the County OP, and shown in Figure 3, is an agricultural designation that encompasses all types of agriculture including cash crops, greenhouse, orchard, vineyard, mushroom and livestock farming. As identified with the Official Plan, the County offers one of the most complex and technologically advanced agricultural areas in Ontario. It is recognized that with 90% of Essex County being designated Agricultural Area, there will be some development pressure on these lands. The Official Plan provides that such development proposals will only be permitted if adequate justification based on the growth management policies of this Plan are provided and if the development is in accordance with the Provincial Policy Statement. The Plan does identify that there is a need to permit other types of land use within the Agricultural Areas, for example, gas and oil and extraction of mineral aggregate.

Wind energy projects within these Agricultural Areas will be impacted as there is an attempt to minimize or avoid loss of these valuable lands for food production. Mapping of higher order agricultural lands such as those used for specialty crops should be undertaken to ensure a policy approach consistent with the PPS.

5.6.6 Visual

The visual acceptability or impact of wind turbines of any size is primarily dependent upon the values and subjectivity of the individual. For this reason, visual impacts are the most controversial yet the least understood of many land use issues.[67] The landscape character of an area is linked to a variety of attributes including topography, vegetation, existing uses, visual diversity, settlement patterns and landmarks.[68]

---

[67] Schauman, Sally, Foundations of Visual Project Analysis. New York: John Wiley & Sons. 1986.
[68] University of Guelph, Landscape & Visual Assessment Guidance for Wind Energy Farm Development, Municipality of Grey Highlands. March, 2006.

Our initial assessment of the general landscape character of the County was based on tours of the County on June 19, 20 and 25, 2007 and on aerial photograph interpretation. The routes undertaken for this assessment are shown on Figure 2. The routes were chosen to consider the trails and tourist routes shown on Figure 5. The following characteristics were identified:

- A significant presence of major transportation corridors with built up areas including 401.
- A generally flat landscape, built development flanking most roads.
- Pockets of significant tree cover.
- Significant built settlement areas along shorelines of Lake Erie, Detroit River and Lake St. Clair, with smaller settlement areas inland on transportation corridors.
- Significant agricultural investment.
- Views along the transportation corridors are dominated by shoreline residential development, and a variety of agricultural operations including fruit crops, markets, vineyards, cash crop, greenhouses and livestock.
- The shorelines are highly modified based on significant built up areas being elongated along the shore.
- Scenic Views from the Lake Erie shores, Detroit River shores and Lake St. Clair Shores.

These observations provide an initial starting point for future consultation and review. These observations are general in nature and should be considered in relation to the comments received during this process from staff, ratepayers and stakeholders.

The economics of tourism, trails and wine routes are important to the County and its member municipalities. Visual impacts from a large scale proposal or from the cumulative effects of multiple proposals could have an impact on tourism and the features shown in Figure 5. Therefore, a significant issue when addressing tourism constraints is attempting to minimize visual impacts on key areas of tourism (i.e. Chrysler Canada Greenway). Key routes and trails should be identified and assessed by the County and further reviewed by local municipalities once the details of a specific project are submitted.

5.6.7 Airports

There are four airports within the County or in the immediate area which need to be considered, including (i) Windsor Airport, which is located in the southeast portion of the City of Windsor (ii) Essex Airport which is located approximately seven kilometres southwest of the Town of Essex (iii) Cottam Airport which is located approximately seven kilometres east of Cottam and (iv) Leamington

Airport is located approximately five kilometres east of the Municipality of Leamington.[69] Figure 10 identifies airport locations with buffering radius.

The Windsor Airport is the largest airport in the area with scheduled air services with large operators as well as general aviation traffic. The airport services a mixture of scheduled airline flights and general aviation and is a popular point of entry into Canada for private and business aircraft. The airspace above the airport is exceptionally busy because of the proximity to Detroit Metropolitan Wayne County Airport. All arrivals and departures from Windsor Airport are handled by Detroit approach control.[70]

Section 1.6.72c) of the Provincial Policy Statement, land uses shall be discouraged which may cause a potential safety hazard. As a result, airports represent a constraint to the development of large scale wind energy facilities. Each airport establishes a height control by-law that could prohibit development within a defined radius of the airports. Applications to develop new building and structures within this radius are reviewed by Transport Canada. Depending upon the particular application, certain proposals may be denied within the exclusion area or modified in terms of height and location to minimize impacts on aviation safety. Figure 10 illustrates an approximate four kilometre buffer around the three County airports and a ten kilometre buffer around the Windsor Airport. These buffer areas depict constraints to the construction of new renewable energy facilities, particularly large scale wind, in areas that may create an aviation hazard. We have attempted on may occasions during the preparation of this Paper to discuss aviation issues with Transport Canada; however, we have not been able to make contact.

Depending upon the particular application, certain proposals may be denied within the exclusion area or modified in terms of height and/or location to minimize impacts on aviation safety.

5.6.8 Electrical Transmission & Distribution

There are two potential options for the delivery of electricity from generators – the transmission network and the local distribution system. The mode of delivery will depend on the size of the generator being proposed. The larger the generator, the more likely that its power is too much for a lower voltage distribution system to handle, and therefore, power generated will be directed to the higher voltage transmission network for distribution throughout greater Ontario and beyond.

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[69] www.wikipedia.org/wiki
[70] www.wikipedia.org/wiki/WindsorAirport

As part of this discussion paper, local electrical utility companies in Essex County were contacted to discuss whether there was local public/corporate interest in wind energy/renewable energy generation projects, any initiatives that may be established to encourage new generation sources and any potential constraints to new generators being established. Figure 11 depicts transmission and utility lines within the County. The responses were as follows:

- **E.L.K. Energy**: This distributor serves six urban municipalities including Essex, Harrow, Belle River, Comber, Kingsville and Cottam. Their distribution is entirely within Essex County. Formed in 2000, E.L.K. is the successor utility of the Hydro-Electric Commission for the Town of Essex, Lakeshore Hydro Electric Commission, and Kingsville Hydro-Electric Commission. Based on discussions with the provider, there is not a concern with renewable energy projects based on their distribution area consisting of primarily urban municipalities. E.L.K. Energy is always willing to review opportunities. Currently, the distributor does not have any current initiatives regarding renewables. E.L.K. Energy is an embedded local distribution company and any connections require coordination through Hydro One. E.L.K. Energy provides service to six non-contiguous service areas with various voltages, feeders and loads. As a result, projects would have to be reviewed site specifically within the area they are located.[71]

- **Essex Power**: Essex Power serves as the distributor that provides distribution and operation services to Essex Powerlines. They also provide customer account maintenance and billing services to Essex Powerlines, and the municipalities of Amherstburg, LaSalle, Leamington and Tecumseh. On June 1, 2000 the former utility companies of Amherstburg, LaSalle, Leamington and Tecumseh were amalgamated to form Essex Power. The distributor serves as a regulated "local distribution company" which provides reliable power to 27,000 customers in Amherstburg, LaSalle, Leamington and Tecumseh.

  As a Local Distribution Company (LDC) regulated by the Ontario Energy Board (OEB), their licence requires them to connect customer/developers/generators. Essex Powerline's only requirement is to work with and connect new generation (as directed by the OEB from the Ministry of Energy).

  Constraints to new sources are put forward by Hydro One Networks Inc and their requirements/constraints on the Transmission System. The process for application through Essex Powerlines would be to consult with and have Hydro One complete studies on

[71] Michael Audet. E.L.K. Energy Inc. Discussion August 13, 2007. Email August 15, 2007.

Customer Impact Assessments (CIA). Hydro One has an established connection process that the local distributors must follow. It is their understanding that most transmission stations are "full" at this point in time with potential projects. As such, unless an applicant is already in the queue then there is little opportunity of being connected. (http://www.hydroonenetworks.com/en/customers/generators/generation_connections/distribution/queue_process/Application_List_FINAL.pdf)

With regard to constraints, 600 Amps per feeder at 27.6 kV, and xx MW per station (with each station being different with limits) is a constraint based on capacity. Different size renewables have different requirements.[72]

- **Hydro One**: Hydro One is one of the local electricity distributors within Essex County. No response at this time.

Hydro One has been contacted to discuss the how the planning process and approval for connection process can be integrated to ensure that projects do not unnecessarily lose their priority with respect to connecting the distribution/transmission system. Where possible, the response of Hydro One will be incorporated into the policy development process

In summary, the local electricity distributors contacted suggested that their distribution systems were healthy and could accommodate new generators. Both Essex Power and ELK Energy commented that they could accommodate most projects. Both companies stated that under current regulations they are bound to accommodate projects and thought that smaller renewable systems were only a matter of time. There was no hesitation from either company that they will accommodate new source projects and that their only concern is with connected the source to the grid.

5.6.9 Mineral, Petroleum & Aggregate Resources

As defined in Section 2.4 and 2.5 of the Provincial Policy Statement, in areas adjacent to or in known mineral deposits, petroleum resources and mineral aggregate resources, development and activities which would preclude or hinder the establishment of new operations or access so the resources shall only be permitted if the proposed land use or development serves a greater long term public interest and issues of public health, public safety and environmental impact are addressed.

The County of Essex Official Plan identifies the location of petroleum resources, mineral aggregate resources, petroleum and mineral aggregate resources and salt deposits. It also recognizes locations

[72] Mark Alzner. Essex Powerline Corporation. Discussion August 13, 2007. Email August 15, 2007.

of existing brine wells. Figure 12 identifies locations of minerals within the County. Development of certain renewable energy facilities in areas having high resource potential could impact on the extraction of these resources. As a result, determination should be made as to whether the generation of electrical power from renewable sources such as wind is considered a land use that serves a "greater long term interest". For research purposes, these resource areas should be considered a constraint to renewable energy facilities.

5.6.10 Cultural Heritage Landscapes & Built Heritage Resources

The construction of renewable energy facilities in the proximity of Cultural Heritage Landscapes or on or near Built Heritage Resources has the potential to adversely impact these heritage features. Neither the County nor the local municipalities have mapped either Cultural Heritage Landscapes or Built Heritage Resources. However, Figure 5 does depict several unique features of the area including the wine routes and the Detroit River Heritage Parkway.

6.0 Draft Considerations for Discussion

The third stage of the Essex County wind and renewable energy study is to develop a policy approach. This Paper forms a baseline for future policy approaches in many respects; however, specific direction needs to be provided by the Steering Committee on a number of items in order to proceed completely to Stage 3. These items have been detailed in the following list of considerations, the answers to which will complete the base framework for the policy preparation exercise. Other issues identified during the stakeholder consultation will also be considered as part of the policy development process.

1. Mapping of Specialty Agricultural Lands

Specialty Crop lands are a finite resource afforded the highest priority for protection by the PPS in Prime Agricultural Areas. However, these lands have not been mapped in the County.

- Will the County map Specialty Agricultural lands for the purposes of minimizing the loss of these productive areas that may occur as a result of renewable energy projects?
- Will the County allow renewable energy facilities in Specialty Agricultural lands on the basis that the loss of productive areas is offset by the benefits of renewable energy and improved farm income?
- Does the County want to consider limitations on the size of large scale solar facilities in higher order agricultural areas?

2. Mapping of Cultural Heritage Landscapes and Built Heritage Resources

The Provincial Policy Statement seeks to conserve cultural landscapes that represent heritage significance and are valued by a community. In our opinion, the responsibility for identifying cultural heritage landscapes and built heritage resources ideally rests with both the County and local municipalities. In the absence of identification, it is difficult to expect a renewable energy proponent to consider cultural heritage from the broad perspective. If these resources are not identified, then the policies will simply reflect the need to consider potential cultural heritage and built heritage resources as part of the planning approval process.

Based upon our background work there are no obvious Cultural Heritage Landscapes that would need automatic protection; however, there are a number of areas such as shorelines, the Detroit

River Heritage Parkway, wine routes and important bird areas that may be appropriately identified as Cultural Heritage Landscapes.

- Will the County identify Significant Cultural Heritage Landscapes and Built Heritage Resources in order for the effective development of conservation policies?

3. Balancing Resources – mineral, aggregate and petroleum

The protection of minerals (including salt), petroleum and aggregates for long-term use is mandated by the PPS while a great deal of emphasis is also placed on electrical energy generation and supply. On this basis, we consider the development of renewable energy system in many instances to serve a greater long term public interest than resource extraction. However, a resource assessment could be undertaken by any proponent who proposes a renewable energy facility in an area having high resource potential. The assessment would consider the quality and quantity of the resource, the impact that the proposed facility will have on its potential extraction, and the importance of the resource to the local economy. Similar studies could be undertaken at the County wide level to identify what, if any, resources are of County significance for potential protection.

- Should the County permit renewable energy facilities that may reduce extraction opportunities on the basis that renewable power generation serves a greater long term public interest?

- Will the County undertake a review of the mineral, aggregate and petroleum resources that have significant importance to the County?

4. Additional Bird and Bat Analysis

The peer review undertaken by Dougan and Associates confirms that wind energy facilities do have potential impacts on birds and bats and that the County has significant areas of bird activity. The peer review did not identify standardized buffers or preferred development areas as this was outside of the terms of reference as defined in the Request For Proposal. Specific policies to reflect wildlife sensitivities will require additional study.

- Does the County want to develop specific policies regarding the impacts on birds and bats that may identify preferred areas of development or does it want to specify minimum information requirements for future applications that can best assess the particular merits/impacts of a proposal?

5. County Official Plan Amendment (OPA)

The level of County involvement regarding future applications for renewable energy facilities will depend on what amendments are required to the County Official Plan. Planning approvals outside of this document will make the County a commenting agency. The current state of the environment and Provincial Policy would suggest that a more permissive approach is appropriate. A county OPA for most renewable energy projects is likely considered onerous. However, a County OPA may be considered where a renewable energy facility is proposed in any of the following situations:

i. Significant wildlife habitat.

ii. Birding areas having County or Provincial significance.

iii. Specific mineral, aggregate or petroleum resources that are important for the economy of the County (an Ontario example would be the Milton Shale deposits).

iv. Site alteration in the Detroit River floodplain.

v. Large scale projects that will adversely impact or sterilize specialty crop lands or significant portions of prime agricultural lands.

It is Provincial Policy to prohibit site alteration in Provincially Significant Wetlands and the habitat of threatened or endangered species. Outside of these two areas and the five listed above, we expect that County concerns or issues could be adequately addressed during the local approval process.

- Should a County OPA be required for renewable energy facilities? If yes, then at what scale?

6. Monitoring

Monitoring is an important function to determine the effectiveness of land use policies and cumulative effects over a larger area.

- Should future land use impacts (if any) of renewable energy facilities be monitored by the County to allow for a more comprehensive assessment of potential cumulative impacts?

7. Development Permit Process

The development permit process may allow for the unique land use characteristics of renewable energy facilities to be better addressed through the planning approval process. The Development Permit approval process may be effective for dealing with the unique land use characteristics of wind energy facilities. The effectiveness of the development permit system has been proven in other jurisdictions outside of Ontario. The County may wish to enter into discussions with the Province to explore opportunities to utilize the development permit process.

- Should the County explore the use of Section 70(2) of the Planning Act that provides for planning approvals using the development permit process?

8. Expanded Circulation

An expanded circulation process to all stakeholders, including the First Nations, will make for a more transparent approval process and avoid the potential for future land use issues. Greater public knowledge regarding land use applications is always a benefit of ensuring that the interests of all stakeholders have been considered.

- Should an expanded circulation be considered, including the First Nations, for renewable energy planning applications?

9. Scales of Renewable Energy

As noted in Section 4.3 of this Paper, we have made recommendations for the scales of various renewable energy facilities.

- Does the County wish to develop land use policies using the scale definitions for wind, solar and biomass as proposed in this document?

10. Best Practices for Wind Planning

We have outlined our recommendations on Best Practices for wind planning. The incorporation of these best practices can be subject to feedback obtained as part of the public and stakeholder consultation process.

- Does the County support the principles of the best practices identified in Section 5.2.1.19 of this Paper?

11. Noise

As noted under the issues section of this Paper, noise impacts from wind turbine development is one of the most common concerns expressed by resident groups. Applicants should be made to demonstrate that they will meet the MOE requirements; however, given the sensitive nature of this issue, we also recommend that the expectations of the County be clearly articulated in future policies.

- With respect to noise, does the County want their future policies to require applicants to meet the MOE requirements only, or does the County wish to stipulate County specific requirements?

7.0 Conclusion

The purpose of this Background Research Paper was to identify and analyze matters concerning the development of wind power generation and options for renewable energy systems within the County of Essex.

A comprehensive research and analysis exercise has been undertaken to provide the foundation for the development of land use policies for the County and its member municipalities. This research included a summary of policy and regulatory best practices, a lexicon for renewable energy and wind power terminology, a base line for scales of facilities, identification of constraints and land use issues, a peer review of bird, bat and wildlife impact, a discussion on alternative energy sources and a summary of discussions with stakeholders and interest groups.

The County of Essex consists of seven municipalities which are each host to their own unique characteristics and history providing a strong distinctiveness for the County. From a County perspective, characteristics include an array of viable agricultural lands for diverse agri-operations, strong wind speeds, a consistent set of landscape characteristic units, significant shoreline areas and proximity to the US border.

The identification of land use issues was carried out and then further analyzed in a chart depicting the possible roles of the County and its member municipalities. The purpose of this chart is to stimulate discussion in order to help identify broad and local land use issues and appropriate policy responses.

As a summary to the Background Research Paper, a series of questions have been put forward whose answers, resulting from the Windpower and Renewable Energy Planning Study, will assist in the development of local and County policies.

The circulation of the Background Research Paper and its baseline information will encourage participation in the policy development process by all stakeholders and allow for more meaningful consultation. This consultation will be incorporated into the development of draft policies that seek to respond to emerging renewable energy land use issues in the County.

In summary, the County of Essex offers resources that continue to attract renewable energy facilities. While these facilities introduce new land use issues, they also serve as a means for the Province of Ontario to meet its energy demands.

