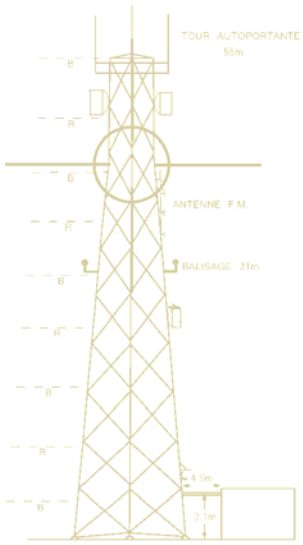
APPENDIX F

EMI PRELIMINARY IMPACT STUDY



ADELAIDE WIND FARM PROJECT
In the region of
STRATHROY, ONTARIO

PRELIMINARY IMPACT STUDY

IDENTIFICATION OF TELECOMMUNICATION SYSTEMS

Prepared for

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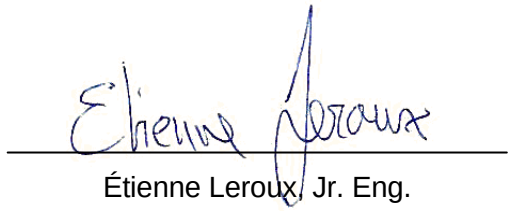
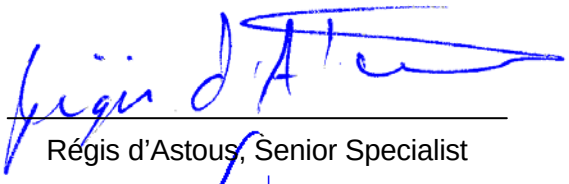
Team members in charge of the preparation of this document



Étienne Leroux, Jr. Eng.



Régis d'Astous, Senior Specialist

Maurice Beausejour, P.Eng.
March 12, 2009

Note: This document is written according to a mandate given to Yves R. Hamel et Associés Inc. by TCI Renewables Ltd. This document is based on data obtained mainly from the database of Industry Canada and third parties, for which no field validation was made. Consequently, the information and conclusions presented in this document are strictly informative. Yves R. Hamel et Associés Inc. as well as the people acting on their account cannot be held responsible for any direct or indirect damage connected to the contents of this document.

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ADELAIDE WIND FARM PROJECT
In the region of
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PRELIMINARY IMPACT STUDY
IDENTIFICATION OF TELECOMMUNICATION SYSTEMS

1 Introduction

Yves R. Hamel et Associés Inc., broadcast and telecommunications consultants have been mandated by TCI Renewables Ltd. to verify the impact of the deployment of a large scale wind farm on the telecommunication systems operating in the region of Strathroy, Ontario.

This report presents the results of the preliminary impact study, identifying telecommunication systems in the Adelaide wind farm area that might be affected by interference due to the deployment of the wind farm. This study aims, among others, to identify point-to-point microwave telecommunication links that intersect the proposed wind farm and to define the consultation zones associated with these links. The study also aims to identify radar and navigation systems susceptible to be affected by wind farm interference and to assess the potential for interference with radio and television broadcast signals.

Generally speaking, the methodologies used in this study are in line with the RABC/CanWEA published guidelines. In some specific cases, like for the AM stations and for the TV transmitter stations, the radius of the consultation zone used exceeds the guidelines, using two kilometres radius for the TV transmitter stations and up to 10 km for the AM stations under particular conditions. On the other side the consultation radius used is reduced to 500 m in the case of mobile radio stations as well as for the FM broadcast stations, as compared to the guidelines recommended 1 km. There is no reference in the technical literature and no documented case of interference attributable to nearby wind turbines for these types of systems, justifying consultation radius larger than 500 m.

The results of this study will determine the extent of the second phase which will consist in a detailed study aiming to evaluate the extent of potential interference to specific systems, the level of degradation and to recommend alternative solutions where required.

2 Discussion

Previous studies from different sources indicate that almost every telecommunication systems could be affected by the operation of a wind turbine in extreme proximity cases. In more realistic cases for many systems, interference is not noticeable when a spacing of only a few rotor diameters between the telecommunication systems and the wind turbine exists.

Generally speaking, the interference issues from wind turbines can be from two different sources; the *obstruction* of the radio wave caused by the wind turbine and the *reflections* of the radio wave from the wind turbine's surfaces. Both types of interference can degrade the received signal and affect the performance and reliability of the communication systems.

