

Wind Turbine Environmental Assessment

DRAFT SCREENING DOCUMENT

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TREC and Toronto Hydro

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1.0 INTRODUCTION

This report documents the assessment of the environmental effects of the proposed construction and operation of up to three wind turbines on the Toronto Waterfront. This assessment was conducted in accordance with the requirements of the *Canadian Environmental Assessment Act* (CEAA) and Regulations.

The report consists of eight sections:

Section 1.0 provides background on the environmental assessment and the wind turbine project

Section 2.0 provides the need and justification for the project as well as a description of alternative sites and technologies for the wind turbines were derived

Section 3.0 describes the activities associated with the project (project scope)

Section 4.0 describes the scope of the assessment

Section 5.0 describes the existing biophysical and socio-economic environment

Section 6.0 presents the assessment of environmental effects and proposed mitigation measures

Section 7.0 describes the consultation program that was undertaken and input received from interested parties

Section 8.0 presents the conclusions of the environmental assessment

1.1 Background

The North Toronto Green Community, a neighborhood-based environmental group, was formed in 1994 to promote environmentally sustainable communities. Three years later the North Toronto Green Community launched the Toronto Renewable Energy Co-operative (TREC) as a response to climate change and smog.

TREC's mission is to promote renewable energy through education, advocacy and project development. One of TREC's key objectives is to develop a project that will help raise the profile for forms of renewable energy generation that do not create the harmful emissions and waste associated with coal-fired and nuclear energy generation.

TREC received funding from the Toronto Atmospheric Fund for an initiative that involved community ownership of a renewable energy generation device. TREC subsequently developed a concept for a community-based wind turbine project.

In April 1999, TREC launched the TREC Wind Power Co-operative (WPC). The concept of this co-operative venture is that owners/members receive an energy rebate on their Toronto Hydro bills in return for purchasing an interest in the energy produced by the wind turbine. Toronto Hydro is now working in partnership with WPC on this initiative. The Toronto Hydro Board of Directors viewed this as an ideal initiative that would support their Green Energy Plan that identifies green power as an important component of Toronto Hydro's generation strategy.

1.2 Canadian Environmental Assessment Act

The proposed wind turbines are subject to the requirements of the *Canadian Environmental Assessment Act* (CEAA). This section provides a brief overview of CEAA and its application to this project.

CEAA is federal legislation that applies to certain initiatives involving federal lands, federal initiatives, federal funding and/or specified federal approvals. The purpose of CEAA is to ensure that federal decision-makers assess the potential environmental effects of a project early in the project development process, before irrevocable decisions are made. CEAA provides a systematic process for the identification of environmental effects of proposed projects. By identifying environmental effects before they occur, decision-makers are able to modify plans so that the effects can be minimised or eliminated.

Under CEAA, federal departments, certain federal agencies, and other prescribed bodies are called "federal authorities". The federal authority that proposes a project, or that may provide funding, land and/or specified approvals for the projects, is called a "responsible authority (RA).

Environment Canada has been identified as an RA for this project since it is considering the provision of funding to allow the project to proceed, as long as the environmental assessment under CEAA shows no significant environmental effects. As the RA, Environment Canada must ensure a screening is completed in accordance with the requirements of CEAA.

Section 16 (1) of CEAA requires that:

Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:

- (a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;*
- (b) the significance of the effects referred to in paragraph (a);*

- (c) comments from the public that are received in accordance with this Act and the regulations;*
- (d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and*
- (e) any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered.”*

After the screening has been completed, Environment Canada is required to make a decision about whether or not the project should proceed. If the project is not likely to cause significant adverse environmental effects, taking into account mitigation measures, Environment Canada may exercise any power or perform any duty or function that would permit the project to be carried out.

2.0 PROJECT DESCRIPTION

2.1 Overview of Project

The TREC WPC and Toronto Hydro have formed a joint venture to develop up to three utility scale wind turbines on City lands on the Toronto waterfront. Each wind turbine will generate approximately 1,400 megawatt-hours (MWhs) of emissions-free electricity. Each turbine will offset 1400 tonnes of carbon dioxide annually. The project will be capitalized on a 50/50 basis by both WPC and Toronto Hydro.

WPC's capital contribution will come from the sale of "turbine units" or interest to Toronto Hydro customers who will then become members of the TREC WPC. Members will receive an "energy credit" or rebate on their Toronto Hydro bills in return for purchasing a turbine unit or interest in the energy produced by the wind turbines. This energy credit may not be redeemed as cash, but rather will be used to offset the amount owing on the member's utility bill. The actual rebate that members receive will be based on the extent of their share holdings in relation to their share of the energy produced by the turbines in a given period (likely monthly).

Toronto Hydro will capitalize its share of the project out of its capital budget and will, in turn, own the other half of the energy generated by the wind turbines. This "green power" will be sold by Toronto Hydro to customers who choose this option and will form a part of the Utility's emerging pool of green power.

2.2 Need and Justification

When a decision had been made to initiate a renewable energy project, TREC made a decision to pursue a wind turbine project since it was the only low impact, cost effective, truly renewable, energy generation technology available for Toronto. Toronto's good wind regime, particularly along the waterfront, reinforced the suitability of this energy source.

World-wide, wind energy is the fastest growing form of energy generation, with annual growth rates in the past five years exceeding 25%. The United States, Europe and many other countries have implemented progressive policy initiatives intended to stimulate development of this emissions-free source of energy. Denmark now meets over 8% of its energy needs with wind energy. Germany has 3,900 MW of wind energy while Denmark has 1,800 MW, Spain has 1,200 MW, India has 1,100 MW and the United States has over 2000 MW of wind energy. In comparison, Canada has only 124 MW. Most of the Canadian wind energy is recently installed (1998 and 1999) and is located in the Province

of Quebec. Ontario has only a single utility scale wind turbine (600 kW) in a province with an appreciable wind energy resource.

WPC and Toronto Hydro's project is intended to profile the pollution reduction and employment generation possibilities of wind energy. In order to raise the profile of this technology, the proponents propose the installation of the wind turbines within the borders of Canada's largest and most visited city.

2.3 Alternatives

2.3.1 Alternative Locations

In order to identify potential locations for the wind turbines, WPC and Toronto Hydro applied a number of criteria to the City of Toronto. The City of Toronto was selected as the siting area since the City is the sole shareholder of Toronto Hydro. As a result of the application of these criteria, eleven sites were identified. These sites are predominantly located along the waterfront. Stakeholders identified additional sites for consideration. These sites were assessed through the application of the same criteria originally used by WPC and Toronto Hydro. A description of the results of the application of the criteria and the siting exercise is described in Appendix A the document entitled *Siting Windmills in Toronto: An Overview of Wind Resource Assessment Methodology*. The Toronto Renewable Energy Co-operative prepared this document for WPC and Toronto Hydro.

The following three locations are the subject of this Environmental Assessment under CEAA:

- § Lakefront lands located at the Ashbridges Bay Sewage Treatment Plant
- § Lakefront lands at Leslie and Unwin Streets owned by the TEDCO (a City of Toronto Agency)
- § Lakefront lands in southern Etobicoke located in the area of the R.L. Clark Filtration Plant

Figures 1 and 2 provide maps of these areas. A maximum of three wind turbines will be erected through this initiative. There may be more than one wind turbine located on the lands at the Ashbridges Bay Sewage Treatment Plant, but on the TEDCO and the R.L. Clark lands there would only be one at each location.

2.3.2 Alternative Technologies

There is a limited range of alternative technologies for utility scale wind turbines. This is the result of the constant evolution of the technology that has led to common designs. Table 1 summarizes the types of variables associated with existing wind turbine technologies.

There are no significant differences from an environmental perspective between technologies. Consequently, a competitive process (e.g. bids from suppliers) will be used to arrive at the most cost-effective solution.

Figure 1

Figure 2

Table 1: Alternative Wind Turbine Technologies

Variables	Types of Technologies
Type	The horizontal axis wind turbine completely dominates the utility scale wind turbine market
Size	Typical land-based utility scale wind turbines are in the 600 to 1,500 kW range. The average wind turbine is about 750 kW
Foundation	The foundation is usually poured concrete. Its size and shape is dictated by the size of the wind turbine and geotechnical considerations.
Tower	Tubular steel towers
Rotor	3- bladed rotor
Rotor Speed Control	Fixed or variable speed rotors
Gears	Geared and Gearless
Upwind/Downwind	Downwind is by far the most common
Generator	Standard high speed generator (geared) or custom low-speed ring generator (gearless)
Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines.

3.0 SCOPE OF PROJECT

CEAA requires the RA to define the scope of project that will be assessed. The “scope of project” refers to those components of the undertaking that will be assessed for environmental effects. The scope of project should include elements of the principal undertaking as well as any other physical work or activity that will be needed for the project to proceed. The scope of project includes construction, operation and decommissioning activities.

3.1 Project Construction Activities

In order to construct the proposed wind turbines, a series of activities will need to be undertaken. This environmental assessment considered the following construction activities as part of the project scope:

A. CONDUCT SURVEYS

Prior to initiating construction, a number of surveys will be required including, but not limited to, site survey, geotechnical survey and grid construction survey.

B. UNDERTAKE SITE PREPARATION

Site preparation activities will include preparing a point of access to the site (i.e. temporary road), preparation of the site (e.g. placement of temporary snow fencing), and the mobilization of construction equipment

C. COMMENCE EXCAVATION

Depending on the type of base to be constructed, some degree of excavation will be needed. The most significant amount of excavation will be associated with the construction of concrete foundations. Foundation holes will be excavated using a backhoe. Excavated materials will be disposed of in accordance with provincial regulatory requirements. Excavation will likely be completed in less than one day. Alternatively, piles may be driven depending on the geotechnical conditions. A concrete pad will be anchored on the piles.

D. CONSTRUCT FOUNDATION

Construction of the foundation involves building the forms for the foundation. The forms are usually built from wood and will be reused/disposed of in accordance with provincial regulatory requirements. The reinforced concrete foundation will be poured and will have a mounting ring attached. The foundation will then be left up to a week to cure. If the geological conditions dictate the use of reinforced piles will be used.

E. TRANSPORT TURBINE TO SITE

The wind turbine, including tower, will be brought on site by the supplier in sections on flatbed trucks.

F. CONSTRUCT TURBINE

A large crane will be brought on site. It will lift and bolt tower sections into place. The nacelle, which contains the gear box, generator and yawing mechanism, will then be placed onto the top of the tower. The next step will be to assemble or partially assemble the rotor (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place.

A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put it in place. It will take approximately 2 days to erect the turbine. The proposed turbines will be between 83 and 93 metres tall (depending on the model). The blade length will be approximately 25-27 metres while the diameter of the tower will be 3-4 metres.

G. INSTALL TRANSFORMER

A transformer, that will be approximately 1.5 cubic metres, will be sited within or proximal to the tower base. This transformer will have approximately a 30-year life span. The transformer will be connected to the power grid via a bus duct cabling arrangement.

H. CONNECT TURBINE TO POWER GRID

The trench for the power cables will be dug using heavy equipment. The trench will be 1.5 metres below the surface to carry the bus duct and associated power cables. The power cables will then be placed in the trench and the trench filled. The power cables will be installed at the turbine and connected with the grid. It is expected that the conduit would be placed in existing road allowance to the extent possible. This activity will take approximately 1 to 2 days.

I. CONDUCT COMMISSIONING

Prior to the start up of the wind turbine, a series of checks and tests will be carried out. This will include both static and dynamic tests to make sure the turbine is working within appropriate limits. Grid interconnection and unit synchronization will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades. The schedule for this activity will be subject to site and weather conditions.