Respectively Submitted,

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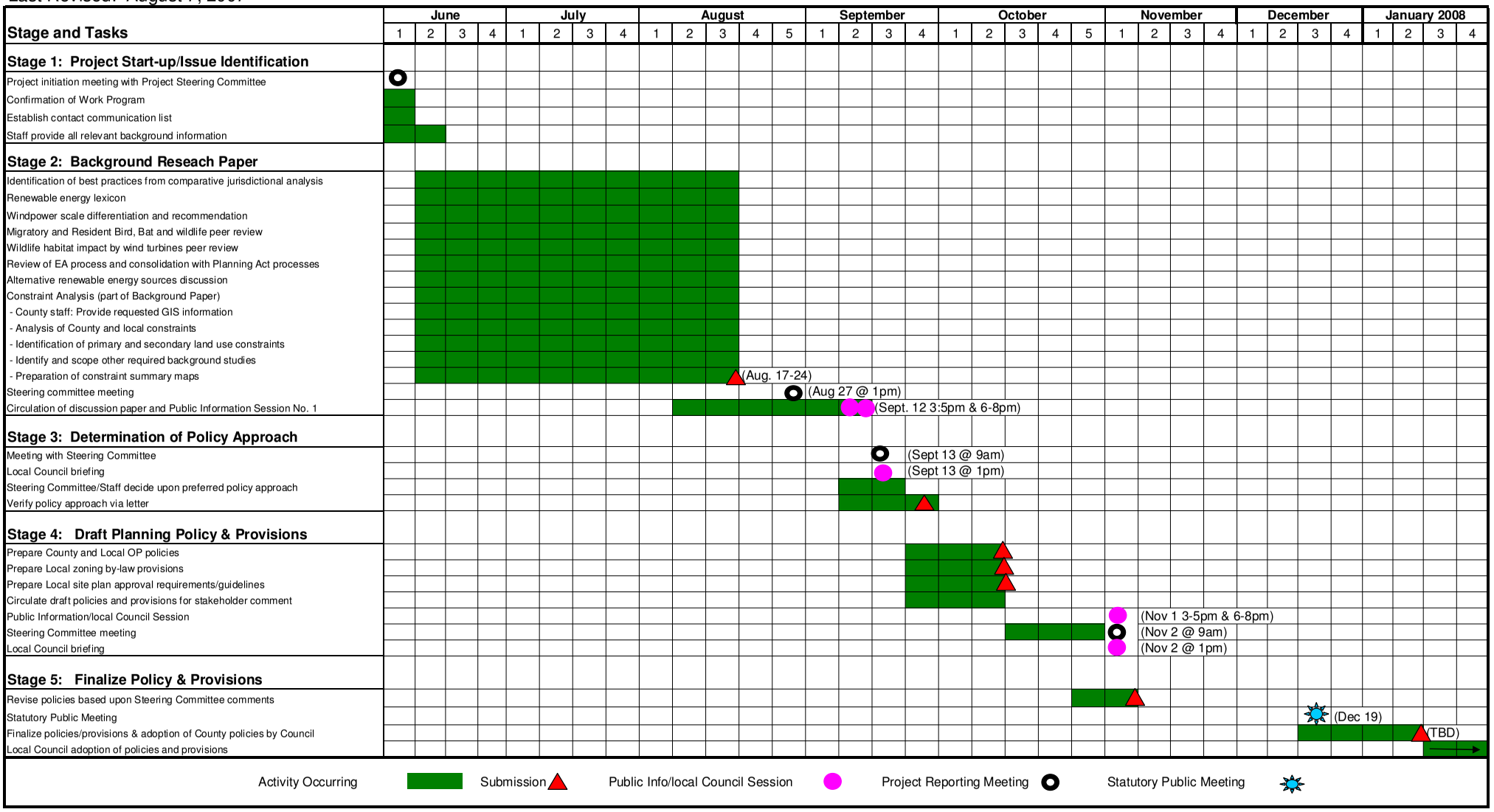
Appendix A

Work Plan B: County of Essex Wind Energy Review

Project Schedule: Essex County Windpower & Renewable Energy Planning Study

Last Revised: August 7, 2007



Notes:

1. Substantive changes to the Background Research Paper are considered extra work outside of this work program

Appendix B

Dougan and Associates Report:

Wind Turbines and Wildlife: A Literature Review

County of Essex

Windpower & Renewable Energy Planning Study

Wind Turbines & Wildlife: A Literature Review

August 17, 2007

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1 INTRODUCTION

As part of the Wind Power and Renewable Energy Study for Essex County being prepared by Jones Consulting Group Ltd., there is an interest in what effects wind turbine developments may have on the wildlife, in particular birds and bats, of the region. Therefore, Dougan and Associates, an ecological consulting services company, is participating by providing the following literature review of the interactions between wildlife and wind turbines; based on these findings, recommendations with regards to wind turbine developments will be made.

2 METHODOLOGY

A literature review of scientific papers, newspaper and magazine articles, and government documents was made in order to summarize what is known about the interaction between birds, bats, and other wildlife and wind turbines. A summary of the government documents that would be useful to any proponent of a wind farm development in Essex County is found in Appendix 1.

In addition, a number of local wildlife experts were interviewed to identify factors specific to Essex County that should be considered when developing County policy for wind turbine developments.

3 ESSEX COUNTY – A NATURAL HERITAGE CHARACTERIZATION

Essex County is located in extreme southwestern Ontario, adjacent to Michigan State to the west. It has limited topography, being mostly flat and intensively used for agriculture. It is bounded by water on three sides: Lake Erie to the south, the Detroit River to the west, and Lake St. Clair to the north. On the east, it is bordered by Chatham-Kent County, which is also dominated by limited topography and agricultural land uses. Essex County is in the Carolinian forest zone, and is approximately 5% forested, with many areas regenerating naturally as well as being artificially reforested. The major wetlands are concentrated along the shore of Lake Erie, and are largely comprised of marshes within Point Pelee National Park, Hillman Marsh, and the Big Creek/Holiday Beach Conservation Areas. Additional larger wetlands also occur along the southern shore of Lake St. Clair, although smaller ones are scattered throughout the County. Major urban centres are few, with Windsor being the largest in the northwest part of the County, plus Leamington in the southeast and, to a lesser degree, Amherstburg in the southwest.

Essex County has many natural areas that are of importance to birds, bats and other wildlife (see Figures 1 & 2). Many of these are protected to varying degrees within 18 conservation areas, six important bird areas (see Appendix 2), one national park, plus numerous Areas of National and Scientific Interest (ANSI). Many other miscellaneous municipal parks exist; some are very significant such as the Ojibway Prairie Nature Preserve in Windsor. Other natural areas and features attracting certain wildlife may have no official status, but are nonetheless utilized by birds and bats; These could include sewage lagoons (attracting waterfowl and shorebirds), landfill sites (gulls), ephemeral wet areas in agricultural fields (migrating shorebirds), and local lakeshore ridges (migrating raptors).

3.1 SPECIES-AT-RISK IN ESSEX COUNTY

Essex County has a number of wildlife species that have been designated as 'Species-at-Risk' (SAR) by the provincial and federal governments. These include 21 species of birds, three amphibians, 13 reptiles (five turtles, one skink, and seven snakes), three mammals, and one insect. Of the mammals, there are presently no species of bats that are considered at risk. These species are categorized in either of three levels, from most threatened to vulnerable to extirpation or extinction: Endangered, Threatened, and Special Concern. Any wind turbine development proposal would have to carefully assess the importance of a proposed site to any one of these species. In the guidance document for Environmental Assessments prepared by Environment Canada (CWS 2006a) (see Appendix 1), if a proposed site has any documented SARs present, then the sensitivity of the site is automatically considered very high site sensitivity, which leads to much higher efforts with regards to assessing and monitoring the potential effects of the development.

Appendix 3 lists all Species at Risk known to occur within Essex County, along with their associated Conservation Status.

3.2 COLONIAL BREEDERS AND CONCENTRATIONS OF MIGRANTS IN ESSEX COUNTY

The various guidance documents for environmental assessments (see Appendix 1) assign areas with high concentrations of birds, whether migrants, staging, wintering or breeding, a very high site sensitivity. Major concentrations occur in a number of discrete and well documented areas and features of the County; smaller, localized and sporadic concentrations may occur outside these focal areas. Concentration areas for the following groups need to be identified and assessed as part of siting studies:

i. Raptors – the south shore of Essex County, along the north shore of Lake Erie, concentrates raptors during their fall migration. The peak numbers occur in September and October and involve mainly Broad-winged Hawks, Red-shouldered Hawks, Red-tailed Hawks, Sharp-shinned Hawks, Northern Harriers, Turkey Vultures and American Kestrels. The following species are found in lesser numbers, but still significant with regards to their overall national and continental populations: Osprey, Bald Eagle, Golden Eagle, Cooper's Hawk, Northern Goshawk, Rough-legged Hawks, Peregrine Falcon and Merlin.

ii. Shorebirds – this group migrates mainly in May and early June, and again in the fall from August to October. They tend to concentrate in lakeshores and wetlands, but can also congregate in ephemeral wet areas in agricultural fields. Therefore, a proposed site in agricultural areas would need to be monitored for the presence of migrating shorebirds. Plovers (mainly Black-bellied, but also American Golden and Semipalmated) also migrate through Essex County, especially in late May, and tend to prefer open dry fields as opposed to wet areas.

iii. Waterfowl – many species of waterfowl migrate through or winter in Essex County. Most of the sites for concentration in spring and fall are wetlands, such as Hillman Marsh Conservation Area. Inland areas with ponds or sewage lagoons are also used for staging, as well as agricultural fields. One such example is Jack Miner Bird Sanctuary. A few thousand waterfowl

(mostly Canada Goose) are attracted to the agricultural fields present there (mostly in the fall) by corn that is specifically placed out for them. In winter, depending on the severity and the amount of ice cover, large numbers gather along the Lake Erie shoreline and the Detroit River. The south shore of Lake St. Clair is also an area of significant concentrations, especially in the fall.

iv. Colonial breeders – Double-crested Cormorant, Herring Gull, Ring-billed Gull, Common Tern, Great Blue Heron, and Black-crowned Night-Heron all breed colonially, usually with other species of colonial nesters. Therefore, particularly in lakeshore areas and wetlands, a proposed turbine development site should be monitored and assessed to see if any colonial nesters are breeding in the area, are using the site for foraging, or passing through the area between nesting and foraging areas.

3.3 BIRD MIGRATION IN ESSEX COUNTY

3.3.1 GENERAL MECHANISMS

3.3.1.1 NOCTURNAL MIGRATION

Many species of birds migrate at night. Night-time migration provides protection from day-time predators such as raptors, and less turbulent air conditions due to the absence of heating by the sun. Also, migration is a heavy physiological burden for birds and the cooler air at night reduces stress from over-heating.

Songbirds, including well known groups such as warblers, sparrows and flycatchers, migrate mostly at night. These migrants generally wait for appropriate weather conditions, which would be south winds for northward movement in the spring, and north winds for southward movement in the fall. When these conditions are present, they take off within half an hour of sunset, and fly for four to six hours. They fly generally at elevations from 150 metres up to 1500 metres, although poor weather will force them to fly lower. In early morning, they generally land in appropriate habitat and spend two days to a week feeding and storing energy for the next leg of their journey. Some nocturnal migrants will continue flying for the first few hours after sunrise, but will fly at much lower elevations (generally less than 75 metres) and follow visible topography such as lakeshores, rivers and landforms such as ridges.

3.3.1.2 DIURNAL MIGRATION

Many groups of birds migrate during day-time hours. Common groups include blackbirds, jays and crows, hummingbirds, most waterfowl, and raptors (hawks, falcons, eagles). Unlike nocturnal migrants that fly in broad fronts, these migrants tend to follow visual features, such as ridges and lakeshores. Also, they tend to fly much lower to the ground for safety. Raptors either use strong winds associated with fronts to follow the shorelines or, when winds are weaker such as during high pressure events, they use air thermals that form over fields, which raise the birds up high and then they slowly drift downwards towards the next thermal, where they start rising again. In this way, they use very little energy to travel great distances. Like nocturnal migrants, they will migrate north with south winds along warm fronts in the spring, and migrate south with north winds behind cold fronts in the fall. The migration can go on for most of the daylight hours for groups such as shorebirds and waterfowl as they do not require the thermals found only during the heat of the day. Raptors can move during most of the daylight hours as well - species that specialize in using thermals for

migration, such as Broad-winged Hawks and Turkey Vultures, generally migrate between approximately 10:00 a.m. and 5:00 p.m. when the thermals generated by daytime heating are strong enough to provide them with enough lift for effortless flight.

Most diurnal raptor species migrate over land only, but a few species such as the falcons (Peregrine Falcon, Merlin and American Kestrel), Osprey, Northern Harrier and Bald Eagle, will not hesitate to migrate over water. Their wings are not solely adapted for using thermals and air currents only found over land, which thereby enables them to fly over water without expending too much energy. Other diurnal migrants, such as waterfowl and shorebirds, will migrate over water. Diurnal songbird species, such as Blue Jay, will not migrate over water due to their greater vulnerability to predators there; over land they can more easily escape predators, such as hawks, by landing and hiding in cover.

3.3.2 ESSEX COUNTY

3.3.2.1 SPRING MIGRATION

Birds arrive from the south with southerly winds, starting in late February and continuing until mid-June. Of the almost 400 species of birds recorded in Essex County, over 200 species are either neo-tropical migrants or temperate migrants. With Lake Erie to the south, this provides a unique concentration of migrants along the north shore of Lake Erie, at sites such as Point Pelee National Park. With the habitat at Point Pelee, and its overall shape jutting 18 kilometres southward into the lake, it provides an island of concentrated shelter and food sources for tired migrants travelling across the lake. The surrounding agricultural fields, with very few resources for shelter and food, means that many migrants concentrate in the Park. During inclement weather, such as rain and fog associated with warm or cold fronts, migrant birds get disoriented during the night and try and find the closest land to settle upon. Therefore, a broad front of birds migrating north and otherwise aiming to land in inland areas of the County, or even flying over Essex County completely during one leg of migration, are concentrated under these inclement weather conditions and are forced to land along lakeshore areas of Essex County, such as Point Pelee. Therefore, during these 'fall-outs', tremendous numbers of migrants, especially nocturnally-travelling songbirds, can arrive at Point Pelee.

3.3.2.2 FALL MIGRATION

Fall migration is much more protracted than spring migration in Essex County. The first shorebirds and songbirds start moving through the region by early July, and some species of hawks migrate southward well into January. The birds move south with north winds following cold fronts, and either fly over Essex County during the night with favourable winds, or land within the County during the day to rest and feed.

One of the most significant facets of fall migration in Essex County is the migration of raptors. Large numbers of many species of raptors pass through, concentrated along lakeshore areas by northwesterly winds. The geography of the area causes this unique migration: broad fronts of hawks migrating south from further north reach Lake Ontario and Lake Erie. Hesitant to cross the lake, they begin moving west to try and go around the two continuous lakes. Therefore, hawks hitting the east side of Lake Ontario eventually move west and pass around the west end of Lake Erie. This means that the number of migrating hawks increases as one moves further west along the north shore of these two lakes. Holiday Beach Conservation Area, located on the north shore of Lake Erie in Essex County, at the extreme west end of Lake Erie, gets some of the highest counts of hawks in Canada, including

globally and nationally significant numbers of some species (IBAC 2004). Depending on the winds, large numbers of hawks pass though in areas away from the lake in Essex County. Lakeshore areas consistently have the highest number and concentration of raptors, however.

3.3.2.3 ESSEX COUNTY BIRDING YEAR

Less than 100 species of birds overwinter in Essex County, and most of these do so in small numbers. If water is open, numerous species of waterfowl will attempt to overwinter, such as Greater Scaup and Common Merganser. Areas that these waterfowl will overwinter, often in nationally or continentally significant numbers, occur along the shores of Lake Erie and along the Detroit River up to Lake St. Clair. Most of the agricultural areas of Essex County have no concentrations of wintering birds, and forested areas have a few songbirds and resident species. Gulls, such as Herring, Ring-billed and Great Black-backed, can overwinter in large numbers in Essex County, mostly in harbours, marinas, open rivers, and landfill sites.

Spring migration starts early in Essex County, with the arrival of Horned Larks in mid-February. Ring-billed Gulls, some waterfowl (e.g. Tundra Swans), some songbirds (e.g. American Robin and Red-winged Blackbird) and even some shorebirds (e.g. Killdeer) have usually arrived from the south by the end of February. In colder years, however, some of these migrants don't return in significant numbers until the middle of March. These early migrants are all temperate short-distance migrants, only migrating from their wintering range in southeastern North America. Therefore, with the first warm front in early spring, they only have to fly back a few hundred kilometres to reach Essex County. March is a month mainly for waterfowl migration, although a number of species of temperate landbirds, such as blackbirds, also migrate mainly in March. April and May are the busiest months for spring migrants, with most temperate and neo-tropical migrants arriving during this time. Shorebirds and many of the songbirds (e.g. warblers) migrate mostly in May, while raptors migrate through mostly from April to mid-May. Spring migration continues until mid-June, when the last of the northbound shorebirds, cuckoos, flycatchers and warblers pass through the region.

Breeding occurs in Essex County starting in January, when early breeders like Great Horned Owls start setting up territories and courting, right through to September, when species with multiple broods, such as American Robin, finish nesting. Most neotropical migrants don't start breeding until after their arrival in late May to early June. Many of these late migrants also finish breeding after only one brood. The majority of the population of neotropical species, such as Baltimore Oriole, Eastern Kingbird and Yellow Warbler, have essentially left the province by mid-August.

Fall migration is a much more protracted affair than spring migration, being spread out over almost seven months. The first southbound migrants arrive in Essex County by early July, only two weeks after the last of the northbound migrants. These early migrants include a few species of shorebirds, such as Least Sandpiper and Lesser Yellowlegs, plus a few warbler and flycatcher species. Fall migration begins in earnest in August, when large numbers of shorebirds and songbirds begin to move south through the region. September and October are the busiest migration months, with massive number of raptors, herons, waterfowl and landbirds migrating. During this time, thousands of songbirds can be found in lakeshore areas, and wetlands can be teeming with shorebirds. The skies overhead can be full of migrating raptors, looking to feed on the numerous shorebird and landbirds. By November, most of the landbird migrants are gone – only a few short distance temperate migrants remain – but gull and waterfowl numbers peak. A few shorebirds still remain, while a few raptor species actually peak in November, such as Golden Eagle. Fall migration continues well into early

December, with a few species, such as Rough-legged Hawk, migrating through the County in mid-January when winter storms hit more northerly parts of the province.

3.4 BAT MIGRATION IN ESSEX COUNTY

Only eight species of bats regularly occur in Essex County. None of these species are considered Species-at-Risk (i.e. Endangered, Threatened or Special Concern). The eight species are: Big Brown Bat, Little Brown Bat, Eastern Pipistrelle, Hoary Bat, Eastern Red Bat, Silver-haired Bat, Northern Long-eared Bat, and Eastern Small-footed Bat.

Big Brown Bat is largely sedentary, not moving more than 70 kilometres during the year. Hoary, Eastern Red and Silver-haired Bats are considered long distance migrants, moving from parts of Ontario to the north and east, through Essex County, and into the Ohio River valley and further south to Mexico. The other five species are considered local migrants, only moving within Essex County looking for overwintering sites (hibernacula).

In summer, these bats roost by day in buildings, rock crevices, under rocks, and in trees. In winter, they migrate south from their day roosts to hibernaculum sites in underground areas which are cool and humid, such as caves, abandoned mines and basements. They can hibernate alone or in clusters. August and September are the heaviest months for migration, and these bat species will also congregate at this time around potential overwintering sites. Females also form maternity or nursery colonies and roosts, where up to thousands of adult females and young can gather in one area, generally in summer and early fall.