Many different parameters, related to the wind turbine itself, influence the importance of the interfering signals. The type of wind turbine (vertical or horizontal axis), the rotor diameter, the number and shape of the blades, the material used for the blades, the shape and size of the supporting tower, the shape and size of the nacelle, all have an impact on the resulting obstruction or reflection of the signal. Similarly, the parameters of the telecommunication systems such as the type of modulation, the frequency and the signal polarisation, the relative position of the transmitter, wind turbine and receiver as well as terrain topography, antenna radiation pattern and propagation conditions, also have an impact on their vulnerability.

The main cause of wind turbine interference is the conductive nature of the metallic or carbon fiber turbine blades. The rotation plane of the blades appears as a significant conductive surface causing obstruction or reflection of signal. Fiberglass-epoxy blades offer some improvement but do not solve the problem entirely as the presence of wires connecting lighting receptors at the tips of the blades to ground is often sufficient to make the blade appear equivalent to a metallic element.

The following system categories are considered to be vulnerable to the wind turbine interference under certain conditions and will be discussed in more details in the following section.

- Broadcast systems, TV, FM radio and AM radio;
- Cable TV operators cable head;
- Navigational aids systems, VOR;
- Mobile systems, VHF and UHF mobile, cellular and PCS;
- Point-to-point radio systems, UHF, microwave and satellite links;
- Point-to-multipoint systems, FWA, MMDS, LMCS;
- Navigational and meteorological radar systems;
- Canadian National Seismograph Network.

3 Systems Identification

3.1 Broadcast Systems

3.1.1 Television Broadcast Station

Of the telecommunication systems susceptible to suffer interference from the wind turbine operation, the analog television reception is probably the most likely to be affected. Analog television interference from wind turbine generally occurs as video distortion taking the form of a jittering of the picture synchronized with the blades passage frequency. The impact on the aural channel is generally not perceptible as it is a frequency modulated (FM) sub-channel.

There is no simple rule to determine the minimum separation, between wind turbines and analog TV transmitter or receiver, insuring interference free operation. The topographic information and the relative positions of the sites are important parameters. Interference free operation have been encountered in some cases at relatively close distances of less than a kilometre, while unacceptable interference have been experienced at distances exceeding 10 km. Each case needs to be evaluated separately to consider the actual field conditions.

The operation of television transmitters is regulated and each television station has an associated protected service contour, within which interference from other stations affecting the quality of signal reception is not allowed. The deployment of wind turbines in close proximity to a television station is problematic as it may degrade a large portion of the service contour area and special care should be taken as the distance between the wind turbine and the transmitter decrease. The deployment of wind turbines within the protected service contour will have an impact on receivers in the vicinity of the wind farm by producing static local ghosting and dynamic local ghosting for which the level of degradation needs to be evaluated.

Static ghosting is not a new phenomenon with analog TV broadcasting and is noticeable in the vicinity of most structure like buildings, barns, high voltage power line towers, billboards, even hills and mountains. This type of static ghosting is relatively common and tolerated since the origin of the North American analog television system deployment. In order to improve the performance of the analog television transmission technology, an update of the NTSC standard called the Ghost Cancelling Reference (GCR) was introduced in 1994 to eliminate, or at least reduce, the impact of such ghosting. However not all television broadcasters implemented this feature. On the other

side, dynamic ghosting caused by the rotation of the wind turbine blades is attributable directly to the wind turbines operation. Such dynamic ghosting can also take its origin in other sources, like airplanes flying at relatively low altitude in the vicinity of airports or heavy trucks driving down the road. In each case, some mitigations measures are often successful, but cannot always solve the issue.

In the case of the Adelaide wind farm project, protected service contours of 12 analog TV stations overlap partially or entirely with the wind farm project analysis zone. The identified stations are listed in the table below. There is no TV station transmitter located within or in the vicinity of the wind farm area.

Table 1 - List of TV stations whose service contours overlap the wind farm project area.

STATION	NETWORK	TRANSMITTER LOCATION
CKCO-TV-3	CTV	SARNIA
CIII-TV-29	GTN	SARNIA-OIL SPRINGS
CKCO-TV	CTV	KITCHENER
CJMT-TV-1	INDEPENDENT	LONDON
CITS-TV-2	INDEPENDENT	LONDON
CHCH-TV-2	INDEPENDENT	LONDON
CBLN-TV	CBC	LONDON
CICO-TV-18	TVO	LONDON
CFPL-TV	INDEPENDENT	LONDON
CBLFT-9	CBC	LONDON
CFMT-TV-1	INDEPENDENT	LONDON
CIII-TV	GTN	PARIS

Many TV broadcast operators are in the process of converting their analog NTSC TV stations to the ATSC North American digital standard. As required by a decision of the CRTC (Public Notice CRTC 2007-53), this transition process must be completed prior to or at the latest on the 31st of August 2011. Considering that the Adelaide wind farm implementation will most probably occur after that date, the detailed impact analysis on the analog TV reception would not be required, since the analog TV stations should be shut down before the wind farm begin operation or shortly after. The impact of wind farm on digital television (DTV) reception is not known precisely, but it is

well known that DTV is much more robust than the analog NTSC system. Most of these 12 analog TV stations will be replaced by new digital TV stations.