J. UNDERTAKE SITE REMEDIATION AND DEMOBILIZATION

The site will be demobilized when the work is completed. Backfill will be placed over the base and the ground will be remedied with appropriate vegetation. Fencing will be removed, and any access points to the site will be remediated. It is expected that this will take approximately 2 days.

In some cases, these activities may be carried out concurrently to optimize scheduling of equipment.

3.2 Project Operation Activities

The following activities will be required for the wind turbine operation:

A. ONGOING OPERATION

The wind turbine will be operational except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.

B. MAINTENANCE

The wind turbine will be subject to periodic maintenance and inspection. Periodic oil changes will be required. Any waste products (e.g. oil) will be disposed of in accordance with municipal and provincial waste management regulations.

3.3 Project Decommissioning Activities

Decommissioning involves the following activities:

A. SITE PREPARATION

Site preparation activities will include preparing a point of access to the site (i.e. temporary road), preparation of the site (e.g. placement of temporary snow fencing) and the mobilization of construction equipment.

B. DISASSEMBLE AND REPLACE EXISTING TURBINE

A large crane will be brought on site. It will be used to disassemble tower sections. These sections will be reused, recycled or disposed of in accordance with regulatory requirements. All parts of the turbine are reusable or recyclable except for the blades. Some of the parts (cabling, generator) will have high economic value. There are ongoing programs in Europe to develop blades that are recyclable.

4.0 SCOPE OF ASSESSMENT

For a screening, CEAA requires the RA(s) to, among other things:

- § determine the scope of the project and the scope of the criteria to be considered in the screening;
- § determine if any criteria in addition to those required to be considered under the screening process should be considered;
- § consider the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project;
- § consider any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- § consider the significance and likelihood of the environmental effects of the project and the cumulative environmental effects referred to above;
- § consider comments from interested parties;
- § consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- § ensure that a screening report is prepared;
- § make a decision on whether the project is likely to cause significant adverse environmental effects after taking into account mitigation measures; and
- § ensure that any mitigation measures that the RA considers appropriate are implemented.

4.1 Criteria

The term “criteria” applies to those considerations that were used to assess the effects of the project on the environment.

Under CEAA, the definition of environment (Section 2(1) of CEAA) is:

"the components of the Earth", and includes:

- a) *land, water, air, including all layers of the atmosphere;*
- b) *all organic and inorganic matter and living organisms; and*

- c) *the interacting natural systems that include components referred to in paragraphs a) and b)".*

In CEAA, the definition of environmental effect (Section 2(1) of CEAA) is:

- "a) any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing, that is of historical, archaeological, paleontological or architectural significance, and*
- b) any change to the project that may be caused by the environment."*

To systematically address the requirements of CEAA, criteria were used in the assessment of potential environmental effects associated with the project. In addition to addressing CEAA requirements, the assessment criteria also reflect concerns of stakeholders identified through consultation programs. The environmental components that were considered in the assessment include:

§ **Biophysical Environment**

- aquatic environment and water quality
- noise
- soils
- terrestrial vegetation
- terrestrial wildlife (including birds)

§ **Socio-Economic Environment**

- cultural resources
- planned land use
- recreation
- safety (including ice shedding)
- social environment
- visual landscape.

Appendix B provides a listing of the criteria along with indicators and data sources that were used to consider the environmental effects associated with this project. Both direct and indirect environmental effects were considered. Once environmental effects were identified, consideration was given to whether or not there were technically and economically feasible mitigation opportunities available. The effects remaining after

the consideration of mitigation measures are called net effects. Finally, the significance of the net adverse environmental effects was considered.

4.2 Cumulative Effects

As part of the assessment of environmental effects, CEEA requires consideration of cumulative effects that are likely to result from the wind turbines in combination with other projects or activities that have been or will be carried out.

In undertaking the environmental assessment work, the direct net effects of the wind turbines and the potential combined effects from other existing and future activities and projects were considered. Existing activities and projects were addressed through consideration of the existing environment. Future activities and projects within the study area were identified through discussions with various approval agencies, including the City of Toronto, Waterfront Regeneration Trust and Toronto Region Conservation Authority. These discussions focused on the expansion of the ABSTP, the R.L. Clark Filtration Plant and new waterfront trails.

Cumulative effects were considered for projects for which there is some commitment to develop, and there is some potential for effect overlap with the wind turbine project in terms of time and/or space.

In identifying the potential for cumulative effects, the short period of time required to erect the wind turbine was an important consideration for cumulative effects associated with construction.

The projects that were assessed as part of the assessment of cumulative effects include:

- Construction of residue management facility at R.L. Clark Filtration Plant
- Developments at the ABSTP including:
 - New gas control building (under construction, scheduled to be completed late 2000)
 - Digestion tanks (part of gas modifications) extreme south east point of plant, construction ongoing through to late 2000
 - Biosolids facility with construction under way will continue through early 2001
 - Pelletization facility ongoing through early 2001
 - Biofilter structure with construction under way which will continue through early 2001
 - Odour control (scrubber building) located beside biosolids loading facility
 - Ultra violet disinfection structure (very large, 2-story structure) to be constructed starting in 2002
 - Outfall and effluent conduits to be constructed starting in 2002
 - RC Harris Residue Management Program has identified ABSTP as the preferred location for a residue management facility. The proposed location for this structure has not been identified, although land has been reserved on the south-west corner of property

- Landscaping site plan, which will deal with perimeter and interiors of the property to enhance the aesthetics of the ABSTP. The plan may involve some substantial earth moving. Work would begin in 2001.

At this point in time there are no proposals to construct any more wind turbines beyond the three proposed by WPC and Toronto Hydro. Consequently, the cumulative effects assessment of multiple wind turbines was limited to the assessment of these three turbines for which approval is currently being sought.

4.3 Accidents or Malfunctions

CEAA requires consideration of the environmental effects of accidents or malfunctions. The potential for the presence of the wind turbine to cause new environmental effects not currently experienced under the current situation must be considered as part of this assessment.

Criteria have been included under the heading “Safety” in the tables presented in Appendix B.

4.4 Assessment of Significance of Environmental Effects

The environmental effects of the proposed wind turbine project were assessed using the evaluation criteria described in Section 4.2 of this document. As part of the assessment process, mitigation measures are identified that offset the predicted environmental effects. The significance of the residual environmental effects (i.e. the net effects) are assessed and documented giving consideration to:

- § Magnitude of the net environmental effect B whether the effects are considered to be minor or major;
- § Geographic extent of the net environmental effects B whether effects associated with the project are localized or broad;
- § Duration and frequency of the net environmental effects - whether effects are short-term or long-term and infrequent or frequent;
- § Reversibility of net environmental effects B whether the effects are reversible or irreversible;
- § Ecological context B whether the ecological setting of the project is particularly sensitive to the net environmental effects or is it relatively unaffected by the net environmental effects; and
- § Regulations and standards B whether the residual effects contravene government regulations or standards.

5.0 EXISTING CONDITIONS

5.1 Aquatic Environment

The Toronto waterfront is part of the large set of ecosystems defined by Lake Ontario and its tributaries. Habitats are defined by cold water, along shore currents and wave action in varying amounts depending on exposure to lacustrine conditions. Resident fish communities will reflect adaptations to the habitat created by these conditions. The three study areas include both open water habitat and embayment (sheltered) habitat.

5.1.1 Open Coast Habitat

Shorelines exposed to wave action, upwellings and wind-generated mixing of subsurface waters onto inshore areas provide habitat suitable for cold water fish species such as lake trout (*Salvelinus namaycush*) and lake whitefish (*Coregonus clupeaformis*) (Strus 1994). Bottom substrate historically consisted of boulders, rubble, gravel and sand with some areas of exposed bedrock. The removal of much of this substrate for construction aggregate has compromised habitat quality, particularly for spawning, through the open coast shoreline. These areas are now primarily used as seasonal travel corridors for these cold water species and, during thermally stable periods, as a warm water corridor between sheltered habitats (McLaren et al. 1995).

5.1.2 Embayment Habitats

Embayment habitats provide sheltered areas with typically more complex habitat characteristics. Protection from wave action and thermal upwellings result in conditions suitable for warm water species such as white sucker (*Catostomus commersoni*), common carp (*Cyprinus carpio*) and gizzard shad (*Dorosoma cepedianum*). These areas are also capable of supporting emergent and submergent aquatic vegetation, which provides cover and food and results in greater species diversity as well as suitable conditions for spawning and nursery areas (McLaren et al. 1995).

Colonel Samuel Smith Park

This park is the most recent embayment created by lakefilling in 1990. It consists of a series of armoured hard points and a reinforced spit, which protects the embayment. A natural shoreline extends eastward and westward from the park. Substrate close to the shore consists of boulders, rubble, gravel and sand. Further offshore the bottom consists mainly of sand. The park embayment reaches a depth of 8 metres and outside the southern perimeter the gradient falls to a depth of 10 metres (Buchanan 1991).

Twenty-three species of fish have been collected at Colonel Samuel Smith Park. Alewife (*Alosa pseudoharengus*), white suckers and spottail shiners (*Notropis hudsonius*) were the predominant species and comprised 82% of the total catch. White perch (*Morone americana*), white bass (*M. chrysops*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*M. salmoides*) and yellow perch (*Perca flavescens*) were also captured (Buchanan 1991).

Leslie Street Spit

This structure is the largest artificial structure in Lake Ontario and consists of an outer harbour, four sheltered embayments and three central cells. Each of the four embayments offer sheltered and diverse fish habitat. Two of them reach a depth of greater than 6 metres and the other two are typically less than 2 metres in depth (Buchanan 1991). Substrate in the four embayments consists mainly of sand with some rubble. Sandbars are present along the western shoreline, which sometimes restricts access to the shallower habitat. Submergent and emergent vegetation, boulders provide cover for resident fish communities and protection from the open water provides thermal refuge. Thirty-one species of fish have been collected from various sampling sites through the Leslie Street Spit indicating a diverse aquatic community. Alewife, spottail shiner, bluntnose minnow (*Pimephales notatus*), pumpkinseed (*Lepomis gibbosus*) and johnny darters (*Etheostoma nigrum*) comprised 77% of the catch. Other species included gizzard shad, white perch, white sucker and rock bass (*Ambloplites rupestris*).

Ashbridges Bay

Prior to the 1900's Ashbridge's Bay was a wetland at the mouth of the Don River. The destruction of the wetland resulted from extensive filling, diversion of the Don River and dredging of the lake bottom (Buchanan 1991). Lakefilling occurred through the mid-1970's to create two small embayments and a waterfront park. Present habitat is created with armourstone, rubble and boulders. Water depth reaches a maximum of slightly over 4 metres within the embayment. Depths of 5 metres occur along the outer perimeter of the park. The substrate is mainly sand and silt with a few boulders.

Alewife, white suckers, spottail shiners and emerald shiners (*Notropis atherinoides*) were the predominant species in Ashbridges Bay. Brown trout (*Salmo trutta*) are stocked by the Ministry of Natural Resources (Buchanan 1991).

5.2 Terrestrial Vegetation

The lands of the Ashbridges Bay Sewage Treatment Plant, the TEDCO Site, the R.L. Clark Water Filtration Plant, and the adjacent parks are formed of construction fill and debris, removed from construction sites elsewhere in the city and deposited in these waterfront areas. At and near the Ashbridges and TEDCO sites

a number of invasive plants such as Manitoba maple, willows, dogwoods, goatsbeard, chickory, ragweed, dandelions, goldenrod, and milkweed have become established. Around the Clark site the area is mowed lawn. A variety of grasses, sedges and other herbaceous plants may have seeded themselves in disturbed areas at any of the sites, but no unusual plants are known or expected in these situations.

5.3 Terrestrial Environment

Birds

In the Toronto waterfront area there are large numbers of colonial nesting birds in summer, and waterfowl in winter, plus seasonally migrating birds. About 40 species of birds have been known to nest in recent years and about 300 species have been recorded in waterfront areas.