3.5 PROVINCIAL POLICY IMPLICATIONS

The Provincial Policy Statement is issued under the authority of Section 3 of the Planning Act (MAH 2005). The most recent version came into effect on March 1, 2005. Section 3 of the Planning Act requires that decisions affecting planning matters "shall be consistent with" policy statements issued under the act. This applies to all levels of government, including Essex County.

According to Natural Heritage Section of the Provincial Policy Statement, subsection 2.1.4 states:

> *Development and site alteration shall not be permitted in:*
>
> - *significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E1;*
> - *significant woodlands south and east of the Canadian Shield2 ;*
> - *significant valleylands south and east of the Canadian Shield2;*
> - *significant wildlife habitat; and*
> - *significant areas of natural and scientific interest*
>
> *unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*

Essex County supports a variety of species, features, and conditions which merit consideration as candidate significant wildlife habitat as defined in the Significant Wildlife Habitat Technical Guide

(OMNR 2000). This includes amongst others, habitats that support Seasonal Concentrations of Animals. Those most likely to be affected by wind turbine developments include the following:

- Landbird migratory stopover areas
- Waterfowl stopover and staging areas
- Shorebird migratory stopover areas
- Migratory butterfly stopover areas
- Colonial bird nesting sites
- Waterfowl nesting areas
- Raptor winter feeding and roosting areas
- Bald Eagle winter feeding and roosting areas
- Bat hibernacula

As an example, Table Q-1 (Evaluation Criteria for Seasonal Concentration Habitats) of Appendix Q of the Significant Wildlife Habitat Technical Guide states with respect to landbird migratory stopover areas that, "Sites within 5 km of Lake Ontario and Lake Erie shoreline are most significant" as one of its guidelines for evaluation. While relatively few shoreline areas might eventually be determined to be Significant Wildlife Habitat in any given planning jurisdiction, the significance of these areas to migrating birds is of particular relevance to Essex County given its geography. The Wildlife Habitat Decision Support System (OMNR 2002) further speaks to the significance of these areas by stating:

> *Large natural areas with plenty of structure are very important to migrating birds. Therefore, development should be planned so that as much forest and undisturbed open habitat is maintained as possible. The area within 5 km of the Great Lakes (especially Ontario and Erie) is of great value to migrating birds. Planning authorities should try to maintain a continuous band of natural cover (forest and meadow lands) within 5 km of the Great Lakes.*

Figures 1 and 2 help illustrate the areas falling within 5 km of the shoreline. Although not specifically discussed in the Significant Wildlife Habitat Technical Guide, the shoreline of Lake St. Clair, a relatively large body of water also likely concentrates migratory wildlife species.

According to the Natural Heritage Reference Manual (OMNR 1999) which guides the implementation of the Provincial Policy Statement, "The identification and evaluation of significant wildlife habitat is a planning authority responsibility". Therefore the preparation of County policies to guide the development of wind turbine facilities is fully appropriate under the PPS and Planning Act.

4 IMPACTS OF WIND TURBINES ON WILDLIFE – LITERATURE REVIEW

4.1 BIRDS

Although many studies have been made regarding the interactions of birds and wind turbines, few of these have been science based and peer reviewed (Kingsley and Whittam 2005). As such, many findings have been contradictory, and most of these studies have taken place in Europe and the United States of America. European studies have been mostly looking at the indirect effects of wind

turbines, such as disturbance, displacement and habitat loss, while most of the U.S. studies have focused on direct effects, such as collisions with the turbines. Furthermore, most of these studies have involved land-based facilities, as opposed to offshore development projects.

Most studies have found that the number of fatalities at wind turbines is relatively low, especially in relation to other forms of bird mortality, such as those due to feral cats, window and building collisions, automobile collisions, and pesticides. For every 10,000 birds killed in the U.S. it is estimated that less than one of these is by wind turbines, compared to 5,500 by buildings and windows, 1000 by feral cats, 800 by high tension wires, 700 by vehicles, 700 by pesticides, and 250 by communication towers (Heintzelmen 2005). However, these numbers are perhaps lower than what actually occurs due to the fact that the estimates are based on found corpses – many corpses are never found or are removed by scavengers, meaning the number of dead birds is under-recorded. Also, the number of bird fatalities is still relatively low as the number of wind turbines is currently low; when the number of wind turbines starts to increase, then, assuming that the number of birds killed per turbine per year stays constant, the number of bird collisions will increase. It is estimated that the number of birds killed by cars in the U.S. is around 80 million per year, as opposed to only 33,000 per year by wind turbines (Kingsley and Whittam 2005). However, with the number of turbines increasing, it is estimated that as many as one to five million birds may be killed every year by turbines in the U.S. by 2025 (Mueller et al 2007).

Other estimates of fatalities found a rate of 2.3 birds killed per turbine per year in the U.S. outside of California (where the rates are higher, mostly due to the Altamont wind farm which is very large, poorly sited and uses out-moded technology) (Kingsley and Whittam 2005). A more recent study at the Maple Ridge wind project in New York State found 9.6 birds killed per turbine; based on survey data, it is estimated that 2000 birds were killed at the 195 turbine facility between June 17 and November 15, 2006 (Jain et al, 2007). In general, many studies have found that disturbance to birds is often more significant than the number of fatalities, especially with off-shore developments and wind farms in open, prairie habitat.

Birds are affected by wind farm developments in two main ways: directly or indirectly. Direct effects include being injured or killed by collision with the turbine blades, the turbine towers, guy wires, maintenance building, and other associated structures. Direct effects also include electrocution by the wind farm transmission lines, and dying from exhaustion from lighting-induced disorientation during migration. Indirect effects are caused by being displaced from an area due to habitat loss (loss of feeding, breeding or migratory habitat due to the construction, operation or decommissioning of a site) plus avoidance of an area due to noise, structures and human activity; leading to an increase in energy expenditure in order to circumnavigate the wind farm (Kingsley and Whittam 2005).

Research has found that, besides specific turbine design factors (e.g. height, lighting), three main general factors affect the number of bird fatalities at wind farm developments:

1. **The density of birds in the area** – the higher the density, the greater the number of fatalities, both for resident and migratory birds.
2. **Landscape features** – topographical features, such as ridges, steep slopes, and valleys increase the degree of interaction between birds and the landscape, especially for neotropical migrants and raptors.

3. **Poor weather conditions** – the number of nocturnal migrants colliding with the turbines increases in poor weather (e.g. rain and fog) and low visibility.

Therefore, important siting factors intended to decrease the number of birds colliding with the wind turbines and infrastructure would include locating them in areas of low bird density, and away from significant landscape features. Areas with a frequent number of days with low visibility, due to rain or fog, should also be avoided (Kingsley and Whittam 2005). The determination of appropriate impact avoidance strategies i.e. important wildlife areas that should be avoided altogether, buffered with setbacks, or treated through special design considerations, is discussed later in this report.

4.1.1 WATERBIRDS

This group includes birds that are associated with water, but not waterfowl and shorebirds (e.g. gulls and terns).

Gulls are reportedly more vulnerable to collisions with turbines as they often fly within the operating altitude range (Fairley 2007; Fox and Petersen 2006). Therefore, in Essex County, turbines should not be developed near gull and tern colonies on Lake Erie, or in areas where they congregate, including landfill sites, sewage lagoons, and agricultural fields.

One concern with setting up offshore facilities is how it may change sedimentation patterns, which may alter the prey species composition for waterbirds. Installations may also act as a barrier to seasonal and local migrations, resulting in disconnected ecological units (Kingsley and Whittam 2005). In contrast, the foundations of offshore turbines may act as barrier reefs, resulting in more food for birds. A decrease in human activities close to the turbines, such as fishing, may increase the amount of habitat and food available to birds (Kingsley and Whittam 2005). Other birds that breed in colonies, such as Great Blue Heron, may be susceptible to turbine collisions as they fly from their colonies to foraging locations. Therefore, any breeding colonies in Essex County should have adequate buffers placed around them based on site-specific studies as outlined in the Environment Canada Guidelines (CWS 2006; CWS 2006b), reflecting current scientific knowledge.

4.1.2 WATERFOWL

Most fatalities of waterfowl tend to involve dabbling ducks, such as Mallard, Northern Shoveler and Blue-winged Teal (Kingsley and Whittam 2005). Disturbance to waterfowl breeding, foraging and migrating, however, tends to be more of an issue than collisions. Many ducks have been found to avoid areas with turbines, especially in poor weather – they often avoid flying or landing within 100 metres of the turbines. This means that if the turbines were placed in or close to appropriate waterfowl habitat, then the waterfowl would avoid using this area. Also, at night ducks have been found to completely fly over or around wind turbine installations, rather than between them, which increases the energy that they have to expend to fly between two points (Fairley 2007). Similarly, studies at Confederation Bridge, between Prince Edward Island and New Brunswick, have shown that ducks avoid flying under the bridge (between the support structures) despite the fact that there is sufficient room to do so (Kingsley and Whittam 2005). A study at a wind turbine in a river valley in the Yukon Territory showed that waterfowl, including Trumpeter Swans, avoided flying close to the single turbine. Research suggests that the avoidance distance varies from species to species: in Europe, Pink-footed Geese would not forage within 100 metres of turbines, while Barnacle Geese foraged

within 25 metres (Fox and Petersen 2006). In Pickering, Ontario, Canada Geese foraged at the base of the single turbine located there (James and Coady 2003). In addition, Canada Geese and other waterfowl were noted feeding underneath and adjacent to a single wind turbine located at Exhibition Place, Toronto, Ontario (James and Coady 2003). At this location, many geese and associated waterfowl are very habituated to urban infrastructure and human activity – what effect this has on their avoidance of wind turbines is not known.

With the high concentrations of waterfowl found in Essex County in spring and fall migration, great care should be exercised in siting potential wind farms. Therefore, site-specific studies, as per existing Environment Canada guidelines (CWS 2006a; CWS 2006b), should be conducted near wetland areas and lakeshores (including rivers) to determine how wide buffers surrounding these areas should be to ensure impacts are avoided. Also, many species of waterfowl overwinter in significant numbers, especially along the Detroit River, so these areas should either be avoided or appropriate mitigation measures incorporated into the design and operation of the facility.

4.1.3 SHOREBIRDS

Very low mortality rates have been found so far for shorebirds (Kingsley and Whittam 2005), although this is probably partly due to the fact that very few wind farms have been built as yet in or near shorebird habitat. Purple Sandpipers were found not to be disturbed by the construction or operation of turbines on the east coast of the U.S., while other species of shorebirds were found to avoid the turbines (Kingsley and Whittam 2005). While there may be few collisions, if the turbines are in prime shorebird habitat then many species of shorebirds would not use these areas. Another significant adverse effect of wind farms on shorebirds may be that long lines of turbines may act as a barrier to seasonal movements of these birds both offshore and along the shoreline (Fox and Petersen 2006). As well, with respect to offshore developments, the presence of the wind turbines may potentially affect the sedimentation patterns in the area which in turn may adversely affect the shorebirds' food supply.

Significant concentrations of shorebirds pass through Essex County during spring and fall migration, typically in wetlands and along lakeshore areas. If possible turbine development within and adjacent to these areas should be avoided. At the very least, appropriately conducted monitoring studies (possibly spanning multiple years) should be carried out to determine if wind turbines need to be set back from or not constructed within and near these areas. In addition, many inland agricultural areas are used by congregations of migrating plovers (Black-bellied Plovers and American Golden-Plovers). These sites also need to be identified, and appropriate impact avoidance strategies identified (i.e. setbacks or operational approaches). Low numbers of shorebirds are present in Essex County in summer (breeding) and winter and should not represent an operational constraint.

4.1.4 DIURNAL RAPTORS

This group of birds has received the most research attention, with most of the research from the U.S. and Europe. The large site at Altamont, California, has had numerous studies. For example, over six seasons the 7000 turbines there were searched for carcasses, and of 183 dead birds found, 119 were raptors (Kingsley and Whittam 2005). These were mostly Red-tailed Hawk, American Kestrel, and Golden Eagle, and it was found that 55% were killed by collisions with the turbines, 8% electrocuted, 11% collided with power lines, and 26% were unknown (Kingley and Whittam 2005). The largest risk factors for the site were turbines at the end of a row, turbines within 500 metres of a canyon, and

turbines with a lattice-type tower (as opposed to a tubular design) (Kingsley and Whittam 2005).

One of the few studies originating within Canada involved a wind farm at McBride Lake, Alberta – a total of seven Swainson's Hawks were killed there in 2003 and 2004, of which all were young of the year or juveniles (Kingsley and Whittam 2005). This suggests that inexperience with wind turbines may lead to an increased incidence of collision.

In Tarifa, Spain, which is located at the edge of the Strait of Gibraltar, over 30,000 storks and raptors migrate through the area each fall. Most of the turbines there run parallel to the direction of migration, although some are perpendicular. In one year, 106 raptors were found dead, and all during days with excellent visibility (Kingsley and Whittam 2005). In another study there, only 2 birds were found dead in 14 months: only one Griffon Vulture, out of 45,000 observed, and one Short-toed Eagle, out of 2,500 observed (Kingsley and Whittam 2005). Therefore, the overall level of collisions detected were extremely low in relation to the number of birds migrating through the area.

Topography has been identified as the most important factor relating to raptor mortality. In California, one study looked at two sites, one along a high elevation ridgetop and the other in a lowland area – the ridgetop site had significantly higher mortality rates (Sagrillo 2003).

Overall, existing data suggest that younger birds, such as young of the year and juveniles, collide with turbines more frequently than adults (Kingsley and Whittam 2005). There also appears to be no correlation between the number of deaths and the velocity of the rotating blades.

Within Canada, Essex County has some of the most significant concentrations in fall of migrating raptors. This group has some of the highest collision rates with turbines of all non-songbirds (Kingsley and Whittam 2005); combined with their overall low reproductive rates and numerous other population pressures, this indicates that the impact of wind turbine developments on their populations could potentially be high. The raptor group also has a relatively high economic importance in Essex County due to its appeal within the tourism industry (T. Hince, pers. comm.). Therefore, wind turbine development proposals in the County need to investigate the potential effects that the development might have on the migrating diurnal raptors of the region. The flight paths of these birds can often be kilometres away from the lakeshore and can also be very unpredictable, depending on the prevalent weather conditions. Therefore, even inland developments warrant pre-assessment surveys and on-going monitoring programs to determine if the site development should proceed and, if so, mitigative measures required to minimize any adverse effects upon this group of birds.

To date, there is no collision data regarding the nocturnal counterpart of the owls, which are diurnal raptors. Most owl species in Essex County are resident or appear only in occasional winters. However, two species, the Long-eared Owl and Northern Saw-whet Owl, are highly migratory and migrate through the County every spring and fall. Lakeshore areas often receive very high concentrations of Northern Saw-whet Owl, particularly in the fall months of October and November.

4.1.5 LANDBIRDS

Migrating songbirds are the most commonly affected group of birds at most wind energy facilities; on average, more than 80% of all mortalities are of songbirds (Kingsley and Whittam 2005). Grassland

species with aerial courtship, such as Horned Larks and Bobolinks, may be especially vulnerable. In Nine Canyon, Washington State, Horned Larks represented 47% of all collision victims in 19 searches over one year at 37 turbines (Kingsley and Whittam 2005). Horned Lark is a common migrant and breeder in Essex County.

Songbirds do not seem to be overly disturbed by turbines while in their breeding habitats, as shown by a study in Vermont which found breeding birds nesting within 20 metres of the turbines. Some species (e.g. Swainson's Thrush), however, moved further into the forest when they were near turbines in clearings. In Altamont, California, the density of nests within 50 metres of the turbines was found to be less than 50% of that in other areas (Kingsley and Whittam 2005). The largest threat from the turbines is direct habitat destruction, habitat fragmentation, and disturbance. In open habitat, for example, many species avoid nesting near the turbines as raptors use the turbines as lookout perches (Kingsley and Whittam 2005); most new tower designs, however, do not provide adequate perches for raptors, which largely eliminates this problem.

4.1.6 HOW BIRDS ARE AFFECTED THROUGH THE YEAR

Breeding birds generally have lower collision rates than non-residents, such as migrants, due to a familiarity with the site (Kingsley and Whittam 2005); this is especially relevant during poor weather with low visibility. Bird productivity has mostly not been found to be negatively affected by wind facilities; at one site with 66 turbines, the productivity was found to be the same as in surrounding areas. However, productivity has been found to be lower at some sites due to habitat loss and disturbance from maintenance and construction staff.

4.1.7 BIRDS IN MIGRATION

The migration of birds mostly occurs during the spring and fall when they are moving between their breeding and wintering grounds. However, birds also show seasonal movements in winter, such as southerly movements after cold periods and due to food shortages (e.g. some owls and finches), and summer, such as the movements of young birds, failed breeders, and non-breeding adults. In general, migratory birds seem to be more susceptible to collisions than breeding or wintering birds. This would be partially due to unfamiliarity with a wind turbine area, but also because the birds are actively moving, and often in poor weather. At one turbine site along a mountain ridge, 71% of all carcasses were found during spring and fall migration (Kingsley and Whittam 2005). Turbines placed on ridges operate close to the altitude at which birds are migrating, therefore increasing the risk of collisions. Poor weather also lowers the altitude of migrating birds, potentially bringing them into the height range of the turbines.

Diurnal migrants, such as raptors, tend to follow visible landscape features, so placing turbines at these locations would increase the chance of a collision. Nocturnal migrants tend to fly lower over land than over water, so would also have a greater chance of hitting turbines built on ridges. Generally, most of the collisions documented with nocturnal songbirds were related to the height of the turbine, the lighting on and around the turbine, and the weather and visibility at the time.

4.1.8 STAGING AREAS FOR BIRDS

Many shorebirds and waterfowl concentrate in suitable habitat for resting and feeding between

migratory flights. These areas include lakes, marshes, flats, and estuaries – in Essex County, Hillman Marsh and Point Pelee National Park are two excellent staging areas. The birds often concentrate more if these staging areas are surrounded by inappropriate habitat, such as open areas devoid of vegetation or water. Some species, such as swans, tend to descend or ascend gradually when approaching or leaving these areas, so this means that they may be flying at altitudes prone to collisions with wind turbines over quite a long distance. Therefore, appropriate strategies (determined on the basis of site specific monitoring and available science) such as avoidance of turbine development in these areas, adequate setbacks, and operational procedures should be considered for proposed facilities around these staging areas within Essex County

4.1.9 WINTERING AREAS

In wintering areas, birds are generally less concentrated than during migration or, depending on the habitat, during the breeding season. However, if there are areas with high concentrations of wintering birds, such as raptors, this should be taken into consideration in the design and siting of a potential wind farm development. In the case of Lake Erie, most offshore areas are ice covered for months in the winter, which would decrease or eliminate any overwintering waterfowl and foraging waterbirds (e.g. gulls) in the region, thereby reducing interactions between birds and wind turbines.