Loons and grebes stop over on the Great Lakes during both spring and autumn migration. Their numbers and dispersion are highly variable. Usually only a few individuals are seen, but occasionally groups of up to several hundred may be found. While they may fly very low over water, they are weak fliers that tend to stay high over land (see Kerlinger 1998).

The Toronto Eastern Headland now hosts about 2500 pairs of nesting double-crested Cormorants in summer (D.V. Weseloh, Pers. Comm.). Most of their flying is to feeding sites offshore. They may fly long distances just above the waves, and all along the waterfront in offshore areas. However, inland flights are relatively infrequent and tend to be at considerable heights. Nesting colonies are situated more than 3 km from the nearest proposed turbine site.

As many as 800 pairs of Black-crowned Night-Herons have nested in the Toronto Harbour area (Blokpoel and Tessier 1998). Single birds and small groups fly at low heights all along the Toronto waterfront to forage. Nesting colonies are located more than 3 km away from the nearest proposed turbine site. A few other herons, mainly Great Blue Herons, may be seen in shoreline areas along the Toronto waterfront, usually singly.

About 40,000 waterfowl may be found wintering in the Greater Toronto area. Up to 4,000 or more could be expected in and around the Toronto Harbour area (Toronto Field Naturalists Newsletter 1999). Numbers and movements are highly variable from day to day and place to place. Long distance migrations are usually in groups and birds tend to be very high (Bellrose 1980). Large concentrations and shorter movements are offshore. Local movements along the waterfront, consisting of single birds or small groups, are often close to the ground or water.

Each autumn an average of 15,000-16,000 hawks, eagles, falcons, ospreys, and harriers (also vultures) are counted flying over and through the City of Toronto, following a westward course adjacent to the north shore of Lake Ontario (Shapiro 1999). Heights of passage vary greatly from some quite close to the ground to those soaring far overhead. They may travel as singles to large groups, widely dispersed from the shore to several kilometers or more inland. A small number of these raptors also winter along the Toronto Waterfront, particularly at uninhabited park areas. Numbers vary each winter depending upon food availability locally and elsewhere.

A few rails, moorhens, and coots still nest in lakeshore marshes in the Toronto waterfront areas. However, these birds seldom fly during the summer, and always close to the water.

Most shorebird migrants completely overfly southern Ontario without stopping (James 1999). Such movements extend over a broad front and birds are typically flying very high (Able 1999). In spring shorebirds are also dispersed over a wide area. However, both spring and autumn, small groups, and even single birds, will be found scattered all along the shores of the Great Lakes, and rarely larger groups. As many as 3,000 Whimbrel for example have been seen on the Toronto Eastern Headland (Weir 1998). Birds making local movements are typically offshore.

About 40,000 pairs of Ring-billed Gulls, 160 pairs of Herring Gulls, 300 pairs of Common Terns, and a very few Great Black-backed Gulls nest in the Toronto Waterfront, primarily on the Eastern Headland (D.V. Weseloh, Pers. Comm.). All colony areas are more than 2 km away from the nearest proposed turbine site. Gulls forage all along the waterfront at low altitude, terns usually remain largely offshore.

Great Horned Owls may be found in waterfront areas year round, and three other species are possible on migration or in winter in very small numbers. In addition, Saw-whet Owls migrate in greater numbers, and several hundred could be counted in autumn in lakeshore areas.

Small birds, primarily nocturnal passerines, migrate over the Toronto area in huge numbers. But they fly in a broad front all across the land. On many days few may be migrating, but under favourable weather at the right time, 30,000/hour/km of front have been recorded passing (Richardson 1982). Nocturnal migrants generally fly below 2000 feet and above 500 feet (Able 1999), but elevation is variable depending upon species and distances they are moving. Daytime migrants tend to fly lower than the nocturnal migrants, but very low level migration close to the earth's surface is almost non-existent when birds are moving long distances. When coming to land, after crossing a large body of water such as Lake Ontario, some are going to land in shoreline areas rather than continuing to overfly the city to look for foraging habitat.

There are six species of medium-sized mammals that are common associates of people that can be

expected in Toronto Waterfront areas (cottontail rabbit, gray squirrel, woodchuck, muskrat, red fox, raccoon, striped skunk and coyote). There will also be a number of mice, shrews, and moles that might be found in some areas. Little Brown and Big Brown Bats could be regularly expected in Toronto waterfront areas. Very small numbers of six other bat species are possible seasonally.

Two species of reptiles and two amphibians are regularly found in waterfront areas. A few others are possible, but unlikely.

Many monarch butterflies migrate east to west each autumn along the north shores of Lake Ontario. As many as 1,000 /hour have been counted at peak migration times (Henshaw 1999). They fly singly and at widely varying heights, but may congregate for the night at a variety of places along the waterfront. Fifteen other species of butterflies have been seen in waterfront areas (Peuramaki, in Fairfield 1998) but do not occur in large numbers.

The large green darner dragonflies undertake some migration along the Toronto waterfront, but the numbers are unclear. They travel singly and in daylight. Many will be close to the ground and the shore at least morning and evening, but during the heat of the day may be far overhead and well away from the water (Nicoletti 1997).

5.4 Noise

The lands around all three siting areas have noise levels consistent with an urban environment. Typical sound pressure levels for a residential area in an urban environment are 58-62 dBA.

5.5 Soils

The three siting areas are situated on fill materials. The fill originated from various construction sites throughout the Greater Toronto Area. The fill materials are heterogeneous. Once precise locations for the wind turbines are known, soil samples and geotechnical studies will be undertaken to further characterize the soils.

5.6 Cultural Resources

Cultural resources include both archaeological and heritage resources. Due to the location of these sites on fill, no archaeological resources would be expected.

The R.L. Clark Filtration Plant is built on the southwestern corner of lands that were once part of the former Lakeshore Psychiatric Hospital. There is a *Master Design and Implementation Plan* (1996) for the former Lakeshore Psychiatric Hospital that establishes a framework to balance the conservation of

existing heritage and natural resources with meeting the needs of the urban community. This plan was developed for the area by the former City of Etobicoke.

In reference to the former hospital grounds it is noted that:

“The buildings and grounds constitute a historic resource of considerable importance.... in terms of historic integrity, the former hospital grounds area remains largely intact as developed in the period 1889-1911 and is considered to be of good quality.

It is also noted in the report that *“The Lakeshore Hospital site was developed with the clear intention of integrating the physical environment into the care and treatment of patients with mental illnesses. Both buildings and landscape were carefully planned to provide optimum conditions for patient care.”*

The landscape is also considered an important cultural resource.

There are no archaeological or cultural resources associated with the TEDCO or ABSTP lands.

5.7 Existing Land Uses

5.7.1 Etobicoke

The R.L. Clark Water Filtration Plant is located on Lake Ontario at the foot of 23rd Street in south Etobicoke. The plant was constructed from 1962 to 1968 on property acquired by purchasing a portion of the grounds of the Lakeshore Psychiatric Hospital from the Province of Ontario. The grounds are landscaped, providing a park-like setting which is used for passive recreation by citizens in the area. The plant is surrounded to the north by Humber College, to the west by residential units, to the east by parkland (including boat storage facilities) and Humber College property and to the south by the lake and Colonel Samuel Smith Park.

Colonel Samuel Smith Park was built in the late 1980's to help offset the limited accessibility to the waterfront. This park provides passive recreational opportunities as well as boating facilities. The location for the proposed wind turbine is at the south end of the R.L. Clark Filtration Plant, adjacent to the park.

5.7.2 Ashbridges Bay/TEDCO Lands

Two of the proposed sites for the wind turbines include a parcel of land located on TEDCO property at the foot of Leslie Street and at the Ashbridges Bay Sewage Treatment Plant (ABSTP).

The TEDCO site is located on a vacant parcel of land immediately south of the City-owned community garden. The site is bounded by the ABSTP to the east, Tommy Thompson Park (a natural area) to the south, and industrial land uses to the west.

The ABSTP is located on 40.5 hectares of land at the foot of Leslie Street, east of Toronto Harbour and west of Ashbridges Bay. The facility is the largest water pollution control plant in Toronto servicing approximately 1,250,000 people.

The ABSTP has been constructed in several phases. The plant provides complete wastewater treatment. In addition the facility provides the disposal of wastewater sludge including sludge originating from the Humber and North Toronto Treatment Plants. A portion of the conditioned and dewatered sludge is incinerated at the plant.

Alternative methods to incineration are being developed through the Toronto Biosolids Beneficial Use Program. A biosolids-recycling program will apply to all of the biosolids from the ABSTP by December 31, 2000. At that time the sludge incinerator at the plant will be closed.

5.8 Planned Land Uses

5.8.1 Ashbridges Bay Sewage Treatment Plant

There are a number of plans under development at the ABSTP including:

- new gas control building (under construction, scheduled to be completed late 2000)
- Digestion tanks (part of gas modifications) extreme south east point of plant, construction ongoing through to late 2000
- biosolids facility with construction under way will continue through early 2001
- pelletization facility ongoing through early 2001
- biofilter structure with construction under way which will continue through early 2001
- odour control (scrubber building) located beside biosolids loading facility
- ultra violet disinfection structure (very large, 2-story structure) to be constructed starting in 2002

- outfall and effluent conduits to be constructed starting in 2002
- RC Harris Residue Management Program has identified ABSTP as the preferred location for a residue management facility. The proposed location for this structure has not been identified, although land has been reserved on the south-west corner of property
- Landscaping site plan, which will deal with perimeter and interiors of the property to enhance the aesthetics of the ABSTP. The plan may involve some substantial earth moving. Work would begin in 2001.

5.8.2 TEDCO Site

Future development on site remains uncertain, however, the Martin Goodman Trail is likely to be located on the western edge of the property and linked to the Waterfront Trail running east-west to the south of it.

5.8.3 Waterfront Vision

The City of Toronto in 1999 released a document titled *Our Toronto Waterfront: The Wave of the Future*. The vision will be guided by a number of principles that will ensure the Toronto waterfront is:

- An environmentally-friendly area that nurtures wildlife, restores and creates natural habitats, and provides water that is clean and healthy;
- Is easy to get to and easy to get around – by public transit, ferry, water taxi, bicycle and foot;
- Restores the link between the city and its lake across its 46 kilometres;
- Is known for its distinctive beauty, blending green lands, public places, historical sites, commercial and recreation facilities, residential areas and public art;
- Offers a wide variety of activities and facilities that complement each other and work together;
- Boosts Toronto's tourism infrastructure and its reputation as a tourist destination
- Sparks greater economic development, attracting new investment and creating jobs;
- Is financially viable; and
- Involves a high level of public participation in making decisions.

Over the coming years this vision will continue to be refined as specific projects are developed and initiatives launched. No specific projects coming out of this vision are currently in the approval process.

A second document titled *Unlocking the Portlands* describes the City's vision for the Toronto waterfront. Leslie Street will serve as a green corridor, extending from Lakeshore Blvd. to Tommy Thompson Park. West of Leslie Street the plan envisions a light industrial, service commercial and convenience retail street area that will service the Outer Harbour Marina users as well as visitors to Tommy Thompson and North Shore Parks.

It is also proposed that the east side of Leslie be used as a green corridor creating an improved environment for the Martin Goodman Trail. The plan also notes that another possible route for Martin Goodman trail is along the south side of the ABSTP.

5.8.4 Olympic Bid

Toronto is in the process of developing a Master Plan for the 2008 Olympic and Paralympic Games. It is noted in the document that This Olympic Bid will be centred on the Toronto Waterfront. One of the objectives of the Bid is a cleaner environment. The Toronto 2008 Olympic Bid Environmental Policy forms the basis for the environmental strategy and initiatives to be followed during the bid process and the operation of the Games. From this, a number of principles and specific environmental objectives were formulated. One of these objectives is to "maximize energy conservation at all opportunities including in transportation and facility operation. Use and promote renewable energy and certified sources of "green power".