The Short-eared Owl, which is a Species-at-Risk, overwinters in Essex County, often concentrated in prime habitat. This habitat includes agricultural fields that are left fallow, where groups of up to approximately 20 birds will congregate, along with diurnal raptors such as Northern Harrier and Rough-legged Hawk. The identification of these types of concentrations is most reliably identified through discussions with the expert birder community and Christmas Bird Count data (if available), then corroborated with site specific monitoring in critical seasons over several years,

4.1.10 FACTORS RELATED TO WIND TURBINE DESIGN AND CONFIGURATION

From the previous discussion, it is clear that the County contains well-documented bird concentration areas, primarily associated with the lakeshore, some rivers, wetlands and major concentrations of natural habitat, which need to be specifically avoided by new turbine farms, or where particular operational constraints will exist. The most current Environment Canada (Canadian Wildlife Service) and Ministry of Natural Resources guidelines address the study needs and considerations for these as well as less significant areas. The determination of adequate setbacks or buffers from these areas must be based on current scientific information relevant to the species known to utilize these areas, their reported pattern of use over an extended period of years, and factors which influence that use (such as weather events or conditions).

The inter-relationships between turbine facility placement, turbine design, various scales of landscape utilization by potentially affected biota, wildlife adaptation/adjustment to wind farms (as well as other changing land uses), and general or specific factors contributing to impacts, represent highly complex variables. The base scientific knowledge on particular biota, and understanding of impacts of turbine developments on these species and their habitats is growing over time, and the planning process therefore will need to be adaptive to both new information and technological advances. Similarly, wildlife migration and activity patterns are not static and are subject to unpredictable and occasionally catastrophic factors such as unusual weather events and climatic change; avoidance of impacts under every circumstance is probably unrealistic. Existing studies have shown that some

wildlife are adapting to the presence of turbine installations at certain stages of their annual breeding/migration cycles but may be vulnerable at other stages.

The following is a summary of some general knowledge on wind farm infrastructure.

Scale of facility – the larger the facility, in terms of both land area covered and the number of turbines, the higher the potential number of collisions. A small properly located windfarm will kill fewer birds than a large facility. However, a small poorly sited facility may kill more birds than a larger, well sited one (Kingsley and Whittam 2005). Therefore, a facility of a given size will kill more birds if it is poorly sited.

Tower dimension and turbine design – since the 1980s, rotor diameters, generator size and power, and tower heights have increased. The average height is now around 100 to 120 metres. Previous studies have shown that turbine heights under 150 metres should not have a significant effect on migrating birds, whether by avoidance of the tower or by collision with the tower. However, as more and more studies are being completed, results may end up showing the impact to be higher than first characterized. Tubular towers have been shown to result in lower mortalities than the lattice design as the latter encourages some birds to perch on them, which increases the chance of a collision with the rotating blades. The lattice design also provides more surface area for birds to collide with (Kingsley and Whittam 2005).

Turbine lighting – turbines must be lighted according to Transport Canada guidelines. Research has shown that flashing white lights, with a minimum intensity and minimum number of flashes per minute, have lower collision rates than solid or flashing red avoider lights. The number of collisions due to birds being attracted to lights is correlated with poor weather, the theory being that birds lose their usual visual cues in the low visibility, and therefore orientate themselves to the turbine lights (Kingsley and Whittam 2005).

Guy wires – some collisions occur between the birds and support wires of turbines. Therefore, few or no guy wires would be recommended to decrease mortality (Kingsley and Whittam 2005).

Blade Speed – birds often collide with the rotating blades, as opposed to the turbine tower, base, or other infrastructure (e.g. hydro wires). The reason for this is that the birds do not see the blade due to 'motion smear' (a decrease in visibility of moving objects). Birds have been shown to collide more with blades that are rotating faster; therefore, having blade speeds lowered by lowering the revolutions per minute of the turbine can decrease mortality. Other theories, such as painting the blades certain colours to decrease collisions, have not been tested (Kingsley and Whittam 2005).

Transmission wires – it is estimated that 174 million birds per year die in North America from colliding or landing on transmission wires (Kingsley and Whittam 2005). Therefore, putting the transmission wires underground would decrease this number at wind farms. Above ground wires should be spaced far enough apart so that large birds, such as raptors, cannot electrocute themselves by touching two wires at once.

Facility configuration – for inland sites, at least 200 metres should be left between turbines so that birds can move between them (Kingsley and Whittam 2005). For offshore sites, the spacing requirements are not known – research has suggested that turbines set up in long strings, as

opposed to clusters with large spaces between them, hinder the movement of birds (Fairley 2007; Fox and Petersen 2006).

Facility construction – construction of the site should avoid the breeding months (i.e. proponents need to demonstrate that the Migratory Birds Convention Act is not contravened). The number of roads and other infrastructure should be minimized. Once construction is finished, the number of staff required to run the site is minimal, so disturbance should be slight.

4.2 BATS

Overall, bats have been shown to collide more with turbines than birds do with turbines (Arnett 2005). The hypotheses of why bats collide with turbines are as follows (OMNR 2006b):

1. They are unable to visually or acoustically detect the moving blades.
2. They mistake the turbines for roosts (depending on the design of the turbine).
3. They are attracted to the sounds of turbines. However, one study found that the amount of ultrasonic noise (greater than 20 MHz, that is, beyond human hearing) below turbines was minimal. This infers that the turbines would not attract bats, nor interfere with their acoustical perception (Arnett 2005; Szewczak and Arnett 2006).
4. They are attracted to lit areas such as turbines because of an increase in insect activity. However, some studies have shown the rates of collisions to be similar between unlit and lit turbine facilities.
5. Wind farms are often built where insects tend to concentrate, amongst other examples, hilltops and ridges.
6. Open spaces created around turbine create foraging habitat for bats.
7. Corridors that are created for turbines help to funnel and concentrate bats.
8. Migrating bats don't echolocate, which increases their susceptibility to colliding with objects such as turbines.
9. The body mass of bats in the fall (i.e. pre-hibernation) is greater than the rest of the year, making them less maneuverable, thereby increasing the rate at which they collide with turbines.
10. The turbulence from a turbine creates a decompression zone around the turbine, which kills bats that enter them (Arnett 2005).

Bats, like birds, are affected by wind farm developments in two main ways: directly or indirectly. Direct effects include being injured or killed by collision with turbine blades, turbine towers, guy wires, maintenance buildings, and other associated structures. Indirect effects include being displaced from areas due to habitat loss, removal of feeding or migratory habitat due to construction, operation or decommissioning of a site, and avoidance of an area due to noise, structures and human activity near the wind farm.

Studies have shown that as many as 2000 or more bats have been killed by wind turbines in mountainous locations in West Virginia, in periods as short as six weeks (Arnett 2005). Long distance migrant bats, such as Hoary, Eastern Red and Silver-haired, made up over 80% of the mortalities. Short distance migrants, such as Little Brown and Small-footed Bats and Eastern Pipistrelle, along with sedentary species, such as Big Brown Bat, rarely collided with the wind turbines (OMNR 2006b). Another study in 2006 found that 24.5 bats per turbine were killed at the Maple Ridge wind

project in New York State. This was based on surveys around ten turbines so it was estimated that for the entire 195 turbine site 6000 bas were killed between June 17 and November 15 (Jain et al 2007). Most studies have found that the most frequent time of collisions was late summer, from mid-July to late September. This coincided with the peak migration periods for Hoary, Eastern Red and Silver-haired Bats. Both adults and juveniles were involved, with adults colliding more than sub-adults, and males slightly more than females. There were few collisions in spring when females were rearing their young.

i. Landscape – landscape plays a large role in determining the number of bat collisions. Turbines located along forested ridges have far more collisions than those found in open agricultural areas and grasslands. Clearings in forested ridges, created to build the turbines, had higher rates still. The number of bat collisions decreased as the distance between turbines and the edges of forests increased; at least 100 metres should exist between the edge of the forest and the turbine to decrease the number of collisions. Bat activity has been shown to be lowest in open flat areas, at least 500 metres from water and riparian habitats and forest. Therefore, to minimize bat collisions, wind turbines should be located away from ridges, in flat open areas, at least 500 metres away from water and forests (Arnett 2005).

ii. Weather – weather does not seem to play as large a role in determining the number of collision for bats as it does in birds. The changes in the number of collisions between bats and turbines from night to night does seem to have some correlation with weather, and possibly lunar phase (Arnett 2005). Some studies have shown that the number of bat collisions was the same before, during, and after weather fronts. Just as many bats were also killed on windless nights as windy nights. The timing of bat mortality seems to be clustered around when they are most active – within two hours of sunset and in the hour before sunrise.

iii. Facility size – unlike birds, an increase in the number of turbines does not correlate with an increase in mortality, at least on a per turbine basis. A small wind farm in an area of high bat activity will kill more bats than a large facility in an area of low activity. Large facilities, however, will remove more bat habitat (Arnett 2005).

iv. Tower height – there is currently no published information with regards to the effect of turbine height on bat mortality.

v. Blade speed – this may not be as important with regards to bat mortality as it is in birds; one study showed that the non-operational turbines (that is, the blades were not moving) killed as many bats as the operational ones, indicating that blade velocity was not a major factor (OMNR 2006b).

vi. Turbine lighting – several studies have shown that there was no relationship between the type of turbine lighting and the number of bat collisions (Arnett 2005).

It is important to assess and monitor bat activities around proposed turbine sites. This would include searching for roosts and monitoring their echolocations, as well as using radar. Most species of bats can be separated by their echolocations to determine what species are using the site. Roost inventories also need to be conducted to determine where night roosts, day roosts, maternity roost and hibernacula are. Ground surveys and interviews could also be used to find bat roosts.

A recent Ontario Ministry of Natural Resources working group found the following risk factors as related to wind turbine site sensitivities for bats (OMNR 2007):

- Very high risk – if a site is within 10 kilometres from known significant hibernacula or swarming site, or maternal roost site (the significance of these is determined by using the Significant Wildlife Habitat Technical Guide (OMNR 2000) and contacting local Ministry of Natural Resources staff); if any Species-at-Risk bats are present at site (none in Ontario at present, but perhaps in future)

- High risk – if a site is less than 10 kilometres from coastlines of Great Lakes and other large water bodies

- Medium risk - if a site has potential significant hibernacula sites, such as mining caves, limestone plains, bluffs or karst topography

- Low risk – if the landscape has level linear features (natural or otherwise) that may direct bat activity

The group also identified that sampling would be required at the maternal roosts or hibernacula to confirm or refute the importance of the site to bats. Acoustic monitoring of the site would be required using hardware to identify bats. The activity levels at potential concentration points in the landscape would have to be determined, and monitoring efforts should also be concentrated in the first three hours after sunset and the last hour of the night before sunrise.

4.3 OTHER WILDLIFE

Very little research has been done on the effects of wind turbine developments on other wildlife groups, such as mammals and amphibians. The most damaging impact on these groups would be habitat loss from the development: from construction of the site, as well as maintenance, operation, and decommissioning. Also, there would be disturbance to the wildlife by these same activities. Therefore, to minimize these effects, the habitats selected for wind turbines should not be in areas that are valuable to wildlife. The few studies that exist for other wildlife show that the animals are not unduly affected by turbine installations. In one study, infrared cameras were set up along an active game trail below seventeen turbines. During the fall months (September to November), camera footage showed that deer, moose, black bears and coyotes frequently traveled right below the turbines, and that the overall activity level in the area was normal (Wallin 2005). Although domesticated and thereby perhaps not comparable to wild ungulates, cattle, cows and other grazing animals have nonetheless been recorded feeding directly under and around wind turbines.

A study on ground squirrels in California (New Scientist 2006) showed that the increased noise right below the turbines affected their ability to communicate with each other – this resulted in the animals being much more agitated and ready to hide, which in turn adversely affected their ability to feed and socialize. The individuals closest to the wind farm were more likely to dash back to their burrows when they heard an alarm call and spent a greater proportion of their time searching for predators. This suggests that the noise from the turbine caused the ground squirrels to become more alert in an

effort to compensate for their decreased ability to communicate through sound.

One incident in Ireland highlighted the problems related to wind turbine infrastructure. A turbine built in a peat bog slid sideways into a nearby river, and it is estimated that, in the slide itself plus the associated habitat destruction, at least 50,000 fish and amphibians perished (Priesnitz 2007). The construction associated with wind turbines could certainly have adverse effects on snakes, Snapping Turtles and frogs if built near the wetlands found in Essex County.

5 OPINIONS OF LOCAL EXPERTS

A number of local people, with expertise in wildlife and their habitats in Essex County, were contacted as part of this study (Appendix 4). They are as follows:

Mr. Lyle Friesen – Songbird Biologist, Canadian Wildlife Service, Environment Canada

Mr. Jamie Stewart – Wildlife Biologist, Ontario Ministry of Natural Resources

Mr. Jon McCracken – Ontario Program Manager, Bird Studies Canada

Mr. Tom Hince – Professional Birder, Wheatley

Mr. Bob Hall-Brooks – President, Holiday Beach Migration Observatory

Mr. Phil Roberts – President, Essex County Field Naturalists Club

Mr. Dan Lebedyk – Biologist, Essex Region Conservation Authority

Mr. Todd Pepper – General Manager, Essex-Windsor Solid Waste Authority

Mr. Dan Rieve - Manager Resource Conservation, Point Pelee National Park of Canada

Mr. Paul Pratt – Naturalist, Ojibway Park, City of Windsor

Mr. Allen Woodliffe – District Ecologist, Ontario Ministry of Natural Resources

Mr. Dave Martin – Professional Birder, Belmont

Of the 12 contacted, eight have replied to date (August 15, 2007).

As a group, the consensus of those who responded to date is that Essex County has some of the largest concentrations of birds found anywhere in Ontario, particularly during spring and fall migration. Of these birds, the most unique to Essex County, due to its geography, are the diurnal raptors, a group of birds that has also been found to be quite susceptible to fatalities due to wind turbine developments. Therefore, any proponents for wind turbine developments in Essex County would need to pay particular attention to the monitoring of diurnal migrant raptors in the proposed site, and also be prepared to consider all mitigative techniques to minimize raptor-turbine collisions

and disturbances.

The overall opinion is that there was little information with regards to the interactions between birds and other wildlife and wind turbine developments, especially in Essex County. Therefore, any proposed wind farm developments in Essex County should proceed by following all pre-assessment monitoring and accumulative effect monitoring as outlined in all relevant government documents (see Appendix 1). Also, since most wind farms are very unique with regards to their specific effects on local wildlife, additional studies and mitigative techniques may have to be undertaken. With few scientific studies to date in Essex County with respect to the effects of wind turbine developments on local wildlife, a conservative approach should be adopted.

A number of the respondents also addressed the value of wildlife, birds in particular, in Essex County with regards to ecotourism. The feeling was that wind turbine developments could, in certain areas, cause sufficient disturbance to local wildlife that they may be driven away. Bob Hall-Brooks gives the following example: thousands of hawk watchers and general tourists come to Holiday Beach Conservation Area each fall to witness the spectacle of thousands of hawks actively migrating overhead; there would be adverse economic impacts if these hawks no longer migrated through this area due to disturbance from future local wind farm developments. The same negative economic impact could be applied to Point Pelee National Park and surrounding areas during spring migration if there was wind farm development nearby.

See Appendix 5 for the detailed responses of those local experts who have responded to date.

6 RECOMMENDATIONS

6.1 SITE CONSIDERATIONS FOR WIND TURBINES IN ESSEX COUNTY

Considering the potential impact of wind turbines on birds, bats and other wildlife due to mortality, disturbance, and habitat loss, there are a number of areas in Essex County that need special attention with regards to planning, monitoring, and mitigative techniques. These areas, both onshore and offshore, are as follows:

1. All nationally, provincially, regionally and locally designated areas that support habitats or functions potentially impacted by wind turbine developments, such as national parks, provincial parks, conservation reserves, Areas of National and Scientific Interest (ANSIs), Important Bird Areas, conservation areas, etc.

2. Areas with significant natural habitat, such as woodlands, grasslands or wetlands.

3. Areas with shorelines or river corridors, in particular the Detroit River and the shorelines of Lake Erie and Lake St. Clair.

4. Any area that has Species-at-Risk present, whether bird, mammal, reptile, amphibian, or insect.

5. Any areas that concentrate breeding or migratory birds, including breeding bird colonies,

heronries, ephemeral wetlands in agricultural areas, sewage lagoons and landfills.

6. Areas that are corridors for migrating birds, in particular diurnal raptors. These areas are mostly close to the Lake Erie shoreline, but can also include inland areas and, in the spring, the shores of Lake St. Clair. This also includes areas that are used by birds as movement corridors between nesting, roosting and feeding habitats (e.g. between a nesting colony and the wetlands or lakes where the adult or young birds feed).

7. Any area identified as significant for roosting bats, or any other congregations of mammals, such as burrowing colonies.

8. Any area of higher topography that may be important as a concentration area for migrating birds and bats.

9. Any areas of water that have significant concentrations of waterbirds, such as waterfowl, whether wintering, migrating or breeding.

10. Any area that is acting as a buffer that surrounds the areas identified above.

Given the various types of potentially significant and sensitive habitats within Essex County, future County policies should reflect a hierarchy of these identified areas of concern with respect to wind turbine development and operation.

6.2 WIND TURBINE DESIGN AND CONFIGURATIONS FOR ESSEX COUNTY

1. Number of turbines – a smaller number of large turbines will do less damage than a larger number of small turbines.

2. Configuration – a compact cluster of turbines will remove less habitat and present a smaller barrier to birds than a linear configuration, particularly when the linear direction intercepts birds moving perpendicularly.

3. Relative height – turbine heights of less than 150 metres generally pose very little threat to nocturnal migrants because of their typical flight altitude; however, even turbines of less than 150 metres in height can pose a more significant threat if they are located in an area close to where nocturnal migrants arrive and depart from, or when weather conditions are poor.

4. Guy wires – the less guy wires, the less the bird and bat mortality.

5. Lights – only use where required by Transport Canada. Do not use steady burning lights as they attract birds. Use lights that have the shortest flash duration, that emit no light during the "off phase" (e.g. modern LED or strobe) and have the minimum number of flashes per minute. Change lighting colour and strobe pattern depending on weather and visibility.

6. Motion smear – the lower the motion smear of the moving turbine blades, the better. Therefore, slower rotation of the turbine is recommended. Use blade feathering or other devices to make rotating blades more visible.

7. Transmission lines – underground wires are recommended if the substrate allows for it. Although this may lead to more initial disturbance and habitat loss, the number of birds saved by having no overhead wires to collide with or be electrocuted by will offset this. If overhead wires are necessary, then place bird flappers or bird flight diverters to increase their visibility to birds, do not put the wires over water or other areas of high bird concentration, do not put lightning shields where the lines cross wetlands or migration routes, put lines as close to trees and below tree tops when possible, and prevent electrocution by putting enough space between conductors to prevent large birds from touching two phases at the same time.

8. Habitat loss – minimize the loss of habitat due to roads and power lines. Use constraint mapping to map where roads should and should not be located. Allow access roads no longer needed after construction to revegetate, and replant native species.

9. Industrial waste – dispose of all industrial wastes properly.

10. Decommissioning – remove any unused or unwanted turbines. Restore the site to the pre-project conditions, remove concrete bases and roads, and replace the soil and reseed areas with native species.

11. Disturbance during construction – minimize amount of construction necessary and perform construction as much outside of breeding season as possible. Limit use of personal vehicles at site and keep speed under 30 km/h.

12. Operational – shut down selected turbines during migration.

13. Location – avoid any area that correspond to "Very High" site sensitivity, as defined by Table 1 in Environment Canada's guidance document for environmental assessments (CWS 2006a).

6.3 ADDRESSING DATA GAPS

1. Request that the results of ongoing/future pre-assessment and monitoring studies in support of individual wind turbines or larger wind farms be compiled and maintained in such a way so that they are centrally located and easily accessible to county staff to facilitate:
    a. review of future proposals
    b. future updates to this document and revisions to policy

2. Help address information gaps with respect to documenting migratory patterns of birds and bats in Essex County by recommending that whenever possible, broader scale studies be conducted. For example, recommend surveys be conducted to document shorebird/waterfowl use in agricultural areas. Where appropriate, these studies could be incorporated into the conditions of approval. Responsibilities could also be shared between proponents and span multiple years.

3. Update to this document on a regular basis to ensure that new information is appropriately incorporated.

7 CONCLUSION

With its unique wildlife habitats and utilization patterns, Essex County clearly has many factors to consider when determining whether a proposed wind farm development will have an adverse effect on wildlife and their supporting habitats. Also, given the current levels of technologies available to the wind energy sector, there are many mitigative techniques available should a proposed wind farm development be shown to have potentially adverse effects on the environment. Therefore, it is important that for any proposed development, the steps outlined in the numerous government guidance documents be followed with regards to recommended wildlife pre-assessment and monitoring, turbine design, configuration and siting considerations, and mitigation techniques. Also, because little research has been done in Essex County to date on the interactions between wildlife and wind farms, and because each proposed wind turbine development presents a slightly different set of circumstances with regards to site specific effects on wildlife and wildlife habitat, all development should proceed with caution and be sure to do sufficient monitoring to ensure that the adverse effects to the environment are minimized.

Finally, it should be noted that the understanding of the impacts of wind turbines on wildlife is continuously evolving, as well as turbine technology and mitigative techniques. Therefore, this document should be periodically updated to incorporate these changes.

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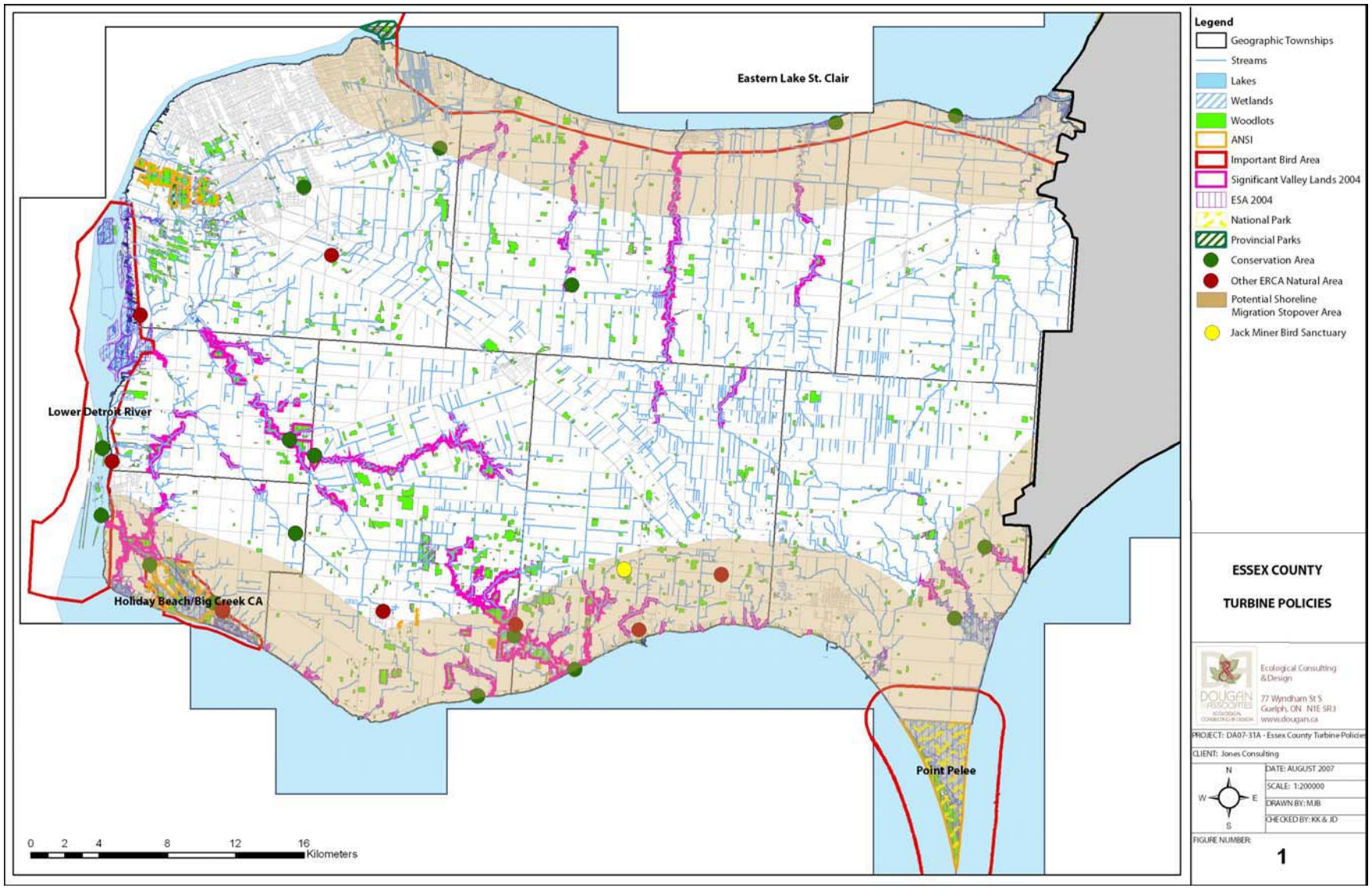
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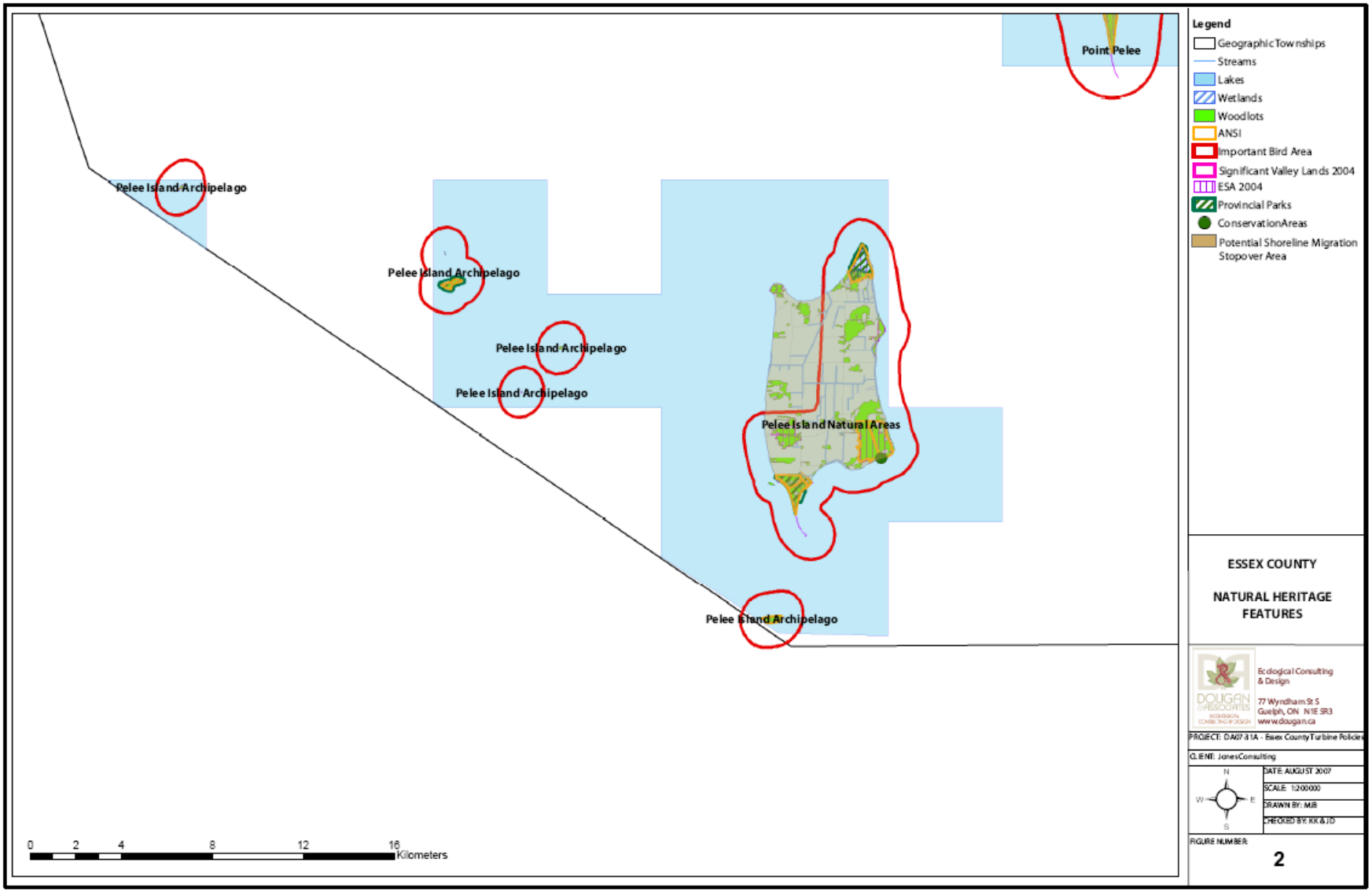
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APPENDIX 1 - Relevant documents for proponents of wind turbine developments

The following five documents were prepared by the federal or provincial government for information, guidance, and direction with regards to environmental policies, requirements, and protocols with respect to wind turbine developments and their potential effects upon wildlife and their habitats.

1. **County of Essex Official Plan**

The purpose of the County of Essex Official Plan is to establish a broad policy framework from which to realize the County's long term planning strategy; the plan offers broad guidance and directive to the County with respect to land use planning matters. The plan can be found at the following website:

http://www.countyofessex.on.ca/countyservices/documents/CountyOfficialPlanFinalApprovedJuly192005-blackandwhite.pdf

The main features of the Official Plan that are relevant to proponents of a wind turbine development project with respect to wildlife are the following sections:

3.4 Natural Environment Areas – this section identifies the eight natural area types within Essex County. Any locations within Essex County that fall within these eight natural area types would have extra considerations for any proposed developments, including wind turbines.

Appendix 3 – this document displays the restrictions on developments for each of the eight natural area designations. It also discusses, for each natural area type, what items need to be addressed for either a full environmental impact assessment, a scoped environmental impact assessment, or a checklist type environmental impact assessment.

2. **Environmental Impact Statement Guidelines for Screening of Inland Wind Farms under the Canadian Environmental Assessment Act.** Produced by Natural Resources Canada and the Wind Power Production Incentive. 2003.
http://www.canren.gc.ca/app/filerepository/EE1AD3621A7047A68D990EE84D71169B.pdf

This document was produced to help proponents prepare an Environmental Impact Statement (EIS) for screening of inland wind farms under the Wind Power Production Incentive (WPPI) program. The financial incentives provided by WPPI for people to build wind farms triggers a federal environmental assessment under the Canadian Environmental Assessment Act (CEAA); therefore, an EIS is a stand alone document that provides the details of a proposed project and the existing environmental interaction between the two. This document provides guidance for the preparation of an EIS – the document does not provide guidance, however, for offshore wind farm developments.

The areas most relevant to environment effects in relation to wildlife are as follows:

Section 2.5 – states that any EIS must include the location of the project, with a map showing environmental features and natural areas.

Section 4.3 – states that for any EIS the environmental characteristics must be summarized, including fauna (4.3.2) and endangered species (4.3.3).

Section 5.2 – summarizes operation activities and their potential environmental effects (e.g. 5.2.1.4 – wildlife disturbance).

Section 5.6 – summarizes potential cumulative effects due to the wind farm development.

Section 5.7 – summarizes potential environmental impacts. In this section, Table 5-2 lists some impacts on birds, bats and other wildlife that are commonly caused by wind turbine development, such as tower construction. Table 5-3 summarizes some cumulative effects that a development can have on bird habitats and populations.

Appendix B – provides a list of 48 possible impacts and mitigation measures from existing environmental assessments. The appendix also lists 62 potential mitigative measures that can be implemented in the development.

3. **Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds.** Produced by Environment Canada – Canadian Wildlife Service. Final, July 28, 2006. http://www.canwea.ca/images/uploads/File/Resources/Government/Wind_Turbines_and_Birds_Monitoring_Protocols_FINAL.PDF

This document was produced to provide proponents of wind turbine developments with information on the types of protocols likely to be useful for baseline studies and follow-up monitoring at proposed wind turbine sites to evaluate impacts of turbines on birds. The document is to be used in conjunction with biologists from the Canadian Wildlife Service as each location is particular and the associated risk factors unique. Most of the protocols in the guide are useful for bats as well as for birds. The documents also summarizes the requirements of the field surveyors, the technology available for monitoring, and the reporting requirements (e.g. raw survey data must be put into a national standardized database, made by CWS and the Canadian Wind Energy Association).

The document also provides pre-construction sampling methods, post-construction follow-up study methodology, and descriptions of all survey techniques.

4. **Guideline to Assist Ministry of Natural Resources Staff in the Review of Wind Power Proposals – Potential Impacts to Birds and Bird Habitat. October, 2006.** Developed by Wildlife Section and Renewable Energy Section, Ontario Ministry of Natural Resources. http://www.mnr.gov.on.ca/mnr/ebr/wind_power/document.pdf

This document provides a brief overview of the review and approval process for proposed wind power developments. It gives a brief summary of potential impacts of wind power development on birds, and describes all federal and provincial legislations and their roles and responsibilities as it relates to birds and bird habitats. These include the Conservation Authorities Act, the Public Lands Act, the Fish

and Wildlife Conservation Act, the Crown Forest Sustainability Act, the Lakes and Rivers Improvement Act, the Planning Act, and the Endangered Species Act.

5. **Wind Turbines and Birds: A Guidance Document for Environmental Assessment. March 2006.** Prepared by Environment Canada. http://www.bape.gouv.qc.ca/sections/mandats/eole_matane/documents/DB15.pdf

This guide is to be used in conjunction with Canadian Wildlife Service biologists and Environmental Assessment experts to consider site-specific concerns. It details how to use best information available to determine the appropriate level of effort that is required to assess and monitor the potential effects of a wind turbine development, given the sensitivity of the relevant species and their habitats. The guide can also be used as a pre-assessment tool to identify site and design features that should be considered to minimize impacts of birds.

The guide uses a matrix approach based on site sensitivity and facility size to rank the proposed project into project categories that indicate the relative level of effort anticipated in determining and mitigating potential adverse effects to birds. The base information and follow-up requirements are identified for the four different project categories – the guide also provides information on assessing the cumulative effects of the development.

Appendix 2 – Important Bird Areas

Important Birds Areas (IBAs) are sites that provide essential habitat for one or more species of birds. There are approximately 10,000 of these sites worldwide, and 597 in Canada; Essex County has six (Point Pelee, Holiday Beach/Big Creek Conservation Areas, Lower Detroit River, Eastern Lake St. Clair, Pelee Island Natural Areas, and Pelee Island Archipelago – See Figures 1 & 2. IBAs include sites for breeding, wintering, and/or migrating birds. Their size varies, incorporating anywhere from a few hectares up to hundreds of square kilometres. Boundaries are approximate, reflecting natural variation. They may include both public and private lands, and be protected and/or unprotected.

To qualify as an IBA, sites must meet at least one of the following criteria:

- species of conservation concern (e.g. threatened and endangered species)
- restricted-range species (species vulnerable because they are not widely distributed)
- species that are vulnerable because their populations are concentrated in one general habitat type or biome
- species or groups of similar species (such as waterfowl or shorebirds) that are vulnerable because they occur at high densities due to their congregatory behaviour

Furthermore, Canadian IBAs can be classified as Globally, Continentally, or Nationally significant. For example, if an IBA has at least 1% of the entire (global) population of a species present, then it would be considered Globally significant. If at least 1% of the Canadian population is recorded at the site, then it would be considered Nationally significant. All six Essex County IBAs are of global significance.

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IBA Site Summary	Point Pelee Leamington, Ontario			
ON006	Latitude Longitude	41.9° N 82.5° W	Elevation Size	173 - 177 m 40.0 km²
Habitats: coniferous forest (temperate), freshwater marsh	**Land Use:** Nature conservation and research, Tourism/recreation		**Potential or ongoing Threats:** Erosion, Industrial pollution, Introduced species, Recreation/tourism	
IBA Criteria: Globally Significant: Waterfowl Concentrations, Migratory Landbird Concentrations, Nationally Significant: Threatened Species, Congregatory Species				
Conservation status: International Monarch Butterfly Reserve, National Park, Ramsar Site (Wetland of International Significance)				
IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français				

Site Description

Point Pelee National Park is located in southwestern Ontario near the town of Leamington. It is the most southerly mainland point in Canada, located on a sandspit that extends

approximately 17 km southward into Lake Erie.

The majority of the park is marsh (approximately 11 km^2) with deciduous forest being located on the higher sandy ground at the tip and along the west side of the peninsula. Within the drier areas, a variety of vegetative communities exist, all having been extensively modified by logging, housing, agriculture, and/or grazing prior to the establishment of the park. Of particular significance are the red cedar savannah and the hackberry forest communities which support several rare or threatened species of flora and fauna. Due to the parks southerly location a large number of provincially and nationally rare vascular plant species are present. Invasive plant species, however, are becoming an increasing problem and are out-competing many of these native species. Nationally threatened mammal species are also present, including the Eastern Mole and the reintroduced Southern Flying Squirrel.