The location of the facilities for the Olympic Bid is still under refinement. Most of the plans however, focus on lands west of the Don Roadway.

5.8.5 R.L.Clark Filtration Plant

There is a proposal to construct a residue management facility on the south end of the filtration plant, immediately adjacent to the site of the proposed wind turbine. This facility will consist of dome covered sludge thickener tanks and a proposed clarifier/plate settler. The site for the proposed wind turbine is immediately south of the residue management facility.

Plans have been developed for the expansion of the R.L. Clark Filtration Plant; however, there is no specified schedule for their implementation. The plans include the following:

- Ozonation building
- Underground equalization tank

- Covered contact chamber
- Flotation facility
- Additional filter building
- Underground reservoir
- New treated water pumping station and maintenance facility

These facilities, if eventually built, will occur north of the proposed location for the wind turbine.

5.8.6. The Lakeshore Grounds: Master Design and Implementation Plan:

As noted earlier, the former City of Etobicoke developed a Master Plan for the lands associated with the former Lakeshore Psychiatric Hospital Area. One of the conclusions of the study was that *“Visual resources contribute to the overall quality of the site and must be managed as they can be impaired or improved by building and landscape development”* This suggests that future developments on these lands should be sensitive to their effect on the visual access to the waterfront.

The Master Plan notes that there are plans for new buildings and facilities, including schools, recreation centre, cultural facilities and sports fields. These proposed facilities are located north east of the Clark Filtration Plant and the proposed location for the wind turbine.

6.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

The following sections describe the environmental effects of the proposed construction, operation and decommissioning of up to three wind turbines on the Toronto Waterfront. The environmental effects as described apply to all three locations unless otherwise indicated. Table 6, located at the end of this chapter, summarizes the environmental effects of the project.

6.1 Aquatic Environment

Construction

There are no environmental effects expected from the construction of the wind turbines. There is some potential for a minor amount of sedimentation during the construction of the wind turbine, however, with the employment of good construction practices, no significant environmental effects are expected.

Operation

There are no environmental effects expected from the operation of the wind turbines since there is not likely to be the potential for negative interactions between wind turbine components and the aquatic environment.

Decommissioning

There are no environmental effects expected from the decommissioning of the wind turbines since no materials from the wind turbine site are expected to enter the water as long as good construction practices are adhered to (e.g. proper disposal of waste).

6.2 Terrestrial Vegetation

Construction

Existing vegetation will be removed from a small area at the construction site, and at the access to the site. Disturbance will also occur during temporary placement of fencing, and where construction equipment is used near the site. Such removal as may be necessary is not considered to be significant since the species involved are common invasive plants, and disturbance is temporary. The disturbed sites can be revegetated quickly.

Operation

There are no environmental effects expected from the operation of wind turbines on any low growing vegetation. There are no expected negative interactions between wind turbines and plants. However, it will be necessary to control the growth of large trees close to turbines, to avoid wind obstruction or contact with turbine blades.

Decommissioning

As with construction, there may be temporary disturbance to plant communities in a small area from construction equipment, but no long lasting or significant effects are expected.

6.3 Terrestrial Wildlife (Including Birds)

Construction

There are no significant environmental effects expected from the construction of the wind turbines. Very few, in any, animals would be incapable of moving away from the site in order to avoid construction activities. Construction is limited in extent and time, and is expected to have very little direct affect on any species at the time.

Operation

Birds- Avian Mortality

A primary concern with the operation of wind turbines is the potential for adverse effects on wildlife. This is particularly true in connection with avian mortality (see Appendix C). However, studies of wind turbines at many sites from across North America and Europe have indicated that avian mortality is not significant to bird populations. On sites with a small number of turbines, there is often no recorded mortality. Even at larger sites the mortality is usually less than one bird killed per turbine per year. The maximum rate at any wind farm site in North America was 1.9 birds/year/turbine. In Europe, most mortality rates were also below the maximum recorded in North America. Two sites, however, using data from peak migration times in a high migration area, recorded rates projected to be as high as 33 birds/turbine/year (see Appendix C).

The usual low rate of mortality is particularly relevant in light of the fact that studies to date have been almost entirely with variable speed turbines. The variable speed turbine is a more serious threat as there is a correlation between the speed of rotation and the number of birds killed (Orloff and Flannery 1995). A fixed speed rotation of only 28-RPM, such as the turbines being proposed, should have an even lower mortality. Up to 80% of birds can fly through the rapidly rotating blades of variable speed turbines and remain unharmed (Winkelman 1992b). Birds have much more time to evade the blades of a fixed speed

turbine.

Most birds are flying during daylight, have excellent vision, and can easily see and avoid obstacles, even slowly moving ones. In good weather, even in coastal areas, the chance of a strike in daylight is virtually zero (Crockford 1992, Winkelman 1985). The birds most likely to suffer mortality are small nocturnal migrants, flying in poorer light and in large numbers. However, even these birds are largely flying too high (Able 1999), but when low can usually still see and avoid structures in good weather conditions. Only in poor flying conditions of fog and rain are they more susceptible to strikes at tall structures (Winkelman 1995). But the timing and location of such weather conditions is not predictable. Collisions could occur no matter where turbines are placed (Hanowski and Hawrot, in press). Even in poor flying conditions there has never been a mass kill of nocturnal migrants such as are commonly associated with tall buildings or communication towers (Gipe 1995, Winkelman 1992a). Even in poor flying conditions the vast majority of birds can fly unharmed through slowly rotating turbine blades.

Avian mortality is far higher at other structures. Tall communications towers in Canada were estimated to be killing more than 1,000 birds each per year (Weir 1976). A relatively few tall buildings in Toronto are estimated to be killing more than 10,000 birds per year (FLAP), the taller ones each killing hundreds (Evans Ogden 1996). Even low buildings, such as houses, are estimated to be killing from 100 million to 1 billion birds across North America with each house killing between 1 and 10 birds (Klem 1989, Dunn 1993). Bird mortality, even at its highest rate in Europe, was considered to kill no more birds per kilometer of turbines than per kilometer of highway, or per kilometer of power transmission lines (Winkelman 1995). House cats, which many households have, are estimated to be killing as many as 140 million birds a year in Canada (www3.sympatico.ca/samgreen/webcats.html). Every structure that is put up is likely to kill some birds; however, the above figures clearly indicate that every average house, directly or indirectly, is killing more birds per year than any average wind turbine. In fact, the average house is probably killing far more birds.

Even in European situations that have recorded the highest avian mortality rates ever, studies have repeatedly considered that avian mortality was not significant to bird populations, and that disturbance effects were a larger issue (Winkelman 1995, Crockford 1992). This is an important consideration since most European wind turbines have been placed in coastal areas, even in harbours on breakwalls. Thousands of birds can fly close past turbines with no problems (e.g. Mossop 1998, Howell and Noone 1992, Still et al. 1994, Lowther in press). Avian mortality should not be serious for the placement of turbines at Ashbridges Bay Sewage Treatment Plant, the TEDCO lands, or the R.L. Clark Filtration Plant. Unless turbines are placed directly in a confined flight of birds, mortality will be low. There are no structures around the proposed sites that would confine birds, or direct them toward the turbine. Collisions with wind turbines are statistically rare events (Curry 1994).

The following comments reflect the probable potential mortality of various bird groups at any of the

three sites under consideration at the Toronto waterfront, based on information from studies elsewhere. For more details see Appendix C.

Loons, grebes, rails, moorhens, coots, cormorants, and terns all appear to be at very low risk. Their habits generally keep them offshore or well away from situations where they would be at any risk.

There is little information available on herons, but the absence of information suggests that these birds are also very low risk. There is a conspicuous absence of mention in European studies in coastal areas.

Waterfowl are clearly among the most wary of turbines and readily learn of the presence of such obstacles and avoid them (Winkelman 1985, Dirksen et al. 1997, Lowther in press). Their risk is low in Toronto despite the presence of considerable numbers year round in harbour areas.

The initial response of diurnal raptors to turbines is always one of avoidance (Curry and Kerlinger, in press) and even among experienced birds most show avoidance reactions (Rogers et al. 1977). The response varies by species, however and some such as Red-tailed Hawks and American Kestrels are more prone to coming close to turbines. But, they are still considered to be at low risk, with migrants less so than residents. There is probably very little risk to the numerous migrants through Toronto.

Peregrine Falcons are susceptible to strikes at hydro transmission lines, but even in California where numerous transmission line strikes are recorded (Olendorf and Lehman 1986) and where many thousands of turbines are in operation, there has never been a reported strike at a wind turbine (Gipe 1995). They have been known to nest near wind farms in Europe with no problems (Lowther in press, Percival 1998). The risk is very low for Peregrines or other rare species.

Shorebirds are abundant in shore areas of Europe where many wind farms are operating, but mortality rates have been very low. Thousands may fly close to turbines without incident (Mossop 1998, Petersen and Poulsen 1991), and most will be well away from turbine sites in Toronto. Their risk is very low.

Although pigeons and doves have been turbine victims, numbers have been small (Thelander and Rugge, in press, Anderson et al., in press). The risk in Toronto is very low.

Owls are few in the vicinity of turbine sites in Toronto, except for Saw-whet Owls. Mortality has been low for owls most anywhere in the world (Thelander and Rugge, in press, Anderson et al., in press, Guyonne and Clave, in press, Phillips 1994). Saw-whet Owls are likely to be flying very low, and that may reduce their risk.

Small nocturnal migrants are probably at greater risk than any of the other types of birds. But, as discussed previously, mortality rates are still low, far lower than mortality at other types of structures,

including houses.

Rare species are exceedingly unlikely to ever suffer mortality at the wind turbines proposed for the Toronto waterfront. There is generally a correlation between the abundance of species moving through an area and the possibility of hitting a turbine (Musters et al. 1996, Winkelman 1995, Pearson 1992, Anderson et al., in press). Rare species are the least likely to hit a structure.

There is no evidence that terrestrial mammals, reptiles or amphibians are likely to be affected at all by wind turbines. Small mammals have been reported living in close proximity to operating turbines (Orloff 1992).

Birds – Disturbance Effects

A number of studies in North America and Europe (see Appendix C), have indicated that there is generally little or no effect to birds nesting close to and right below operating turbines (Bureau of Reclamation 1984, Howell and Noone 1994, Kerlinger, in press, Percival 1998, Karlsson 1983, Meek 1993, Vauk 1990, Winkelman 1992d, Guyonne and Clave, in press). Where breeding birds were disturbed at a site, it was because of extensive disturbance to the surroundings, or the continued presence of people and vehicles (Leddy et al. 1999, Percival 1999), not the turbines themselves. The placement of turbines at the Ashbridges Bay, the TEDCO site, or the Clark site will not have any effect on breeding bird colonies in Tommy Thompson Park more than 2 km away. Birds will nest right below operating turbines (Percival 1998).

Several studies in Europe have indicated that the most serious affect in their situation was disturbance to resting or staging birds (Benner 1993, Crockford 1992, Winkelman 1994). Avoidance reactions have been considered important in European situations where wind farms were placed in estuaries in coastal areas where large numbers of staging waterfowl and shorebirds traditionally gather to feed on tidal mudflats. For flying birds, avoidance reactions have been observed in some species as far as 800 metres away, but most respond only at much closer distances, and many show no avoidance response at all. The response is variable, even within species, and may vary with time of day. Avoidance would mean birds could not take advantage of foraging areas near turbines. But, even where birds avoided turbines at some distance in flight, they were not disturbed when they did land, and would often swim or walk much closer to feed (Percival 1998, Lowther, in press, Winkelman 1985).