Birds

Point Pelee National Park is most renowned for its concentrations of songbirds during both spring and fall migration. On some days the numbers of migrants are astounding. As an example, recent one-day peaks for several songbirds include: 5,000 Golden-crowned Kinglets, 3,000 Ruby-crowned Kinglets, 400 Yellow-rumped Warblers, 620 Nashville Warblers, 280 Chestnut-sided Warblers, and 1,400 Baltimore Oriole. It is likely that several million songbirds migrate through the Park each year.

Numerous nationally threatened species are also present during migration (Prothonotary Warbler - 11 reported from May 6 to 26, 1997; Hooded Warbler - 53 reported from April 20 to May 21, 1995; Louisiana Waterthrush - 12 reported from April 18 to May 11; and Henslow's Sparrow - 11 reported from April 20 to May 23, 1996). Henslow's Sparrow is also identified as a globally near-threatened species. In addition to concentrations of threatened migrating species, over a third of eastern Canada Yellow-breasted Chat population (as many as 32 pairs were reported in 1995) breed within the Park. Yellow-breasted Chats are identified as nationally vulnerable.

A number of waterbirds also occur at Point Pelee in significant numbers. At least two species (Red-breasted Mergansers, and Bonaparte's Gull) are regularly present in globally significant numbers during migration (i.e., greater than 1% of their populations), and over the last five years three additional species have occasionally been recorded in globally significant numbers (Common Tern, Forster's Tern, and Black Tern). Double-crested Cormorant have also occurred in nationally significant numbers with as many as 8,600 birds being recorded in September of 1995.

Summary of bird records available for Point Pelee
(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON006&seedet=Y to see all records)

Species	Season	Number	Unit	Date
American Wigeon	SM	3,300	I	1994
Baltimore Oriole	SM	1,400	I	1995
Bonaparte's Gull	FM	15,000 G	I	1992
Cerulean Warbler	SM	3	I	1995
Common Tern	SM	1,400 G	I	1994

Double-crested Cormorant (Interior)	FM	8,600 G	I	1995
Forster's Tern	SM	700 G	I	1994
Golden-crowned Kinglet	FM	5,000	I	1995
Great Black-backed Gull	FM	700	I	1994
Henslow's Sparrow	SM	6 - 16 N	I	1986 - 1997
Hooded Warbler	SM	14 - 53 N	I	1993 - 1997
Landbird Concentrations	SM			
Louisiana Waterthrush	SM	6 - 12 N	I	1994 - 1997
Olive-sided Flycatcher	FM	14	I	1996
Peregrine Falcon	FM	9 - 29	I	1992 - 1995
Prairie Warbler	SM	2 - 10 N	I	1993 - 1997
Prothonotary Warbler	SM	8 - 11 N	I	1993 - 1997
Red-breasted Merganser	FM	45,000 G	I	1992
Red-shouldered Hawk	FM	160 N	I	1993
Ruby-crowned Kinglet	FM	3,000	I	1995
Tundra Swan (Eastern)	SM	1,330 C	I	1996
Waterfowl	FM	45,000 G	I	1992
Yellow-breasted Chat (Eastern)	BR	10 - 32 N	P	1992 - 1995

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

Point Pelee was designated as a national park in 1918. It was the first to be created primarily on the merit of its biological value. In 1987, Point Pelee was designated as a Ramsar site because of its international importance as a staging area for waterfowl. It is also recognized as an international Monarch Butterfly Reserve.

The Point Pelee National Park Management Plan, last revised in 1995, outlines measures to maintain and enhance the ecological integrity of the park and identifies appropriate visitor-related use and facilities. Current conservation initiatives at the park include: the Red Cedar Savannah restoration project; White-Tailed deer population control; small mammal survey and monitoring; natural habitat restoration projects; organochlorine contaminant study; exotic plant management; and a groundwater quality study.

Human land use in southern Ontario and on Lake Erie has directly affected Point Pelee National Park. Prevailing westerly winds expose the park to airborne pollution from neighbouring industrial centres in the United States (Detroit, Toledo and Cleveland). Lake Erie's poor water quality, due to industrial, urban and agricultural pollution, has altered the ecology of the marsh at the Park. The marsh flora and fauna has also been altered by introduced species from the Lake. High Lake Erie water levels have eroded and breached the eastern barrier ridge. Consequently, increased turbidity and wave action in the open ponds has resulted in the break-up of cattail mats and the movement of floating sections. The park is also threatened by oil and toxic chemical spills because of its location along the Great Lakes shipping channel. Extensive land clearing in the greater park ecosystem has isolated the park from other natural areas.

IBA Site Summary	Holiday Beach / Big Creek CA Windsor, Ontario			
ON034	Latitude Longitude	42.04° N 83.04° W	Elevation Size	174 - 180 m 9.0 km²

Habitats:	Land Use:	Potential or ongoing Threats:
deciduous woods (temperate), scrub/shrub, freshwater lake, freshwater marsh	Nature conservation and research, Hunting, Tourism/recreation	Agricultural pollution/pesticides, Deforestation, Filling in of wetlands, Urban/industrial development

IBA Criteria: Globally Significant: Raptor Concentrations, Migratory Landbird Concentrations, Nationally Significant: Threatened Species, Congregatory Species

Conservation status: Conservation Area (provincial), IBA Conservation Plan written/being written

IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français

Site Description

Holiday Beach and Big Creek Marsh Conservation Area are located near the western tip of Lake Erie, just east of where the Detroit River empties into Lake Erie. Geographically, this site is located at the bottom-end of the migratory funnel created by the lower Great Lakes (Lake Huron, Lake Ontario, Lake Erie and Lake St. Clair). Birds migrating along the northern shore of Lake Erie have only a short flight across the Detroit River before they are then able to fan out in a broader southern movement. In addition, to acting as concentration site for raptors and other species, the site also includes a large shallow marsh with mostly open water that is interspersed by stands of cattails. It is the largest wetland in the immediate area, and has areas of swamp forest and thicket communities. Several islands and parts of the shoreline support moisture-tolerant forests and vegetation. The adjacent Holiday Beach Conservation Area (formerly a provincial park) contains drier Hackberry and oak dominated forest.

Birds

Casual observers have noted hawks at this site since the 1950s, with more systematic counts beginning in the 1970s. Since 1974, volunteer observers have worked towards full coverage during daylight hours throughout the fall migration period. Peak daily counts and highest ever annual totals for the more commonly observed hawks include: Turkey Vulture (daily 3,200, annual 19,645); Sharp-shinned Hawk (daily 2,130, annual 18,604); Broad-winged Hawk (daily 95,499, annual 110,221); and American Kestrel (daily 1,105, annual 5,747).

Each fall observers tally between 600,000 and 750,000 migrant birds of which 300,000 maybe Blue Jays. Peak daily counts for Blue Jays exceed 50,000, with a peak day in September 1994 of 65,400. Other daily peaks include Ruby-throated Hummingbird (200), Eastern Bluebird (825) and Great Egret (195). Annual totals are quite high for some species, such as American Goldfinch (25,000). During the breeding season of 2000, three to five pairs of Prothonotary Warblers (nationally endangered) were recorded at this site, up from the usual one pair.

Big Creek Marsh, and the adjacent waters of Lake Erie, occasionally support large numbers of staging waterfowl: Canvasback (850 October 1996); Redhead (1,275 October 1996), and Red-breasted Merganser (an astounding estimate of 195,000 in November 1992). Such large numbers of mergansers do not concentrate at this site on a regular basis.

Summary of bird records available for Holiday Beach / Big Creek CA

(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON034&seedet=Y to see all records)

Species	Season	Number	Unit	Date
American Kestrel	FM	1,105 - 5,747 N	I	1983 - 1996
Bald Eagle	BR	1	N	1985
Bald Eagle	FM	10 - 96	I	1983 - 1996
Black-capped Chickadee	FM	1,282	I	1993
Blue Jay	FM	65,400	I	1994
Broad-winged Hawk	FM	22,431 - 110,221 G	I	1983 - 1996
Canvasback	FM	850	I	1996
Chimney Swift	FM	243	I	1992
Cooper's Hawk	FM	227 - 1,083 N	I	1983 - 1996
Double-crested Cormorant (Interior)	FM	1,477	I	1995
Golden Eagle	FM	24 - 87	I	1983 - 1996
Great Blue Heron	BR		I	1980
Great Blue Heron	BR	100	N	1960
Great Egret	BR			1980
Great Egret	BR	1	I	1960
Great Egret	FM	195 N	I	1996
Killdeer	FM	1,775 N	I	1995
Landbird Concentrations	FM	65,400	I	1994
Lapland Longspur	FM	1,333	I	1993
Merlin	FM	10 - 121 G	I	1983 - 1996
Northern Goshawk	FM	17 - 78	I	1983 - 1996
Northern Harrier	FM	155 - 1,636 G	I	1983 - 1996
Osprey	FM	27 - 199	I	1983 - 1996
Peregrine Falcon	FM	11 - 83 G	I	1983 - 1996
Prothonotary Warbler	BR	1 N	P	1997
Purple Martin	FM	783	I	1996
Raptors	FM	110,221 G	I	1984
Red-breasted Merganser	FM	195,000 G	I	1992
Red-shouldered Hawk	FM	416 - 1,667 N	I	1983 - 1996
Red-tailed Hawk	FM	2,724 - 11,590 G	I	1983 - 1996
Redhead	FM	1,275	I	1996
Rough-legged Hawk	FM	71 - 315	I	1983 - 1996
Ruby-throated Hummingbird	FM	151	I	1996
Sandhill Crane	FM	23	I	1995
Sharp-shinned Hawk	FM	2,130 - 18,604 N	I	1983 - 1996
Snow Goose	FM	151	I	1996
Turkey Vulture	FM	3,200 - 19,645 N	I	1983 - 1996
Wading Birds (Herons, Cranes etc.)	BR	100	N	1960
Waterfowl	FM	195,000 G	I	1992

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

In general, there are no significant threats affecting the raptors that migrate through this site. However, the magnitude of this migratory movement does need to be recognized and land uses, such as the establishment of transmission or telecommunication towers, or airplane flight corridors, need to be avoided.

Holiday Beach and Big Creek Conservation Areas are run and owned by the Essex Region Conservation Authority. Much of the remaining marsh is a privately owned U.S. hunt club. Runoff entering the marsh from the adjacent agricultural areas is enriched with nutrients and possibly contaminated with pesticides and herbicides. This enrichment leads to increased phytoplankton growth, and this along with bottom-feeding Carp that stir up the mud, result in very turbid water conditions that limit light penetration and growth of macrophytes that sustain staging waterfowl.

IBA Site Summary	Lower Detroit River Windsor, Ontario			
ON047	Latitude Longitude	42.25° N 83.13° W	Elevation Size	174 m 155.0 km²

Habitats:	Land Use:	Potential or ongoing Threats:
rivers/streams, freshwater marsh	Tourism/recreation, Urban/industrial/transport	Industrial pollution, Oil slicks

IBA Criteria: Globally Significant: Congregatory Species, Waterfowl Concentrations, Colonial Waterbirds/Seabird Concentrations, Nationally Significant: Congregatory Species

Conservation status:

IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français

Site Description

The Detroit River is the section of the Great Lakes/St. Lawrence watershed joining Lake St. Clair from the north to Lake Erie on the south. The IBA extends from the north end of Fighting Island to the mouth of the river.

Fighting Island, with its gull and former tern colonies, lies in Canadian waters immediately downriver from Windsor. At the mouth, the river is about 6 km wide, and has several islands that range in size from over 20 km² (Grosse Isle), to less than 1 km² (numerous small islands created by dredging spoils from the shipping channel). The Detroit River freezes only occasionally; the strong current and thermal discharge from both Detroit and Windsor keep the river, or portions of it, open. In some winters, when Lake St. Clair and most of the St. Clair and Detroit Rivers freeze, exceptionally larger numbers of waterfowl will concentrate in the remaining areas of open water.

Birds

At least four species of birds are regularly present in significant numbers along the lower Detroit River: Ring-billed Gulls during the breeding season, and three species of waterfowl

(Canvasbacks, Redheads, and Common Mergansers) during the late fall and winter.

In 1990, the number of nesting Ring-billed Gulls on the north end of Fighting Island was 34,021 pairs. This may represent as much as 3.9% of the estimated North American breeding population, and as much as 5.6% of the estimated Canadian breeding population. The colony has grown quickly; no Ring-billed Gulls were recorded at this site in the late 1970s. Small numbers of Common Terns nest here (33 nests in 1995), although some years they are entirely absent.

For several decades, the Lower Detroit River has been identified as a significant late fall staging and wintering area. On average, more than 8,000 Canvasback (greater than 1% of the estimated North American population), and 7,000 Common Mergansers (greater than 1% of the estimated North American population) are recorded each year during the annual Christmas Bird Count centred on Rockwood, Michigan. Redheads are also occasionally recorded along the entire river in numbers that exceed the global threshold, with nationally and possibly continentally significant numbers occurring more regularly in specific sections (such as Crystal Bay on the Canadian side of the river). Other waterfowl species commonly observed on the river include: Greater Scaup, Lesser Scaup, Common Goldeneye, and Bufflehead.

Summary of bird records available for Lower Detroit River
(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON034&seedet=Y to see all records)

Species	Season	Number	Unit	Date
Canvasback	WI	918 - 14,003 G	I	1993 - 1997
Colonial Waterbirds/Seabirds	BR	34,021 G	N	1990
Common Merganser	WI	2,173	I	1993
Common Tern	BR	n/a - 159	N	1977 - 1995
Greater Scaup	WI	1,001	I	1997
Herring Gull	BR	48 - 195	N	1977 - 1999
Redhead	WI	1,005 - 9,011 N	I	1993 - 1997
Ring-billed Gull	BR	n/a - 34,021 G	N	1977 - 1990
Waterfowl	WI	17,015 C	I	1996

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

The cities of Windsor (Canadian side) and Detroit (American side), along with their associated suburbs and other smaller urban centres, lie on both sides of the Detroit River. The river itself is a busy shipping lane, with traffic occurring throughout most of the year and only a short stoppage during the winter months. Consequently, the river is subject to much pollution from the urban and industrial areas as well as risk of oil and other spills from the shipping traffic. The important wetland / wildlife values of the lower Detroit River are identified in the Detroit River Remedial Action Plan documents, and the Great Lakes Cleanup funds have been targeted for this area. In addition, the marshes at the mouth of the Canard River (which empties into the Detroit River) are identified in Ontario Eastern Habitat Joint Venture Implementation Plan as a Class II Priority Securement Site, to protect the value of the area to staging waterfowl. Disturbance at the Fighting Island Gull colony is

restricted mostly to off-shore boat traffic; access to the island is controlled strictly by the owners.

IBA Site Summary	Eastern Lake St. Clair Southwestern Ontario, Ontario			
ON012	Latitude Longitude	42.5° N 82.5° W	Elevation Size	174 - 176 m 924.0 km²
Habitats: deciduous woods (temperate), native grassland, freshwater lake, arable & cultivated lands	**Land Use:** Agriculture, Nature conservation and research, Fisheries/aquaculture, Hunting, Other, Tourism/recreation		**Potential or ongoing Threats:** Agricultural pollution/pesticides, Arable farming, Disturbance, Dykes/dam/barrages, Introduced species, Other environmental events, Recreation/tourism	
IBA Criteria: Globally Significant: Congregatory Species, Waterfowl Concentrations, Nationally Significant: Congregatory Species				
Conservation status: IBA Conservation Plan written/being written, National Wildlife Area (federal), Ramsar Site (Wetland of International Significance)				
IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français				

Site Description

Lake St. Clair, which forms part of the Great Lake system, is located in extreme southwestern Ontario to the north of the cities of Windsor and Detroit. The St. Clair River provides an inflow from Lake Huron to the north, and the Detroit River provides an outflow to Lake Erie to the south. The Eastern Lake St. Clair IBA encompasses the eastern shore, marshlands and agricultural fields from the Sydenham River at Wallaceburg to the mouth of the Thames River and the open waters of Lake St. Clair, south of the St. Clair River delta under Canadian jurisdiction. The large delta and the shallow nature of the lake result in extensive areas of marshland that is characterized by both submerged and emergent vegetation. Walpole Island, which is located within the St. Clair delta, contains some of the most significant tall grass prairie /oak savannah communities remaining in Canada.

Birds

Lake St. Clair is recognized as being one of the most significant staging areas for waterfowl in southern Ontario. During studies completed in the 1970s and early 1980s, it was estimated that peak totals of waterfowl were over 60,000 during spring migration, and over 150,000 during fall migration. The site was estimated to support 1,137,000 Canvasback and Redhead waterfowl-days, and as many as 5,123,000 dabbling duck waterfowl-days. (A waterfowl-day equals the number of ducks multiplied by the number of days present). The agricultural fields along the east shoreline also support large numbers of Black-bellied Plovers and American Golden Plovers during spring migration. As many as 5,000 Black-bellied Plovers have been reported, which could represent as much as 3.5% of the estimated North American population.

In addition to being significant as a staging area, the Lake St. Clair marshes also support

significant populations of breeding birds. One of the largest breeding concentrations of Black Terns in Ontario is present, along with over 3.5 % of the estimated North American Forster's Tern population. The largest known Canadian population of King Rails (nationally endangered) has been recorded, along with significant numbers of Least Bitterns (nationally vulnerable).

The prairie and oak savannah communities of Walpole Island also support threatened bird species, with the largest self-sustaining concentration of Northern Bobwhite (nationally endangered) being present. There are also historic nesting records of Henslow's Sparrows (nationally endangered), along with numerous other potential breeding records for nationally threatened species such as Acadian Flycatcher, Cerulean Warbler, Prothonotary Warbler, and Yellow-breasted Chat.

Summary of bird records available for East Lake St. Clair

(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON012&seedet=Y to see all records)

Species	Season	Number		Unit	Date
Acadian Flycatcher	BR	1	N	T	1986
American Coot	BR	29 - 200		I	1997 - 1998
Bald Eagle	BR	1		P	1995
Black Tern	BR	153	N	N	1991 - 1992
Black Tern	BR	75	N	P	1997 - 1998
Black-bellied Plover	SM	1,500 - 5,000	G	I	1993 - 1995
Black-crowned Night-Heron	BR	24		I	1997
Canada Goose	FM	672,000	G	D	1980
Canada Goose	SM	378,000	G	D	1980
Cerulean Warbler	BR	6		I	1995
Common Moorhen	BR	55		I	1997
Cooper's Hawk	BR	4		I	1995
Eastern Tufted Titmouse	BR	8		I	1995
Forster's Tern	BR	555	G	P	1991
Great Egret	FM	150	N	I	1997
Henslow's Sparrow	BR	1	N	P	1986
King Rail	BR	32	N	I	1997
Least Bittern	BR	13 - 75	N	I	1997 - 1998
Northern Bobwhite	RE	34	N	I	1995
Prothonotary Warbler	BR	2	N	I	1986
Redhead/Canvasback	FM	1,137,000		D	1980
Redhead/Canvasback	SM	227,000		D	1980
Sora	BR	17		I	1997
Tundra Swan (Eastern)	FM	11,500	G	D	1980
Tundra Swan (Eastern)	SM	135,000	G	D	1980
Virginia Rail	BR	26 - 100		I	1997 - 1998
Waterfowl	FM	7,050,500	G	D	1980
Waterfowl	SM	1,580,000	G	D	1980
Yellow-breasted Chat (Eastern)	BR	2	N	I	1986
Yellow-headed Blackbird	BR	15		P	1995

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

Although portions of this site are managed as protected areas (e.g., St. Clair and Bear Creek National Wildlife Areas, Tremblay Beach; Ruscom Shores Conservation Areas), there is still on-going loss and degradation of marsh habitat as a result of incremental land use change. A large proportion of the site is located within the Walpole Island First Nation Lands. Conservation of this site will require a lake-wide management system that is equitable for all users.

IBA Site Summary	Pelee Island Natural Areas Southwest Lake Erie, Ontario			
ON013	Latitude Longitude	41.8° N 82.62° W	Elevation Size	174 - 185 m 77.0 km²

Habitats:	Land Use:	Potential or ongoing Threats:
deciduous woods (temperate), savanna, freshwater marsh, coastal sand dunes & beaches, abandoned & fallow farmland/disturbed ground, unknown	Nature conservation and research, Hunting, Tourism/recreation, Urban/industrial/transport	Extraction industry, Other environmental events, Recreation/tourism, Urban/industrial development

IBA Criteria: Globally Significant: Migratory Landbird Concentrations, Nationally Significant: Threatened Species

Conservation status: Conservation Area (provincial), Nature Reserve (provincial)

IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français

Site Description

Pelee Island is the largest island in the western Lake Erie archipelago. It has an average frost-free period of 195 days longer than any other part of Ontario and most of Ohio. This climate allows for a growing season equivalent to that of West Virginia, which results in a mix of plant communities that are found nowhere else in Canada or in any of the adjacent U.S. states. Large areas of Chinquapin Oak alvar-savanna (a vegetation community of global significance) are located in many of the remaining natural areas. Other vegetative communities, such as the deciduous forests and marshes at Lighthouse Point and Fish Point Provincial Nature Reserves also support significant natural communities, with over 50 rare plant species being present. In addition to rare plants, numerous rare animals are also present including: the nationally endangered Lake Erie Water Snake and Blue Racer, nationally threatened Eastern Fox Snake, nationally vulnerable Smallmouth Salamander, and Grey Fox.

Birds

Pelee Island supports one of the largest concentrations of nesting Yellow-breasted Chats (nationally vulnerable) in eastern Canada. At least 10 to 20 nesting pairs are present on an annual basis. This estimate would represent about one-third of the eastern Canada population.

Pelee Island also supports large concentrations of songbirds during both the spring and fall

migrations, especially in the Fish Point and Lighthouse Point Nature Reserves. In addition to the more abundant species such as warblers and sparrows, several threatened species, such as Henslow's Sparrow (near threatened globally, nationally endangered), Prothonotary Warbler (nationally endangered), and Hooded Warblers (nationally threatened) are present. Both Prothonotary Warblers and Hooded Warblers have nested on the island but not in large numbers and not on a regular basis. Other common nesters in the islands natural areas include Red-bellied Woodpecker, Blue-gray Gnatcatcher, and Carolina Wren.

Several waterbird species often congregate in the marshes, on the sandbars, and in the waters off the island. Thousands of Double-crested Cormorants are regularly observed, along with various shorebird, gull, and heron species such as: Dunlin, Herring Gulls, Great Egrets, Great Blue Herons, and Black-crowned Night-Herons. Many of the herons, cormorants and gulls likely originate from the nesting colonies on the other small islands in the archipelago (Middle Island, East Sister Island, etc.). These nesting colonies have also been identified as IBAs. Formerly, a very large Black-crowned Night-Heron colony was located at Fish Point (900 pairs in 1971), but this colony appears to have shifted to Middle Island (to the south of Pelee Island) in 1980.

Summary of bird records available for Pelee Island Natural Areas
(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON013&seedet=Y to see all records)

Species	Season	Number	Unit	Date
Acadian Flycatcher	BR			
Black-crowned Night-Heron	BR	900 N	P	1971
Cerulean Warbler	SM			
Double-crested Cormorant (Interior)	BR	n/a - 25	N	1981 - 1992
Henslow's Sparrow	SM			
Hooded Warbler	SM			
King Rail	BR			
Landbird Concentrations	null			
Least Bittern	BR			
Loggerhead Shrike (Eastern)	SM			
Louisiana Waterthrush	BR			
Prothonotary Warbler	BR			
Red-headed Woodpecker	BR			
Red-shouldered Hawk	BR			
Wading Birds (Herons, Cranes etc.)	BR	900 N	P	1971
Yellow-breasted Chat (Eastern)	BR	4 - 20 N	P	1982 - 1996

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

The greatest threat to the Yellow-breasted Chat habitat is succession. In the later part of the 20th century, the number of island farmers has plummeted, while the size of farms have increased, resulting in the abandonment of many farmsteads and traditional farming practices (cattle grazing, widespread and small-scale burns etc.). Additionally, a significant portion of the Yellow-breasted Chat habitat remains unprotected and could be threatened by aggregate resource extraction.

IBA Site Summary	Pelee Island Archipelago Western Lake Erie Basin, Ontario			
ON014	Latitude Longitude	41.8° N 82.85° W	Elevation Size	175 - 180 m 24.0 km²

Habitats:	Land Use:	Potential or ongoing Threats:
deciduous woods (temperate), cliffs/rocky shores (inland), rocky flats & barrens	Nature conservation and research, Tourism/recreation	Disturbance, Recreation/tourism

IBA Criteria: Globally Significant: Congregatory Species, Continentally Significant: Congregatory Species, Nationally Significant: Congregatory Species, Colonial Waterbird/Seabird Concentrations, Wading Bird Concentrations

Conservation status: Nature Reserve (provincial)

IBA Main page | Map of Canadian IBA | Query the IBA database | Species Maps | IBA Criteria | Submit IBA checklist | Français

Site Description

The Pelee Archipelago is a series of limestone islands, in the western basin of Lake Erie. In the Canadian portion of the basin, the archipelago consists of six islands: Middle Sister, North Harbour, East Sister, Big Chicken, Hen, and Middle. Pelee Island, the largest in the archipelago, is not included in this IBA; specific sites on Pelee Island have been identified separately as IBAs.

All of the islands have a base of limestone bedrock and rocky shores. Middle Island, Middle Sister Island, and East Sister Island (the largest islands in the archipelago) have predominantly wooded interiors with forests of Hackberry and Black Maple. Middle Sister Island is probably the most natural and undisturbed of the islands in the archipelago. Over 40 nationally rare plant species have been record, and several of the plant communities have been identified as nationally significant (e.g., mature hackberry forest, hop tree dominated scrub community with blue ash). In addition, the entire population of the nationally endangered Lake Erie Water Snake is restricted to the archipelago.

Birds

The Pelee Island Archipelago supports one of the richest assemblages of nesting colonial birds in Lake Erie. At least 5 species are present in numbers of national significance, including more than 1% of the estimated northeast North American Double-crested Cormorant population, and greater than 1% of the estimated North American Herring Gull population. In particular, the heronry on East Sister Island, is significant with combined estimate of about 500 pairs of Great Blue Herons, Black-crowned Night-Herons and Great Egrets. It is one of the largest heronries in Canada, and the supports the largest population of nesting Great Egrets in Canada.

The islands in the archipelago are also thought to be significant as migratory bird stop-overs. Although detailed studies have not been completed, many have reported large concentrations of songbirds during spring migration. Given the location of the islands, it is likely that large numbers of migrants make use of them.

Summary of bird records available for Pelee Island Archipelago
(Click on http://www.bsc-eoc.org/iba/site.jsp?siteID=ON014&seedet=Y to see all records)

Species	Season	Number	Unit	Date
Black-crowned Night-Heron	BR	500 - 925	N	1980 - 1983
Black-crowned Night-Heron	BR	200	N	P 1997
Double-crested Cormorant (Interior)	BR	1,085	N	1988
Double-crested Cormorant (Interior)	BR	57 - 7,431	G	P 1976 - 1997
Great Blue Heron	BR	500 - 925	N	N 1980 - 1983
Great Blue Heron	BR	250 - 520	N	P 1981 - 1997
Great Egret	BR	68 - 141	N	N 1988 - 1991
Great Egret	BR	115	N	P 1997
Herring Gull	BR	438 - 3,822	G	P 1976 - 1997
Wading Birds (Herons, Cranes etc.)	BR	925	N	N 1983

Note: species shown in bold indicate that their population level (as estimated by the maximum number) exceeds at least one of the IBA thresholds (national, continental or global). The site may still not qualify for that level of IBA if the maximum number reflects an exceptional or historical occurence.

Conservation Issues

In general, the Pelee Island Archipelago is relatively well protected through its inaccessible location in the middle of western Lake Erie Basin. The potential for disturbance from recreational boaters exists and could be a serious threat if large numbers of people land on the island (e.g., for picnics on July 1st and 4th weekends). One of the Islands, East Sister, was purchased as a Provincial Nature Reserve in 1972. The Canadian Wildlife Service is involved in an on-going program to monitor the colonial waterbird populations on the archipelago. The Nature Conservancy of Canada and its partners purchased Middle Island in 1999, with Point Pelee National Park administering it.

APPENDIX 3 – Conservation status/occurrence information for wildlife 'Species at Risk' known to occur in Essex County.

A) **Insects**

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Monarch	*Danaus plexippus*	SC	SC	Common immigrant and seasonal colonist. Greatest concentrations occur along the north shore of Lake Erie in fall, especially Point Pelee N.P.

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

B) Mammals

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Eastern Mole	*Scalopus aquaticus*	SC	SC	Scattered throughout the county
2	Southern Flying Squirrel	*Glaucomys volans*	SC	SC	Known only from Point Pelee N.P. (reintroduced) and Cedar Creek area but many isolated woodlots have not been surveyed.
3	Grey Fox	*Urocyon cinereoargenteus*	THR	THR	Found on Pelee Island only, occasionally in Windsor area (individuals wandering across border from range within United States)

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

C) Amphibians

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Small-mouthed Salamander	*Ambystoma texanum*	END	END	Pelee Island only
2	Tiger Salamander	*Ambystoma tigrinum*	EXT	EXT	Previously only known from Point Pelee National Park
3	Northern Cricket Frog	*Acris crepitans*	END	END-R	Pelee Island only; probably extirpated

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

D) Reptiles

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Common Musk Turtle (Stinkpot)	*Sternotherus odoratus*	THR	THR	Since 1983, reported only from along Detroit River and Point Pelee N.P.
2	Spotted Turtle	*Clemmys guttata*	END	END	Reported previously from Pelee Island, Point Pelee N.P. and shorelines of Lake Erie and Lake St. Clair
3	Blanding's Turtle	*Emydoidea blandingii*	THR	THR	Almost exclusively associated with coastal wetlands and associated
4	Northern Map Turtle	*Graptemys geographica*	SC	SC	

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
5	Spiny Softshell	*Apalone spinifera*	THR	THR	
6	Five-lined Skink	*Eumeces fasciatus*	END (Carolinian population)	SC	Reported from Point Pelee and vicinity, north shore of Lake Erie and along Detroit River.
7	Blue Racer	*Coluber constrictor foxii*	END	END-R	Pelee Island only
8	Eastern Foxsnake	*Elaphe gloydi*	THR	THR	Mostly near shoreline marshes along Lake Erie and Detroit River, as well as within Lake Erie archipelago.
9	Eastern Milksnake	*Lampropeltis triangulum*	SC	SC	Mostly along north shore of Lake Erie, Detroit River and Pelee Island. However, may occur anywhere where suitable habitat exists.
10	Lake Erie Watersnake	*Nerodia sipedon insularum*	END	END-R	Pelee Is. & Lake Erie archipelago only
11	Queen Snake	*Regina septemvittata*	THR	THR	Associated with streams in extreme western parts of county only, very local
12	Butler's Gartersnake	*Thamnophis butleri*	THR	THR	Found in vicinity of Detroit River and Lake St. Clair shoreline only
13	Massasauga	*Sistrurus catenatus*	THR	THR	Ojibway Prairie only. Reported from Lake Erie shoreline prior to 1984.

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

E) Birds

i. The following species do not breed or winter in Essex County, but only migrate through. Also, they only occur in very low numbers when they do appear during migration. Therefore, they are not a high concern with regards to the assessment, monitoring and mitigation measures for sites that are being proposed or developed for wind farms.

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	American White Pelican	*Pelecanus erythrorhynchos*	NAR	END-R	Very rare spring and fall transient
2	Yellow Rail	*Coturnicops noveboracensis*	SC	SC	Very rare spring and fall transient
3	Piping Plover	*Charadrius melodus*	END	END-R	Very rare spring and fall transient
4	Red Knot	*Calidris canutus*	END	---	Rare spring and fall migrant near lakeshore
5	Ross's Gull	*Rhodostethia rosea*	THR	---	Extremely rare spring transient
6	Loggerhead Shrike	Lanius ludovicianus	END	END-R	Very rare spring and fall migrant
7	Kirtland's Warbler	Dendroica kirtlandii	END	END-R	Extremely rare spring transient
8	Cerulean warbler	Dendroica cerulea	SC	SC	Very rare spring and fall migrant
9	Henslow's Sparrow	Ammodramus henslowii	END	END-R	Very rare spring and fall migrant; extirpated as breeder

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

ii. The following species is extirpated from Essex County as a resident, although occasional wild birds may still be observed.

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Northern Bobwhite	*Colinus virginianus*	END	END	Breeds only in Walpole Island, outside of Essex County

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

iii. The following species do not breed in the County, but migrate through in numbers high enough to be of concern to wind turbine developments.

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Red-shouldered Hawk	*Buteo lineatus*	NAR	SC	Uncommon migrant in spring and fall, rare in winter;.
2	Golden Eagle	*Aquila chrysaetos*	NAR	END-R	Extremely rare spring migrant, uncommon fall migrant; migration generally peaks in late Oct and early Nov with up to 6 birds seen per day during excellent conditions along lakeshore concentration areas such as Holiday Beach Conservation Area.
3	Peregrine Falcon	*Falco peregrinus anatum*	THR	THR	Uncommon spring migrant, fairly common fall migrant especially in lakeshore migrant hotspots such as Holiday Beach Conservation Area and Point Pelee National Park.
4	Short-eared Owl	*Asio flammeus*	SC	SC	Very rare spring and fall migrant; winters in small numbers throughout the County in open fields.

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

iv. The following species breed within Essex County.

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
1	Least Bittern	*Ixobrychus exilis*	THR	THR	Rare migrant and uncommon breeder; marshes and wetlands
2	Bald Eagle	*Haliaeetus leucocephalus*	NAR	END-R (South of French R.)	Uncommon migrant and very local breeder; lakeshore areas and wetlands
3	King Rail	*Rallus elegans*	END	END-R	Extremely rare migrant and very local breeder; marshes
4	Black Tern	*Chlidonias niger*	NAR	SC	Rare breeder in wetlands; declining. Only confirmed breeding at Point Pelee National Park since 2001.
5	Barn Owl	*Tyto alba*	END	END	Extremely rare resident and breeder; agricultural areas
6	Common Nighthawk	*Chordeiles minor*	THR	---	Local breeder and common spring and fall migrant

#	Common Name	Scientific Name	Conservation Status*		
			National	Provincial	Local (Essex County)
7	Chimney Swift	*Chaetura pelagica*	THR	---	Local breeder and common spring and fall migrant
8	Red-headed Woodpecker	*Melanerpes erythrocephalus*	SC	SC	Uncommon migrant and local breeder throughout County; open areas with scattered trees
9	Acadian Flycatcher	*Empidonax virescens*	END	END	Rare migrant and very local breeder; valley bottoms
10	Prothonotary Warbler	*Protonotaria citrea*	END	END-R	Very rare migrant and local breeder; wetlands
11	Louisiana Waterthrush	*Seiurus motacilla*	SC	SC	Rare breeder and spring and fall migrant; valley bottoms and forested streambeds.
12	Hooded Warbler	*Wilsonia citrina*	THR	THR	Uncommon spring migrant and rare fall migrant, local breeder; mature deciduous forests.
13	Yellow-breasted Chat	*Icteria virens*	SC	SC	Rare migrant and local breeder; found in open fields with scattered brush.

* National and provincial conservation status based on COSEWIC (2007) and OMNR (2006). Local conservation status/occurrence information based on review of available information. Explanations of abbreviations follow final table.

Explanation of Abbreviations

National Conservation Status (COSEWIC, 2007)

EXT = Extirpated A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
END = Endangered A wildlife species facing imminent extirpation or extinction.
THR = Threatened A wildlife species likely to become endangered if limiting factors are not reversed.
SC = Special Concern A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
NAR = Not at Risk A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Provincial Conservation Status (OMNR, 2006)

EXT = Extirpated A species that no longer exists in the wild in Ontario but still occurs elsewhere.
END-R = Endangered (Regulated) A species facing imminent extinction or extirpation in Ontario which has been regulated under Ontario's Endangered Species Act (ESA).
END = Endangered (Not Regulated) A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.
THR = Threatened A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC = Special Concern (formerly Vulnerable) A species with characteristics that make it sensitive to human activities or natural events.
NAR = Not at Risk A species that has been evaluated and found to be not at risk.

References

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada. Web site: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.cfm [accessed 29 March 2007]

OMNR (Ontario Ministry of Natural Resources). 2006. Species at Risk in Ontario List. List issued June 30, 2006 by Ontario Ministry of Natural Resources Species at Risk Unit. http://www.mnr.gov.on.ca/mnr/speciesatrisk/status_list.html

APPENDIX 4 – Letter/Questionnaire e-mailed to local experts

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R3 • T 519.822.1609 • F 519.822.5389 • www.dougan.ca

July 10, 2007

Dear Sir/Madame,

As part of Essex County's Wind and Renewable Energy Study, Dougan and Associates is currently conducting a background literature review for the County regarding the possible impacts of wind turbine development on the wildlife – in particular birds and bats – of the region. By identifying these possible impacts, Essex County will be better able to plan appropriate by-laws and standards for wind turbine developments that will minimize or eliminate any adverse affects they will have upon native wildlife, including rare and endangered species.

As part of the background information review, we are contacting selected individuals who have expertise in the wildlife and habitats of Essex County and surrounding areas. Your name was suggested by Essex Region Conservation Authority staff. Please consider the following questions regarding wind turbine development in Essex County. You can send us your responses via email; otherwise, we will contact you by phone in the next couple of weeks. Thank you for your time and input.

1. What is your level of interest and expertise with regards to wind turbine developments, especially as they relate to impacts on wildlife?