Such disturbance effects are not going to be of concern at the Toronto sites. Towers will not be located in areas providing rich food sources, and are not located close enough to feeding sites to cause any appreciable loss of foraging opportunities. Avoidance of towers by flying birds reduces the risk of collisions.

Birds – Siting Guidelines

Siting guidelines have been established in various places in Europe and North America. Many have proven to be invalid (Percival 1999, Guillemette 1998 – see Appendix C). Even in coastal locations and harbours, mortality has been low (Dirksen et al. 1997, Lowther, in press, Crockford 1992, Winkelman 1985). Unless turbines are placed in a microhabitat where large numbers of birds are confined by topography or structures, avian mortality is going to be rare. The three sites being considered on the Toronto waterfront do not exhibit characteristics likely to enhance avian mortality. The tubular type of turbine to be used, with no guy wires or overhead transmission lines (far more deadly as they are much less visible – Bevanger 1994), and a fixed slow speed of blade rotation that make them easily visible, are the least likely to cause mortality to flying animals. The minimum red or strobe lights needed to meet Transport Canada regulations will also have minimal impact to nocturnal migrants (Evans Ogden 1996). No additional precautions are needed to mitigate against bird strikes.

Other Wildlife

Bats are at some risk as with other flying animals. But they have excellent navigation skills and generally mortality seems to be less than that of birds (Howell and DiDonato 1991, Therlander and Rugge, in press, Anderson et al., in press, Strickland et al. 1998). They are at low risk on the Toronto waterfront sites.

Butterflies, dragonflies and other flying insects are likely to be at very low risk of collision with wind turbines, certainly at much lower risk than they experience on highways. What studies there are have indicated negligible effects to insects (Gipe 1995).

Decommissioning

As with construction, there are no significant environmental effects expected from the decommissioning of the wind turbines. Very few, in any, animals would be incapable of moving away from the site in order to avoid decommissioning activities. In addition, decommissioning activities are limited in extent and time.

6.4 Noise

Construction

In preparing a site for a wind turbine's erection and for its future maintenance, it is necessary to consider possible noise impacts that may result from construction vehicles and activities, particularly when near residential or sensitive natural/park use areas.

Table 2 provides the noise levels (dBA) for a variety of heavy-duty construction machines at a distance

of 30 metres (100 feet). It can be expected that the most intense noise would occur during site preparation, assembly of the turbine towers, and the mounting of the turbine nacelle. During this period a variety of light and heavy-duty construction vehicles would be operated within and through the project area. The following is a list of construction vehicles/machines/activities that will be used in construction:

- bulldozer
- backhoe
- large crane
- small crane
- dump truck
- ready-mix concrete truck
- flat-bed truck

During the wind turbine's operation, noise levels, as a result of construction or related vehicles, would be limited to its periodic maintenance. Table 2 provides a list of construction vehicles/machines/activities that will be used for maintenance.

At the east end sites, the wind turbines would be located in excess of 1,000 metres from any occupied residence, hence, noise impacts to local residents should not be significant (less than or equivalent to noise levels associated with common urban residential environments – between 42 and 72 dBA. Please see Table 4). In the west end, the nearest household to the wind turbine construction activity would be approximately 260 metres. Noise impacts to local residents will be equivalent to noise levels associated with common urban residential environments. Only in the instance of using the ready-mix concrete truck will noise impacts slightly exceed the typical noise pressures. Construction of the foundation, however, will take only 1 day.

Table 2. Typical Construction Equipment Noise Levels at a Distance of 30 metres (100 feet).

TYPE OF EQUIPMENT	NOISE LEVEL (dBA)	@ 250 m	@ 500 m	@ 1000 m
Dump truck	67.1 @ 30 m	58.1	55.1	52.1
Front end loader	80.2 @ 30 m	71.2	68.2	65.2
Bulldozer	80.2 @ 30 m	71.2	68.2	65.2
Crane	81.3 @ 30 m	72.3	69.3	66.3
Backhoe	81.3 @ 30 m	72.3	69.3	66.3
Ready-mix concrete truck	85.2 @ 30 m	76.2	73.2	70.2

Note: Table 2 is based upon the assumption that sound pressure levels diminish with distance from a point source at a rate of approximately 3 dBA for every doubling of the distance from the point source.

By limiting construction activities to normal working hours, construction noise impacts can be significantly reduced. The construction period would be no more than 2-3 weeks, broken down as following:

- excavation, 1 day
- foundation construction, 1 day
- foundation setting, 7 days (no noise during this period)
- turbine construction, 2 days
- transformer installation, 5 days
- turbine connection to grid, 1-2 days
- site remediation and demobilization, 2 days

Operation

Generally, rural and residential areas are more sensitive to noise intrusion because of a relatively low ambient noise level. Ambient noise levels can vary depending on location (proximity to roads), environment (residential, industrial, farming), and other environmental factors such as wind conditions.

The amount of disturbance, absolute and relative, associated with a particular noise source depends on a number of factors. These factors include the distance from the source, the level and type of background noise, and the nature of the source (frequency, time pattern, and intensity). The United States Environmental Protection Agency (EPA) and other sources have developed dBA ranges for a variety of common noise sources and typical residential locations (see Tables 3 & 4).

Table 3. Noise Levels From Common Sources

COMMON NOISE SOURCES	SOUND PRESSURE LEVEL (dBA)
Jack hammer @ 3 metres (10 feet)	110
Jet aircraft @ 300 metres (1000 feet)	102
Rock band	100
Snowmobile @ 30 metres (100 feet)	95
Freight train 40-48 kph (25-30 mph) @ 30 metres (100 feet)	90
Heavy highway traffic @ 30 metres (100 feet)	80
Heavy city traffic @ 30 metres (100 feet)	66
Dishwasher @ 0.9 metres (3 feet)	65
Conversational speech @ 0.9 metres (3 feet)	62
Office	60
Interior of average residence	45
Whispering	20

Table 5 provides noise levels (dBA) at select distances for the Vestas V47-660 kW, Tacke TW 600, and NEG Micon NM 750/48 wind turbines. Manufacturer noise level tests for the wind turbines range from approximately 46.5 dBA (Vestas V47-660 kW) to 43.8 dBA (NEG Micon NM 750/48) at a distance of 200 m at greater distances noise levels range from 37.4 dBA to 35 dBA (see note below).

All noise levels of the wind turbines taken at a distance of 200 metres (43.8-46.5 dBA) are less than would be experienced in a quiet residential area (48-52 dBA), and are approximately what would be experienced in the interior of an average residence (45 dBA). The nearest residence to the proposed turbine locations is approximately 260 metres. Hence, given the ambient noise within and without an average suburban residence, a wind turbine at a distance of 260 metres would be inaudible.

Table 4. Noise Levels Associated with Common Environments

LOCATION DESCRIPTION	TYPICAL SOUND PRESSURE LEVEL (dBA)
Quiet suburban residential	48-52
Normal suburban residential	53-57
Urban residential	58-62
Noisy urban residential	63-67
Very noisy urban residential	68-72

As shown in Table 5, as distances from the turbines increase, noise levels continue to decrease. Based on the figures from Table 5, it should not be expected that associated noise levels resulting from the

turbines' operations, at either the ABSTP or the TEDCO property at Leslie and Unwin, will be an issue to local residents. The nearest residence would be approximately 1000 metres away.

Table 5. Noise Levels of Various Wind Turbines at Select Distances

TYPE OF TURBINE	TOTAL HEIGHT ^a	NOISE LEVELS (dBA) AT SELECT DISTANCES ^c
(Vestas) V47-660 kW	63.5-78.5 m ^b	46.5 @ 200 m 44.4 @ 250 m 42.7 @ 300 m 37.4 @ 500 m ^d
(Tacke) TW 600	71 m	44.3 @ 200 m 39.0 @ 300 m 35.6 @ 400 m
(NEG Micon) NM 750/48	69.1-94.1 m ^b	43.8 @ 200 m 43 @ 250 m 38 @ 300 m 35 @ 500 m

^a Total Heights based on hub height and radius of blade circumference

^b Depending on type of tower and/or base actual heights may vary

^c Vestas V 47-660 kW noise levels (dBA) taken at 10 m with a wind speed of 28.2 km/h

Tacke TW 600 noise levels (dBA) taken at windspeed of 28.8 km/h

^d Vestas V 47-660 kW and NEG Micon NM 750/48 noise levels (dBA) taken at 500 m; Tacke TW 600 noise level (dBA) taken at a distance of 400 m

With respect to a wind turbine sited at the R.L. Clark Water Filtration Plant on the southeast end of the property, the nearest residential property is to the west at a distance of approximately 260 metres. Noise levels from the turbine at this distance would be less than between 43-44.4 dBA. The nearest residential property to the east is 560 metres where noise levels would be less than 35-35.6 dBA.

At the December 14, 1999, meeting of City Council, Council adopted the following standards concerning noise and potential impacts to City residents:

1. (a) a 200 metres separation between wind turbines and residential low-rise dwellings;
- (b) a 300 metre separation between wind turbines and high-rise residential buildings; and
- (c) a 50 metre separation between wind turbines and sensitive natural areas or sensitive park use areas;

unless lesser distances can be demonstrated to be similarly appropriate in keeping with the spirit and assumptions of the City of Toronto Noise Report. The Report recommended that "noise impact

statements” be required by Council if sites selected were under the recommended distances noted above and further, that noise compliance monitoring be undertaken following the installation of the wind turbines.

The standards recommended by the Report and adopted by Council are based upon noise levels associated with typically sized wind turbines (660 kW), the use of commonly employed separation distances for wind turbines around the world, and the Province of Ontario’s standards regarding noise in “Outdoor Living Areas” [as provided in “Noise Assessment and Land Use Planning: Requirements, Procedures and Implementation” (MOE, May 1997)]. The City of Toronto “Noise Report”, found in Appendix D, provides additional details on noise effects.

Decommissioning

Noise levels associated with decommissioning would be similar or less than those associated with construction. At the east end sites, the wind turbines would be located in excess of 1000 metres from any occupied residence, hence, noise impacts to local residents should not be significant (less than or equivalent to noise levels associated with common urban residential environments – between 42 and 72 dBA). In the west end, the nearest household to the wind turbine construction activity would be approximately 260 metres. Noise impacts to local residents will be equivalent to noise levels associated with common urban residential environments. Therefore no significant adverse effects are expected.

6.5 Soils

Construction

As noted in Section 5.5, the soils at the three sites are heterogeneous. Prior to the commencement of excavation, soils samples will be taken to determine appropriate management methods for excavated materials. If it is found that the soils are in excess of the MOE Guidelines, they will be disposed of off site in accordance with provincial requirements. If the soils are consistent with the guidelines they will be used as back fill.

Decommissioning

If the turbines are decommissioned and any additional fill material is required, clean soils must be used.
No

significant environmental effects are expected.

6.6 Cultural Resources

Construction

The areas to be disturbed by the construction activities are not considered to have a high potential for archaeological resources since these areas are disturbed and/or consist of fill. Significant effects are therefore not expected. However, in the event that archaeological resources are encountered during construction, the Ministry of Citizenship, Culture and Recreation would be immediately notified.

As noted in Section 5.7.1., the R.L.Clark Filtration Plant is located on lands adjacent to the former site of the Lakeshore Psychiatric Hospital. There is a Master Plan in place for the former Lakeshore Psychiatric Hospital grounds. The environmental effects associated with the construction of the wind turbine are limited to a temporary increase in nuisance effects (e.g. noise, minor amount of dust) and truck traffic. Consequently, no significant environmental effects on the cultural resources are expected.

There are no heritage resources associated with the TEDCO or the ABSTP sites.