2. Other than key natural areas in Essex County (e.g. Point Pelee National Park, Hillman Marsh Conservation Area, Holiday Beach Conservation Area) are there other areas that you consider important for breeding, migrating and wintering birds and bats? More specifically, we are interested in knowing about areas where birds and/or bats concentrate. Also of potential significance would be nesting areas for Species at Risk (e.g. Barn Owl).

3. In your opinion, what policy considerations for wind turbine development in Essex County are important from the standpoint of wildlife?

4. In general, are there wind turbine design characteristics (e.g. height, span, density, buffering) that you would consider important for developments within Essex County?

5. What location factors, such as habitat or proximity to bodies of water, do you consider important with regards to minimizing impacts on local wildlife when selecting sites for wind turbine development in Essex County?

6. Are you interested in further participation in the County's renewable energy policy process?

Please feel free to contact us if you have any questions, comments or concerns regarding this questionnaire.

Sincerely,

Karl Konze & Ian Richards
kkonze@dougan.ca ianrichards@cogeco.ca
(519) 822-1609 x 22 (905) 631-0740

APPENDIX 5 – Response from local experts

There is very little published information on bird and bat movements in Essex County. In an attempt to address this lack of local data a number of recognized local experts were consulted. A questionnaire (see Appendix 4) was circulated and responses were gathered by email reply or through telephone contact. Not all of the experts who were sent a questionnaire provided a response. For those that did, their responses are copied and/or described below. In the future, a special working session may be an effective and efficient way to access their expertise.

Todd R. Pepper
General Manager
Essex-Windsor Solid Waste Authority

Replied to questionnaire by email.

1. What is your level of interest and expertise with regards to wind turbine developments, especially as they relate to impacts on wildlife?

As General Manager of the Essex-Windsor Solid Waste Authority I have completed detailed investigations into a number of forms of alternative energy: wind turbines, including the potential for the installation of wind turbines at one or more of three open and closed landfill sites managed by the Authority; bio-fuel; energy-from waste; and energy from landfill gas. I have read a number of research papers on the potential impacts of wind turbines on wildlife, both pre and post installation of wind turbine farms. I have also been through three Environmental Assessments under the Environmental Assessment Act of Ontario where I participated in the "Natural Environmental Appraisal" and "Bird Hazard Assessment" components of those environmental assessment studies related to the sighting and development of landfill sites.

2. Other than key natural areas in Essex County (e.g. Point Pelee National Park, Hillman Marsh Conservation Area, Holiday Beach Conservation Area) are there other areas that you consider important for breeding, migrating and wintering birds and bats? More specifically, we are interested in knowing about areas where birds and/or bats concentrate. Also of potential significance would be nesting areas for Species at Risk (e.g. Barn Owl).

With over 15 years of observing bird migration patterns in Essex-Windsor, and with my membership and associations with the Friends of Point Pelee, Holiday Beach Migration Observatory, Essex County Field Naturalists, the Ontario Field Ornithologists, and the Ontario Breeding Bird Atlas, I have observed at least 3 major migratory bird patterns in Essex-Windsor. The first is the well known spring and fall migration pattern through the Municipality of Leamington, generally in a semi-circular pattern linking Point Pelee National Park, Hillman Marsh Conservation Area, Kopegaren Woods Conservation Area and easterly to the eastern limits of Essex County at Wheatley Harbour, Wheatley Provincial Park and the former Two Creeks Conservation Area. Observations in spring and fall in private woodlots and concession roads north of this area have resulted in few observations of migratory birds. Breeding birds identified in this area through the Ontario Breeding Bird Atlas work between 2001 and 2005, Atlas Squares 17LG76 and 77, are generally grassland or shrub to mid-canopy breeding species that should not be affected by the standard heights of wind turbines and their blades, if the turbines are reasonably spaced and set back from remnant woodlots

and hedgerows.

The second major migration pattern observed is along the Detroit River corridor including the Ojibway and Black Oak complexes, and along the north shore of Essex County (or the south shore of Lake St. Clair), including such locations as Ruscom Shores Conservation Area, Trembley Beach Conservation Area and the Lighthouse Cove area of the Town of Lakeshore. Not only is this a major corridor for passerine migration, but observations have included large flocks of thousands of shorebirds, particularly American Golden and Black-bellied Plovers moving along the north shore of Essex County through to the Thames River and Jeanette Creek drainage complexes in Chatham-Kent including areas around the St. Clair National Wildlife Refuge.

Finally, there is a little studied, but important fall migration route for owls, raptures and passerines along the north shore of Lake Erie. This migration route is generally south of the ridge of the former glacial Lake Whittlesey (County Road 34 through the Municipality of Leamington and Town of Kingsville to Ruthven). This route leads through to the well studied migration pattern at Holiday Beach Conservation Area over to the mouth of the Detroit River. Migration through the Municipality of Leamington and Town of Kingsville occurs up to the height of the ridge, and would be a concern for any wind turbines constructed south of this ridge.

Turkey vultures have been observed to migrate in fall at elevations generally consistent with the height of wind turbines and the length of their blades through most of the south half of Essex County. The slow and circular flight pattern of Turkey Vultures likely represents the largest potential for bird impacts with wind turbines through the southern half of the County. Fall raptor migration through the middle and north half of Essex County has been observed, but usually in kettles high above the height of standard wind turbines.

Barn Owl is an extirpated species in Essex County. There has been only one unconfirmed sighting of a Barn Owl in Essex County in my 15 years of birding in Essex-Windsor. The unconfirmed sighting was from a location south of the South Talbot Road and East of Walker Road in the former Township of Sandwich South. The bird was reported by a child to a parent, but could not be located by a number of professional and amateur ornithologists, including Paul Pratt, Phil Roberts, and myself after extensive searches.

3. In your opinion, what policy considerations for wind turbine development in Essex County are important from the standpoint of wildlife?

No wind turbine development should be permitted in the following three areas: the south-east portion of the Municipality of Leamington in the semi-circular pattern noted above; along the north shore of Lake Erie in a line running parallel with the ridge of the former glacial Lake Whittlesey to the Detroit River covering the Municipality of Leamington, Town of Kingsville, Town of Essex and Town of Amherstburg; and, within a set back from the south shore of Lake St. Clair that should be defined by an environmental assessment of bird migration patterns along that shore.

4. In general, are there wind turbine design characteristics (e.g. height, span, density, buffering) that you would consider important for developments within Essex County?

The studies I have read indicate that well placed wind turbines, reasonably set apart from each other, and at standard heights, blade lengths and rotation patterns have little impact on breeding bird species. The concern is with bird migration, when larger concentrations of species in flocks migrate at night.

5. What location factors, such as habitat or proximity to bodies of water, do you consider important with regards to minimizing impacts on local wildlife when selecting sites for wind turbine development in Essex County?

As noted in response to Questions 2 and 3, wind turbine development should not be permitted within what would probably be a 2 or 3 kilometre setback from the shores of Lake Erie, Lake St. Clair and the Detroit River. For the protection of breeding species in Essex County, wind turbine development should not be permitted adjacent to remnant woodlots, wetlands and hedgerows.

6. Are you interested in further participation in the County's renewable energy policy process?

If I can provide any further assistance in the renewable energy policy process, I would be pleased to participate.

Todd R. Pepper, MPA
General Manager
Essex-Windsor Solid Waste Authority

Dan Reive,
Manager Resource Conservation
Point Pelee National Park of Canada

Replied to questionnaire by email.

Sorry for the delay in response to the questionnaire. I don't know how much detail you want, but here are some short answers;

1. *Point Pelee National Park has a keen interest with respect to wind turbine developments' impacts on wildlife. Park staff have some expertise when it comes to knowledge of species, numbers, and timing of migrating, breeding, and wintering birds. Information on bats is sorely lacking. Identification of impacts to species is more difficult to quantify without considerable long term study.*

2. *Other areas considered important would be Lake Erie and Lake St. Clair shorelines, as these are geographic features that funnel wildlife to and from migration points (Point Pelee, Holiday Beach, Detroit River). Green corridors (woodlots, wide fencerows, links to protected areas) would also be considered important areas of wildlife concentrations.*

3. *Important policy considerations for wildlife would be the need for detailed study and environmental assessment during the site planning stage of potential wind farm proposals; investigation of specific turbine design characteristics that have been shown to reduce or virtually eliminate wildlife conflicts; and consideration of power-corp. funded natural habitat restoration initiatives distant from established windfarms to "draw" wildlife to less industrialized areas.*

4. *There is a continuing and successful effort in the turbine industry to design and produce turbines that reduce wildlife impact mortality. What is less well understood is the impact the built wind farm in general has on nearby wildlife habitat, e.g. changing migration pathways, disturbance to essential feeding, rearing, and foraging areas, etc.*

5. *Wind farms should be located in existing, highly disturbed, largely agricultural areas, far enough from human habitation to eliminate effects on sleep patterns, etc. The scientific literature identifies minimum distances for locating individual turbines from human habitation - it may be difficult to meet those minimums in the 21st century Essex County, except for areas in the northern Leamington/southeastern Lakeshore municipality, central Essex municipality, and around Tilbury in Essex-Kent counties.*

6. *Yes, Point Pelee is interested in further participation.*

Dan Reive,
Manager Resource Conservation
Point Pelee National Park of Canada
519.322.2365 Ext. 207

Dave Martin
Professional Birder
Belmont, Ontario

Replied to questionnaire by email.

1. What is your level of interest and expertise with regards to wind turbine developments, especially as they relate to impacts on wildlife?

My level of interest is high and my level of expertise is high. I have collected data for or am currently collecting data for 9 projects for 3 companies in Essex County. I am also working on 10 projects for 4 companies in Chatham-Kent and have worked on another 12 projects for 2 companies elsewhere in southern Ontario.

2. Other than key natural areas in Essex County (e.g. Point Pelee National Park, Hillman Marsh Conservation Area, Holiday Beach Conservation Area) are there other areas that you consider important for breeding, migrating and wintering birds and bats? More specifically, we are interested in knowing about areas where birds and/or bats concentrate. Also of potential significance would be nesting areas for Species at Risk (e.g. Barn Owl).

In the fall, diurnal migrants and raptors concentrate along the Lake Erie shoreline between Leamington and the Detroit River mouth. Most days the birds concentrate within a km or so of the shoreline. On days with north winds the concentrated mass is even closer to the lake because the birds drift down to the lake. At Harrow the concentration seems to split with some species continuing to move along the lake and others heading inland to go north of Holiday Beach. Generally, as one moves inland the density of birds decreases

dramatically. In work we did in the fall of 2005, the density of all fall migrants at Blytheswood was less than 10% of the density at Seacliffe, for example.

Large numbers of blackbirds concentrate at Stoney Point in the fall. The peak daily count was in the order of 75,000 birds coming or leaving from their roost site in Tremblay Beach marsh.

We have not encountered or heard of any areas for Barn Owl in Essex County. In our opinion there is not enough grassland habitat especially beside marsh to attract significant numbers of this species. There may be the odd one every few years or so, but we highly doubt there is a sustainable population.

A quick look at the Breeding Bird Atlas results shows that Essex County is not a high point for breeding birds of any sort, other than, perhaps gulls nesting on islands in the Detroit River and a few pairs of Bald Eagles. The marshes at Pelee and Holiday Beach should have much larger populations of bitterns, coots, moorhens, etc.

The only species for which there is significant populations at a Canadian level are likely Yellow-breasted Chat. When I wrote the IBA nominations for most of the sites in sw Ontario, I believe there may have been in the order of 20 to 30 pairs at Pelee and on Pelee Island. Both populations are more threatened by lack of or improper management of their habitat, even though substantial numbers are on so-called protected lands then they would ever be from wind turbines.

The other guild of species that may be important is gulls, terns and herons nesting on the Lake Erie Islands. I have no knowledge of their numbers.

We have not found any large concentrations of birds in winter at any of the Essex sites relative to other sites. Hawk concentrations, for example, were in the 10 to 20 hawks per 100 km range compared to 30/100 km on Hwy 401 compared to 75/100 km in west Middlesex, compared to 125/100km at the Haldimand raptor reserve, compared to a whopping 325 on Amherst and Wolfe Islands.

3. In your opinion, what policy considerations for wind turbine development in Essex County are important from the standpoint of wildlife?

The kinds of policy considerations are well laid out in the EC manuals related to wind turbines. From informal conversations with them I understand that they are asking that turbines be placed at least 50 metres from woodlots that are > 10 ha [in other words, no separation at woodlots < 10 ha.] I also understand that they are asking that turbines be placed at least 250 m from the Lake Erie shoreline. While their "buffer distances" may seem small, it is based on 1000s of studies that suggest that wind turbines are not a significant problem for birds, especially migrant birds. In general, CWS does not consider turbines to be a problem for birds.

The concerns about turbines related to wildlife are infinitesimal compared to so many other impacts that are well known and endlessly listed but here are some again: cats kill millions of birds; high rise buildings kill perhaps billions of birds per year; cars in Essex County will likely kill many more birds than 100s of turbines will; more birds will be killed flying into people's windows than will be killed by turbines; habitat loss, habitat degradation, habitat fragmentation will all cause more problems.

I would like you to suggest in your report that requiring people to drive more carefully, putting ribbons on their windows to distract birds, keeping their cats indoors will save immensely greater numbers of birds than trying to restrict turbines in Essex County.

4. In general, are there wind turbine design characteristics (e.g. height, span, density, buffering) that you would consider important for developments within Essex County?

Can't think of any.

5. What location factors, such as habitat or proximity to bodies of water, do you consider important with regards to minimizing impacts on local wildlife when selecting sites for wind turbine development in Essex County?

First of all, turbines have minimum impact on birds to start with. As mentioned above the size of buffers that CWS is suggesting may seem surprisingly small but are likely sufficient.

6. Are you interested in further participation in the County's renewable energy policy process?

Sure

Tom Hince
Professional Birder
Wheatley, Ontario

Replied to questionnaire by telephone.

Mr. Hince's main comment was that all key natural areas in Essex County should be avoided as far as wind turbine development is concerned. He emphasized that, with regards to wind turbine design characteristics, that all proposed developments sites are specific and that all factors of the development therefore would need to have specific designs to minimize their adverse effects on wildlife, especially migrating bats and birds. He also felt that, despite the fact that heavy bird migration can occur across the entire County, the south side of the County, especially along the Lake Erie shoreline, has more concentrated migration of birds, and is therefore more vulnerable with regards to wind turbine development. Raptors are in particular very vulnerable to wind turbine development in Essex County as there is a huge concentration of these birds in the fall (and to a lesser degree the spring along the south shore of Lake St. Clair): a significant proportion of the eastern North American population of some species of hawks (e.g. Broad-winged Hawk, Sharp-shinned Hawk) get funneled around the west end of Lake Erie and pass along the lakeshore of Essex County. Therefore, any wind turbine development close to the lakeshore would have to be mindful of this.

Mr. Hince would be interested in further participation in Essex County's renewable energy policy process.

Jon McCracken
Ontario Program Manager
Bird Studies Canada
Port Rowan, Ontario

Replied to questionnaire by telephone.

As far as key areas in Essex County for avoiding wind turbine development, Mr. McCracken felt that lakeshore areas, such as the shoreline of Lake Erie and the Detroit River, are very important. In addition, all riparian corridors, woodlots and wetlands should be avoided, and wind turbine development should be directed towards developed landscapes, such as agricultural and urbanized areas. Insofar as design characteristics, wind turbines should be lower in height so as not to interfere with migrant birds and bats, and they should be clustered geographically, as opposed to spread out over the landscape. All proposed wind turbine developments should focus on a long term planning perspective and take in to account the accumulative effects of the development. In addition to wind energy developments, Jon felt that solar power should be investigated.

Mr. McCracken would be interested in further participation in Essex County's renewable energy policy process.

Bob Hall-Brooks
President
Holiday Beach Migration Observatory

Replied to questionnaire by telephone.

Mr. Hall-Brooks felt that wind turbine developments need to avoid the lakeshore areas of Lake Erie due to the density of migrating raptors and waterfowl, particularly in fall migration. He felt the south shore of Lake St. Clair would be more appropriate as there are not nearly as many raptors in the area, although waterfowl are still numerous. Any wind turbine developments in inland areas need to avoid migration corridors – depending on specific weather in fall, diurnal raptor flights can essentially occur anywhere within the County, and at almost any altitude. Therefore, a proposed development site would need to do several years of migration monitoring to determine the concentration and flight characteristics of these migrating raptors, and avoid the area or design the turbine appropriately depending on the findings.

Mr. Hall-Brooks felt that in general, and in particular for Essex County, that more data and research is needed on the interactions between migrating raptors and wind turbines before any developments should be allowed to proceed. For Essex County, he wondered what the effects of wind turbines would be on rare nesting raptors such as the Bald Eagle (a Species-at-Risk) with only eight or nine pairs in the entire County: would young birds be more likely to collide with wind turbines?

Mr. Hall-Brooks would be interested in further participation in Essex County's renewable energy policy process.

Dan Lebedyk
Biologist
Essex Region Conservation Authority

Replied to questionnaire by telephone.

With regards to key natural areas in Essex County, Mr. Lebedyk felt that every piece of habitat in the County plays a role with respect to bird and bat migration. Therefore, migration corridors should be carefully identified, especially for diurnal raptors, and appropriate buffers against wind turbine development should be placed around them. The standardization of these buffers would have to be determined through monitoring at specific sites, and in general a conservation approach should be followed.

With regards to location factors, Mr. Lebedyk felt that there was no scientific data so far to determine how close to the lakeshore these wind turbine development should be without adverse effects on migrant birds and bats. For all siting considerations, wind turbine developments should be treated like any other development proposal, that is, judged on an individual basis. Only when the size and extent of the development is known will the monitoring and mitigative measures necessary be determined.

Mr. Lebedyk would be interested in further participation in Essex County's renewable energy policy process.

Phil Roberts
President
Essex County Field Naturalists Club

Replied to questionnaire by telephone.

Mr. Roberts felt that the southern portion of Essex County was more important with regards to concentrations of raptors and waterfowl during migration. This area also contains a larger concentration of provincially significant wetlands. He felt that habitat destruction should be looked at carefully, and that any turbines that were set up needed large buffers around them, even if not in environmentally sensitive areas. He also felt that more data was necessary, especially with relation to raptor migration corridors and young Bald Eagle movements (through satellite tracking). More studies using Doppler radar to track concentrations of Broad-winged Hawks in the fall is needed to determine their exact flight paths. Tundra Swans also move through Essex County and would be susceptible to wind turbines. Simultaneous monitoring between migratory observatories would be useful to ascertain the movements of certain bird groups, including landbirds (e.g. Blue Jays and American Crows). Finally, he felt that there was very little data in the County with regards to bat populations and movements.

Mr. Roberts would be interested in further participation in Essex County's renewable energy policy process.