Operation

The operation of the wind turbine is not expected to have environmental effects on either archaeological or heritage features at the TEDCO or ABSTP sites, since there are no significant cultural resources.

While there are significant cultural resources near the R.L. Clark Filtration Plant lands, these resources are separated from the specific site where the wind turbine is proposed by the filtration plant itself (to the north) and the Lakeshore Yacht Club parking and winter boat storage to the east. While the turbine will be visible from the former Lakeshore grounds, it can be considered no more intrusive than the Filtration Plant.

Decommissioning

There are no archaeological or heritage effects that would result from the decommissioning of the wind turbines.

6.7 Planned Land Use

Construction and Operation

The ABSTP is undergoing numerous modifications. WPC and Toronto Hydro have been in discussion with City representatives about the siting of the wind turbine on the ABSTP property. Through these discussions sites have been identified on the ABSTP property where the wind turbine(s) could be erected

with limited conflicts for future developments.

WPC and Toronto Hydro have also held discussions with TEDCO officials about the siting of a wind turbine on the TEDCO lands at Leslie Street and Unwin Avenue. Through these discussions, a site has been identified where a wind turbine could be erected with limited direct conflicts for future development.

WPC and Toronto Hydro have also held discussions with City representatives about the siting of the wind turbine on the R.L. Clark property. Through these discussions a site has been identified where a wind turbine could be erected with limited conflicts for future developments associated with the filtration plant.

There are a number of planned uses defined in the *Lakeshore Grounds Master Design and Implementation Plan*. These uses are located north of the filtration plant, well separated from the proposed location for the wind turbine.

Decommissioning

The decommissioning of a wind turbine at any of the three sites would not have significant environmental effects on planned land use.

6.8 Recreation

Construction

During construction there could be some minor disturbances to recreational use of the R.L. Clark Plant or lands adjacent to the TEDCO site (including the community gardens). These effects will be limited to nuisance effects such as noise, dust and aesthetics and will be short in duration.

Operation

As noted under the discussion on noise, the wind turbine will not create intrusive noise that could disrupt the recreational use of the lands surrounding the R.L. Clark site or the TEDCO site. The presence of the wind turbine itself has the potential to add to recreational activities, providing a destination for those wishing to observe the turbine in motion.

Decommissioning

As with construction, the environmental effects associated with decommissioning would be minor and of a short duration and therefore would not be considered significant.

6.9 Safety

Construction

During the short construction period, the public should be banned from the construction site. If construction occurs during the winter months, it will be necessary to take standard construction-site precautions with respect to icing. Wind technicians (“wind smiths”) normally receive training on the hazards of ice on tall structures during construction. Due to the short duration and the ability to mitigate public access to the site, no significant effects are expected.

Operation

Icing is the predominant safety concern expressed by the public with respect to wind turbines. Since there have been no recorded incidents of injury by ice from an operating wind turbine, this aspect of safety has received little regulatory attention in the world-wide wind energy community.

Questions of safety arise in respect to those who maintain and operate windmill equipment, and in respect to members of the general public who come into the vicinity of the equipment. Safety issues potentially arise if anyone is in the vicinity of a windmill when ice, which may under rare conditions, accumulate on the tower or the blades and subsequently slide or be thrown off by the rotating blades. Ice may accumulate under conditions of freezing rain, sleet or melting snow. Operators of the Tacke turbine installation at Kincardine, on the Bruce Peninsula, report a frequency of three such icing events every year. Ice accumulation events should be similar in Toronto.

Safety issues can be addressed either by operational avoidance or set-back criteria. Such set back criteria have been employed where operational controls are not used (e.g. as in remote rural or wilderness areas) where open space is plentiful. In urban areas, operational constraints are a more appropriate method to address safety concerns, where open space is limited.

It is feasible that any Windmill that is sited in Toronto be subject to constraints of operational controls. Windmills have wind sensors mounted on their nacelles. When wind is not detected, the windmill ceases operation. Such a sensor will almost always commonly “ice-up” before any rotating blades become coated with ice and the blades will stop rotating.. However, “almost always” can be improved upon by installing similar icing sensors as are used on aircraft to warn of the need for de-icing measures.

Once stopped, the blades can restart either automatically or by manual control only, depending on equipment specifications. It is here recommended that the City of Toronto should require a manual restart only capability. The restart process should also be linked to a flag placement and falling ice warning protocol to be the responsibility of the operator performing the manual restart.

Mitigation

Colin Morgan et al of Garrad Hassan and Partners have recently presented a paper (Morgan et al., 1999) sponsored under the Non-Nuclear Energy Programme of the European Commission, DGXII, and by the UK Department of Trade and Industry which assesses the safety risks arising from wind turbine icing. They present recommendations on the mitigation of icing risk as including:

- *The use of warning signs alerting anyone in the area of risk.*
- *Operational staff should be aware of the conditions likely to lead to ice accretion on the turbine, of the risk of ice falling from the rotor and of the areas of risk.*

For the WPC/Toronto Hydro proposed turbines, the following measures will be put in place from the beginning of operation of each turbine:

1. The turbine control system will be programmed to recognize icing conditions through the conditions of rotor blade (im)balance (which is constantly monitored), vibration, wind speed reporting, wind direction reporting and any other control system function that can assist in recognizing icing on the turbine blades.
2. As soon as an icing condition is recognized, the control system will perform a safe shutdown of the turbine. (The operator will also be able to initiate this shutdown either on site or remotely.)
3. The turbine will remain shut down until an operator travels to the site to inspect the condition of the turbine blades. When the operator deems that a re-start is safe, he/she will post the area with signs advising that the turbine is about to be re-started and the public should stay behind the signs until the signs are removed. The operator will ascertain whether any members of the public are within the signed area and if not, will re-start the turbine and remove the signs.

In addition, the following measures will be in place.

1. The area will be posted with signage that informs the public of the potential danger from falling ice should icing conditions exist.
2. The turbine operator will be trained to be aware of the conditions likely to lead to ice accretion

on the turbine, of the risk of ice falling from the rotor, and of the areas of risk.

It is important to note that the Toronto lakeshore is likely to be classified as an area of “Light icing” conditions according to Morgan et al.

Safety concerns regarding structural stability and ability to withstand wind force’s will be addressed by the proponents as part of their required technical specifications and as subject to the City’s approval as a component of the City’s lease agreements with the proponents. Maintenance protocols to address equipment or blade failures or damages (potentially leading to breakages) can also be addressed via lease agreements.

Decommissioning

As with construction, signs would be posted advising public to stay off site. If decommissioning occurs during the winter months, it will be necessary to take standard construction-site precautions with respect to icing. Due to the available mitigation measures, no significant effects are expected.

6.10 Social (Including Visual)

Construction

The turbine construction may be viewed as a temporary visual nuisance, particularly around the R.L. Clark site. The effect will diminish as the distance from the site increases. The visual effects can be offset to some extent by the maintenance of a tidy construction site, restoration of the construction site in a timely manner and the removal of excess construction material and equipment.

There may be a temporary, localized increase in dust, particularly during the excavation activities. This would be similar to any sort of small-scale excavation that occurs regularly in the city.

The social effects from the construction are not considered significant due to their temporary nature.

Operation

Visual issues and concerns are subjective, and very largely a matter of individual taste. Clearly, some people dislike the visual appearance of windmills, citing non-conformity with urban or historical cultural identity, or citing the looming presence of a tall structure adjacent to areas such as park areas. Equally clearly, some people like the visual appearance of windmills, citing the modern sculptural lines of a pro-

environmental mechanism in a dynamic urban setting, and siting the educational value of the presence of a clearly identifiable energy alternative structure adjacent to areas such as park areas. Given the conformity of view that windmills are a good thing but that they should be placed “somewhere else” and not “here”, and the recognition that everyone’s “somewhere else” is someone else’s “here”, a balanced answer is needed.

The pro-environment view is that small windmill projects are essential in urban areas to satisfy the need to put an energy alternative before the energy consuming public. Under this view, locating windmills at gateways to urban parks, and especially at gateways to natural heritage areas is a major benefit and goal.

Literature concerning the sociological impacts of wind farms suggests that the most commonly identified issues relating to social effects of siting wind turbines are noise and aesthetics. Further, it is well recognized in the literature that these concerns, while apparent in advance of the actual installation of the turbines, are significantly reduced once the turbines are installed and in operation.

Several studies have been carried out to evaluate the experiences of people who live near wind turbines. Generally, residents have responded quite favourably to local wind turbines, especially if they provided their homes with some electricity. One study surveys the attitudes of people living near the 24 wind turbine Cemmaes Wind farm in Wales both immediately after construction (Phase 1) and one year later (Phase 2). When asked the question “broadly speaking, are you for or against the Cemmaes Wind farm?”, the majority of respondents (86%) were in favour in both Phase 1 and Phase 2 of the survey; 12% Phase 1 and 11% Phase 2 were “neither for nor against”; 1% in both Phase 1 and Phase 2 “didn’t know”; and 1% in Phase 1 and 2% in Phase 2 were “against” the wind farm. Hence, both immediately after construction and one year later, very few local people surveyed (1%, 2%) felt negative about the wind farm.

With respect to the visual impact of the Cemmaes Wind farm, visual appearance was the potential effect most commented on before the wind farm had been constructed. Most comments were either neutral or positive. A few people (4%) had more serious reservations as to the potential negative visual impact but said they were “pleasantly surprised” by what they saw after they were built (Phase 1). Of the respondents who could see the wind turbines from their house, 75% made favourable statements about the wind farm. The study summary states, “Being able to see wind turbines did not bother the majority of people and led in some cases to respondents expressing increased interest and even pride in the machines”. The most common word (62%) chosen to describe the look of the turbines was “interesting”.

A Taff Ely residents’ survey, based on 336 face-to-face interviews carried out in homes near the Taff Ely wind farm, indicates that only 4% of the respondents opposed the development once it was in operation and 71% of residents couldn’t identify any drawbacks to the wind farm. When asked if they thought the wind farm fit into the scenery, many residents thought it made the scenery more interesting.

Hence, once the wind farm had been constructed and was in operation, the majority of local residents were either neutral or supportive of it. This is despite the “extreme opposition to the windfarm” expressed when it was first proposed. The local Mayor, Kate Rees and local Councilor, Mr. Scovie, recall there was a lot of controversy about the wind farm. Councilor Scovie stated he could not remember anybody who was for the wind farm when it was first proposed.

In response to a question regarding what Cemmaes windfarm respondents had heard about other local residents’ experiences of wind farms, noise problems were most frequently recounted. Hence, respondents surveyed at the Cemmaes windfarm tended to believe that other people’s experiences of windfarms were that they are noisy. When asked if the Cemmaes wind farm is noisy, 1% strongly agreed and 1% agreed at Phase 1 of the study and 2% strongly agreed and 14% agreed at Phase 2. Of the 14% who agreed that the windfarm is noisy, the majority did not live within earshot of the windfarm. Hence, 98% of the respondents at Phase 1 and 84% at Phase 2 felt that either the wind farm was not noisy or that they did not know, despite noise being originally identified as a common concern to communities living near windfarms.

A before and after study of opinion in Cornwall and Devon of the Delabole windfarm states that attitudes of residents living in the area of the wind farm changed significantly in the period between the two surveys, becoming more favourable towards the use of wind energy (e.g. 90% of those who changed their minds did so in favour of wind energy.) The response to the question, “In general do you approve or disapprove of wind power?”, the response was 84% approve (40.1% approve strongly, 44.5% approve) 11.4% were not sure and 4% disapprove (3.3% disapprove, 0.7% disapprove strongly).

Research regarding public attitudes towards the three wind farms in Wales based on a sample of 208 local residents indicates an overwhelming support for wind power in Wales and the three local wind farms upon which the research was centered. Respondents had become more positive towards wind power following construction of their local wind farm and, even where the turbines could be heard inside or outside of respondents’ homes, this did not necessarily turn them against the wind farm. Indeed, 70% were in favour of expansion (some subject to conditions), 22% against, 8% no opinion.

It has been the experience of TREC and Toronto Hydro that the most commonly identified potential social impacts of the waterfront wind turbine project are noise and aesthetics. It is well recognized in the literature pertaining to the sociological impacts of wind farms that these concerns, while apparent in advance of the actual installation of the turbines, are significantly reduced once the turbines are installed and in operation. Indeed, TREC and Toronto Hydro’s experience taking several local Etobicoke and Riverdale/Beach residents on a “Power Trip” up to visit the wind turbine on the Bruce Peninsula in Kincardine is consistent with these findings. The wind turbine tour showed that fewer residents had concerns associated with the intrusive social effects (noise and visual) of the wind turbine after they had visited the turbine. Further, the survey results indicate that the level of concern decreased significantly among those who had originally registered concern regarding noise and visual impact before the wind

turbine tour.

It is interesting to note that the aforementioned surveys of residents living close to wind farms are in environments typically defined as “pristine” or “natural” areas. The locations proposed for the TREC/Toronto Hydro wind turbines are in an urban environment, in close proximity to industrial buildings/facilities, i.e. in areas not notably pristine. Hence, the potential for persistent negativity with respect to the visual impact of the turbines could potentially be even less than what is indicated in the literature regarding sociological impacts.

The above data suggests that while there may be concerns about the potential for the turbine to be intrusive, this is not going to a significant environmental effect around any of the three proposed sites.

Decommissioning

The decommissioning of the turbine may create a temporary nuisance from a visual and noise perspective. Since the nuisance effects would be small in magnitude and very short term, no significant adverse environmental effect would be expected.

6.11 Cumulative Effects

Construction

The construction of the wind turbines takes approximately 3 weeks. Of this, only about half the time will involve the effects that are typically associated with construction. The environmental effects that have been predicted through this environmental assessment are not only limited in time, they are also limited spatially. They can be characterized as temporary increases in noise levels, some dust created from excavation activities and the movement of a few additional trucks, beyond what is already experienced on the streets leading to these sites. Given the short-term frame, the minor nature of the effects and the spatially limited range of these environmental effects, cumulative effects with other developments are not expected.

Operation

The concerns associated with the operation of the wind turbines are limited to noise, visual/social effects and bird disruption/mortality.

Studies presented in this document show that the disruption /mortality associated with bird (particularly birds) is in fact less than what would be expected from a typical house. The presence of the wind turbines in combination or with other proposed developments should not result in cumulative effects. Based on

studies it is expected that there will not be adverse social effects associated with the wind turbines. Finally, the sound emulating from the wind turbine will be consistent with the sound levels of an urban environment. The nature of sound is such that it would not accumulate should there be multiple turbines or other developments.

No cumulative effects are expected since the environmental effects of this wind turbine are minor.

Table 6 – 6 pages

7.0 PUBLIC AND AGENCY CONSULTATION

The following section provides a summary of public and agency consultation associated with this project. Additional details can be found in Appendices E and F.

7.1 Pre EA Consultation Activities

WPC and Toronto Hydro have been engaged in various levels of community process. Given that the benefits of the project (both economic and environmental) extend to residents of the City of Toronto and not only those living near to potential sites, outreach activities have been initiated at two scales: city wide and neighbourhood specific.

Before officially partnering with Toronto Hydro in June 1999, WPC began their site specific community consultation activities in March 1998 when the Toronto Islands were being considered as a potential location. Toronto Islanders were extremely supportive of siting a wind turbine at Gibraltar Point.

Many people attended the community meetings and participated in a Power Trip to visit Ontario's only wind turbine near the Bruce Peninsula. Of WPC's 54 pioneer members, 11 are Islanders who signed up as a result of community consultations. Despite significant community support, WPC could not pursue siting a wind turbine on the Island due to Transport Canada regulations governing Toronto Island Airport and surrounding area height restrictions.

WPC, and later Toronto Hydro, have concentrated their efforts in south Etobicoke and the south Riverdale/Beach area since February 1999. Through the application of the feasibility criteria and consultations with various City departments a number of potential waterfront sites were identified. These sites included the R.L. Clark Water Filtration Plant and the Colonel Samuel Smith Park in south Etobicoke and the Ashbridges Bay Sewage Treatment Plant and TEDCO land on Leslie Street near Unwin in the south Riverdale/Beach area.

WPC and Toronto Hydro have met with several key stakeholders from both the Etobicoke and Riverdale/Beaches communities and hosted their first and second in a series of public meetings in mid-July and mid/late October 1999. These meetings provided background information, which in turn helped govern the scope of the environmental assessment.

WPC and Toronto Hydro have engaged in extensive agency consultation processes at all three levels of government and public consultation on both the local neighbourhood and City wide scale. Consultations have been ongoing since early 1997. To date, it would appear that there is a significant degree of support at all levels of government. Both the City of Toronto and the Federal Government have expressed an interest in purchasing green power from the turbines and/or becoming TREC WPC

members.

WPC and Toronto Hydro believe that Toronto residents generally, as well as residents living near to and using the facilities at the candidate site locations, are either supportive or relatively indifferent to the waterfront wind turbine project and the siting objectives in south Etobicoke and the south Riverdale/Beach area. There are, however, a few people, particularly in Etobicoke, who remain opposed to the siting of a wind turbine at the R.L. Clark Filtration Plant.

With respect to the two sets of official public meetings, it would appear that there is more local support for siting a wind turbine in the south Riverdale/Beach community than in south Etobicoke. However, there are many residents of south Etobicoke that have expressed support or indifference to the project yet have not attended in the official public meetings.

WPC and Toronto Hydro agreed to the implementation of a community survey designed by a University of Toronto graduate planning student, to quantify the level of neighbourhood support/concern regarding the project's siting objectives. The survey was administered to 100 households in both south Etobicoke and the South Riverdale/Beach communities. This survey was intended to provide a clearer understanding of the community's positions with respect to siting turbines in their neighbourhoods. The surveys showed that over 70% of local residents in both Etobicoke and the Riverdale/Beach community are supportive of siting turbines in their neighbourhoods on the sites proposed for this particular project. Appendices G and H provide summaries of the surveys, and Appendix I provides a sample of the actual survey questions.

7.2 Consultation to Date on EA

WPC and Toronto Hydro hosted Neighbourhood Community Consultation (NCC) meetings that were open to all residents and local stakeholder groups of Wards 25 and 26 (the East Toronto community) and Ward 2 from the Etobicoke community. The role of the NCC meetings was to respond to the Scoping/Terms of Reference Document.

WPC and Toronto Hydro also hosted an Avian/Turbine Stakeholder Meeting in November 1999 to provide information relating to the potential negative impacts of wind turbines on birds and other wildlife.

7.3 Summary of Issues

Table 7 summarizes the issues and concerns that were raised through the public forums conducted to date on the EA and provides responses and/or comments addressing the issues and concerns.

Table 7: Public Comment-Response Table

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
Wildlife Impacts (including birds)	
<p>Turbines sited at TEDCO or ABSTP would be located too close to bird sensitive areas (areas with high concentrations of birds) and will likely kill, or disrupt the usage of surrounding lands by, many birds.</p>	<p>Siting guidelines have been established in various places in Europe and North America although many have proven to be invalid. Unless turbines are placed in a microhabitat where large numbers of birds are confined by topography or structures, avian mortality is going to be rare.</p> <p>The three sites being considered on the Toronto waterfront do not exhibit characteristics likely to enhance avian mortality. The tubular type of turbine to be used, with no guy wires or overhead transmission lines (far more deadly as they are much less visible), and a fixed slow speed of blade rotation that make them easily visible, are the least likely to cause mortality to flying animals.</p> <p>About 40,000 pairs of Ring-billed Gulls, 160 pairs of Herring Gulls, 300 pairs of Common Terns and a very few Great Black-backed Gulls nest in the Toronto Waterfront, primarily on the Eastern Headland. All colony areas are more than 2 km away from the nearest proposed turbine site.</p>
<p>Turbines on the waterfront will be situated within migratory bird flight paths and will likely kill many birds.</p>	<p>Long distance migrations of waterfowl are usually in large groups and tend to be very high. Large concentrations and shorter movements tend to be offshore. Most shorebird migrants completely overfly southern Ontario without stopping. In spring shorebirds are dispersed over a wide area. Birds making local movements are typically offshore. Small birds, primarily nocturnal passerines, migrate over the Toronto area in huge numbers, but they fly in a broad front all across the land. Hence, it is misleading to think that the Toronto shoreline, immediately along the lakefront running east-west is <i>the migratory corridor</i> – rather, migrations are dispersed over a wide area within the GTA from the lakefront all the way up to the Oakridges Moraine.</p> <p>Further, Studies of wind turbines at many sites, including coastal environments, have indicated that that avian mortality is not significant to bird populations. There is often no recorded mortality at all on sites with one or a small number of turbines. Even at larger sites the mortality is usually below one bird killed per turbine per year.</p>
	<p>The usual low rate of mortality is particularly relevant in light of the fact that studies to date have been almost entirely with variable speed turbine. Variable speed turbines are a more serious threat than fixed speed turbines. A fixed speed rotation of only 28 RPM, a design feature the proponents are committed to, should have an even lower mortality.</p> <p>The minimum red or strobe lights needed to meet Transport Canada regulations will also have minimal impact to nocturnal migrants.</p>

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
<p>CSS is a staging area for birds. A turbine at or near the Park will be a bird hazard.</p>	<p>Several studies in Europe have indicated that the most serious affect in their situation was disturbance to resting or staging birds. Avoidance would mean birds could not take advantage of foraging areas near turbines. But, even where birds avoided turbines at some distance in flight, they were not disturbed when they did land, and would often swim or walk much closer to feed.</p> <p>Such disturbance effects, however, are not going to be of concern at the Toronto sites. Turbines will not be located in areas providing rich food sources and are not located close enough to feeding sites to cause any appreciable loss of foraging opportunities.</p>
<p>Noise Impacts</p>	
<p>Turbines are noisy and would negatively impact the recreational enjoyment of Tommy Thompson Park.</p>	<p>Turbines will be 50 metres from sensitive park use, matches provincial standards for outdoor living space, adopted by Council. When it is windy, as it often is at Tommy Thompson Park, and the noise from the turbine would be at its loudest, the ambient noise from waves lapping and trees rustling would also be at its loudest thereby blocking out the noise from the turbine. When conditions are relatively calm, the turbine too would be relatively inactive, hence, the noise, both ambient and from the turbine, would be minimal.</p>
<p>Turbines located at either the Clark or CSS would be too close to households who would not want to hear them.</p>	<p>TREC and Toronto Hydro will abide by City Council standards regarding noise and potential impacts to City residents by ensuring 200 metres separation between wind turbines and residential low-rise dwellings and a 300 metre separation between wind turbines and high-rise residential buildings.</p> <p>At these distances, noise should not cause any disturbances to household residents. Noise studies of the proposed model of wind turbines indicate that noise levels measured at a distance of 200m are lower than noise levels of a quiet residential area. In fact, the level of noise of a turbine at that distance is comparable to that which would be experienced in the interior of an average residence.</p> <p>Distances between residents and proposed turbine sites at both the east and west ends of the City exceed the 200 metres requirement. At 1000 from the nearest household in the east and 260m in the west, a wind turbine would be inaudible.</p> <p>The only noise disruption residents would likely experience, would be the use of a ready-mix concrete truck during the construction phase of the project. However, noise impacts will only slightly exceed the typical noise pressures. At the east end sites, these noise impacts to local residents are calculated to amount to less than or equivalent to noise levels associated with common urban residential environments, while those at the west end sites would be equivalent to noise levels associated with common urban residential environments. Furthermore, the use of this vehicle is estimated to last a single working day during the short, two-week construction period.</p>
<p>Noise is carried across the water; hence, turbine noise would be amplified if located at certain locations at CSS that extend into the lake.</p>	<p>According to sound engineers from Dillon Consulting, there would be no “lake effect”, i.e., amplification of noise from the wind turbine over the lake. The turbine hub and wind swept area would be approximately 55-65 metres and 30-40 metres respectively above the surface of the water – distances too high up to reverberate off the surface.</p>
<p>Visual Impact</p>	

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
<p>Turbines located on the waterfront, particularly in waterfront parks, will impair the view of the lake.</p>	<p>Any perceived impairment of the view of the lake will be relatively insignificant given the size and dimensions of the turbines and the effects of locating them at the proposed sites. At a total height of 83 – 93 metres with a base diameter of 4 metres, 1 to 2 turbines on any given site should not amount to a significant impact on a view of the lake at either ends of the City.</p> <p>At the east end, the 1000 metres distance from residences to the Ashbridges Bay Sewage Treatment Plant and the TEDCO lands, removes the turbine from the immediate view of any given residence. At these sites, the turbines would be well behind any Park users’ view of the lake from the Park.</p> <p>The proposed site in the west end is estimated to cause minimal, if any, obstruction of the view of the lake. By locating a turbine on the southeast corner of the Clark Water Filtration Plant, park users would only ever be in front of the turbine. No view of the lake, or any other part of the park, would therefore be obstructed.</p> <p>Although a turbine in the CSS Park would be in clear view to all park users and many residences, its proposed siting at the southern tip of the park and relatively small footprint against the long, expansive shoreline will not, it is felt, impair a view of the lake to a significant extent.</p>
<p>Turbines are large industrial structures that would negatively impact the aesthetic of urban green space.</p>	<p>The footprint of a turbine is actually quite small. It sits on a 40’ by 40’ concrete pad, which can be landscaped over, and has a base diameter of only 4 metres. Unlike many other industrial structures, turbines do not have to be fenced off from park users and wildlife. In fact, once in place, fences will not be constructed in order to keep it accessible to the public.</p> <p>Further, many residents feel that these modern looking windmills would be beautiful additions to the landscape and that they symbolize a sustainable future.</p>
<p>Land Use</p>	
<p>Turbines should be sited somewhere outside of the City where they won’t be seen. Turbines are not usually sited in urban environments for a reason – it is not suitable.</p>	<p>While it is true that turbines are not usually sited in urban environments in North America, it has to be recognized that the industry is still in its infancy here. The idea of placing turbines in urban settings is cutting edge. However, developments in this area are being made: at least three turbines are located in schoolyards in populated areas in the U.S.</p> <p>In Europe, there are 6 large wind turbines in Copenhagen’s downtown portlands and twenty more are presently being installed in Copenhagen’s harbour. Many suburban areas in India have innumerable turbines.</p> <p>Furthermore, the City stands to gain from having the turbines located within its parameters. Not everyone knows about wind power and its potential economic and environmental viability. A primary purpose of the project is for people to be able to see a turbine and recognize that there are alternative ways of generating power, hence, renewable energy options available to them in the Ontario’s new competitive energy market.</p>

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
<p>Wind turbines do not belong in public parks – particularly parks with conservation goals.</p>	<p>We believe that within the City of Toronto, turbines would be appropriately sited in parks, even those with conservation goals, for several reasons:</p> <ul style="list-style-type: none"> • Our waterfront parks tend to have the best wind regimes in the City and therefore can provide the best sites for reducing emissions. • Conservation efforts need to address land, water, wildlife <i>and</i> air quality. Without good air quality, the success of our conservation efforts to plant trees, create habitat and wildlife corridors will be limited. It would require planting approximately 200,000 medium to large trees to displace the same amount of CO₂ as a single turbine could over the lifetime of its operation (app. 25 years). • The footprint of the turbine is very small and the base can be landscaped over. The impact to wildlife is extremely small or non-existent. Hence, turbines are not incompatible with creating habitat and the promotion of wildlife.
<p>Public lands should not be used by a private corporation.</p>	<p>The City of Toronto is Toronto Hydro’s sole shareholder. Toronto Hydro is incorporated under the <i>Ontario Business Corporation’s Act</i>. The Toronto Renewable Energy Co-operative is a non-profit co-operative. The benefits of introducing green power to the City of Toronto accrue to all citizens by way of emissions reductions. Clearly then, there is a substantial public good resulting from this project.</p> <p>There are many examples of private enterprises on public lands, some for the public good, others not. To name a few: the community gardens at High Park, the restaurant at High Park, the restaurant at City Hall, Hydro towers and lines on hydro corridors, the amusement park at Toronto Island and the numerous concession facilities and restaurants at Ontario Place.</p> <p>Toronto City Council has made a commitment to reduce 20% of its CO₂ levels by the year 2005 and to purchase 25% of its power from green sources. Therefore, the use of public lands toward achieving this goal is justifiable.</p> <p>There will be a leasing agreement between the City and the proponents whereby TREC and Toronto Hydro will have to pay market rates for the turbine sites.</p>
<p>One, two or three turbines on the waterfront may be OK, but we don’t want the entire waterfront taken up by wind turbines. Won’t three lead to four... five...six etc...?</p>	<p>This project is seeking to site only up to three turbines on the waterfront. Although Toronto Hydro’s long-term goal is to be able to offer customers more green power, this particular project only involves construction of up to three wind turbines, as passed by Toronto City Council in October 1999.</p> <p>In the case of TREC, any subsequent projects are subject to the collective decision of Board Members. Other than energy efficiency initiatives for TREC-WPC members, the TREC Board has not decided upon any future projects.</p>
<p>Land taken up by the turbine could add pressure for further lakefilling at the ABSTP.</p>	<p>The footprint of the turbine is relatively small (4 metres in diameter). Only one or two turbines are proposed for the ABSTP. Given the current plans for the site, it would appear that the pressure for lakefilling would come from the need to expand sewage treatment facilities, which far exceed the dimensions of the turbines.</p>

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
<p>Land taken up by the turbine could compromise the bio-solids project and potential storm-water treatment at the ABSTP.</p>	<p>In terms of jeopardizing the bio-solids project, we understand that it is well under way, that the pelletizer and loading facilities have already been located, some of the incinerators have been dismantled, and that submissions have been made with respect to the Mediator’s Report and environmental assessment. Hence, negotiations with Works on siting turbines at the ABSTP do not appear to have impacted the bio-solids project.</p> <p>In terms of storm-water treatment, turbines can be, and have been, sited in storm-water ponds; hence, they are not incompatible land-uses.</p>
<p>Since solar power is more adaptable to built form, why not work on a solar project instead of a wind project?</p>	<p>Wind energy is the first and only renewable energy to be cost effective. There is an 80 –year vs. a 15-year payback difference between solar and wind technologies.</p> <p>Furthermore, the long-term objective of Toronto Hydro is to establish a mix of ‘green power’. Toronto Hydro will have a forum in 2000 to expand the use of solar technologies in the City.</p>
<p>Project Viability</p>	
<p>There are not sufficient wind resources along the lake to justify this project.</p>	<p>Wind studies indicate that there are suitable winds for wind turbines at various sites along the lakeshore. Wind blows across the water onto the shore. This wind is desirable because the flatness of the water causes little turbulence and hence only minor effects on the flow of winds. Turbines at particular sites along the shoreline would be in good positions to receive these favourable winds.</p>
<p>We don’t want to put turbines along the waterfront if this is simply a “demonstration” project. Why not go with a smaller turbine that won’t take up so much space and that can go elsewhere?</p>	<p>There is an identified need for a visible and fully operational wind turbines. Not everyone knows about the use of wind turbines, particularly utility-scale wind turbines. Therefore, for future use and public buy-in of this technology, public awareness is needed.</p> <p>However, to promote the extent of its potential, TREC and Toronto Hydro seek to maximize the economic viability of wind turbines. As such, they have selected a size of wind turbine that is most cost-effective. The higher the turbine tower, and the longer the turbine blades, the more energy produced, the greater the emissions abated and the more cost-effective the project</p> <p>It cannot be overemphasized that it is important to provide citizens with a cost-effective alternative to non-renewable, polluting energy sources in Ontario’s new competitive energy market.</p> <p>Further, this project will amount to more than a demonstration project. It is projected to supply up to 900 homes with enough power to meet 100% of their energy needs on a yearly basis (assuming three wind turbines were constructed and depending on the energy efficiency and electrical loads of the homes).</p> <p>Each turbine will displace 1,400,000 kg of CO₂, 8,400 kg of NO_x, and 5,600 kg of SO₂ – very real contributors to climate change and urban smog.</p> <p>This project would also contribute in a very real way to the supply of ‘green power’ to the City.</p>

ISSUE OR CONCERN RAISED	COMMENTS AND RESPONSES
<p>Three turbines won't provide that much power... thousands would be needed to supply enough energy for the City of Toronto. Why not build a wind farm outside of the City?</p>	<p>Canada and Ontario lag far behind Europe and the U.S. in terms of wind energy production. Therefore, it is important to start somewhere. While this project will produce a small amount of power in relative terms, it has an important role in providing a visual reminder of where energy is coming from. While a turbine farm will produce more power, the purpose of this project is to leverage awareness and action for more 'green power' in the near future.</p>
<p>Safety</p>	
<p>The turbines would be located in areas with human traffic. Sleet and ice could form on the turbine and then fall on someone walking by.</p>	<p>There are two kinds of ice: rime and glaze. Only glaze ice is of concern in this area. The turbine can be shut down in freezing rain conditions and automatically shuts off when it senses a load imbalance on the blades. Ice shedding is therefore a minimal risk. However, to mitigate this risk, security checks and operational procedures will be undertaken to secure safety.</p> <p>For the proposed turbines, the following measures will be put in place from the beginning of operation of each turbine: 1. The turbine control system will be programmed to recognize icing conditions through the conditions of rotor blade (im)balance (which is constantly monitored), vibration, wind speed reporting, wind direction reporting and any other control system function that can assist in recognizing icing on the turbine blades. 2. As soon as an icing condition is recognized, the control system will perform a safe shutdown of the turbine. (The operator will also be able to initiate this shutdown either on site or remotely.) 3. The turbine will remain shut down until an operator travels to the site to inspect the condition of the turbine blades. When the operator deems that a re-start is safe, he/she will post the area with signs advising that the turbine is about to be re-started and the public should stay behind the signs until the signs are removed. The operator will ascertain whether any members of the public are within the signed area and if not, will re-start the turbine and remove the signs.</p> <p>In addition, the following measures will be in place: 1. The area will be posted with signage that informs the public of the potential danger from falling ice should icing conditions exist. 2. The turbine operator will be trained to be aware of the conditions likely to lead to ice accretion on the turbine, of the risk of ice falling from the rotor, and of the areas of risk.</p>
<p>What is the tolerance of wind turbines to high wind speeds? Are they likely to fall over in strong winds?</p>	<p>Wind turbines are built to withstand strong winds. A control within the turbine shuts it down when winds exceed 100km/hr. The towers themselves can withstand wind blowing at over two hundred kilometres per hour.</p>

8.0 CEEA DETERMINATION

Based on the assessment presented in this document, which has been completed in accordance with CEEA requirements, the project is not likely to cause significant adverse environmental effects. As such, the Responsible Authority may exercise any power or perform any duty or function that would permit the project to be carried out and shall ensure the implementation of appropriate mitigation measures identified in the Environmental Effects Analysis Section of this screening report.

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