Based on the ATSC technology evaluation and on preliminary information available with regard to DTV performance under multipath propagation, it is estimated that the wind farm implementation should not have any significant impact on the quality of DTV signal reception with regard to the static structures. However, the movement of the blades could cause potential quality of reception degradation within appreciable distances, up to several hundred meters, from the wind turbines. A detailed analysis of the potential impact of the wind farm on DTV signal reception would be required, but since the acceptable degradation threshold for DTV reception and the operational parameters of the future DTV stations are not known yet, it is not possible at this stage to evaluate the potential impact on the quality of the DTV signals reception.

The proposed wind farm area is located in a rural region sparsely populated. According to the 2006 census data, there would be approximately 650 peoples residing within the proposed wind farm area, distributed among approximately 225 dwellings.

3.1.2 Cable Television Reception Systems

It has not been possible to validate any information regarding the existence of an off-air TV pick-up feeding a cable TV system in the wind farm area. Rogers Cable Communication is operating a cable distribution network in the municipality of Strathroy, however it is likely that this network is fed from the main cable network, not using any local off-air signal pick-up. This will need to be validated during the second phase of the study.

3.1.3 FM Broadcast Station

Previous studies and simulations in laboratories have shown that FM broadcast reception is generally not affected by the wind turbine operation, as long as a minimum distance of a few hundred meters from the wind turbine is maintained. Perception of FM reception degradation would take the shape of a background “hissing noise” synchronised with the blades rotation. Noticeable degradation would typically only happen on the fringe of the coverage area of a station, as the signal to noise ratio is already marginal (<12 dB) and at close proximity to the wind turbine. These conditions occur mainly outside the protected service contours of the stations.

There is one FM broadcast transmitter stations located at proximity of the proposed wind farm area. A 500 m radius consultation zone has been defined for that FM station.

Table 2 - List of FM stations within or at proximity of the wind farm project area.

STATION	NETWORK	TRANSMITTER LOCATION
CJMI-FM	INDEPENDENT	STRATHROY

3.1.4 AM Broadcast Station

Just like television signals, AM broadcast signals are amplitude modulated and as such could experience interference from wind turbine operation. However, the AM broadcast systems operate at very low frequency with wavelength much longer than TV signals and thus are not reflected by wind turbine components. The reception of AM broadcast signals will not be affected, unless the receiver is very close to the wind turbine itself (less than a few meters). One should note that the construction of any metallic vertical structure near an AM antenna system (within a few wavelengths) would modify the radiation pattern of the antenna system, as the new structure will react as a secondary radiator. Considering the lightning protection cables within the wind turbine blades, the placement of a wind turbine within proximity of an AM station array might cause serious service disruption.

There is no AM broadcast transmitter station located within or near the proposed wind farm area.

3.2 Navigational Aid Systems

3.2.1 VOR /Localizer Systems

The VOR (VHF Omnidirectional Range) use frequencies in the 108-118 MHz band and a combination of amplitude and frequency modulation to facilitate aircraft short-range navigation. The VOR ground stations are generally located within the boundaries of airports but are sometimes located along main navigation corridors for en route navigation. A clear area of approximately five hundred meters around ground stations should be maintained for proper operation and precision of the airborne receiver. Tall buildings or structures should be avoided at larger distance from the station to avoid distortion of the variable azimuth signal. Previous investigation has shown that wind turbine structures can be considered as static structures with

regard to VOR operation and the Transport Canada Aeronautical Obstruction Clearance should be obtained as for any other tall structure.

There are no VOR stations located within the proposed wind farm area and we do not anticipate any interference issues concerning these systems.

3.3 Mobile Systems

All mobile systems operating in the VHF, UHF bands as well as the Cellular or PCS systems in the 800 and 1900 MHz bands use some form of frequency or phase modulation which similarly to the FM broadcast systems, are not considered susceptible to wind turbine interference. Even if interference is theoretically possible at very close distance from the wind turbine under weak signal conditions, there is no reference in the literature describing any encountered real case. We do not expect any significant interference with that type of systems.

There is no cellular, PCS or mobile telecommunication base stations located within the proposed wind farm area. We transmitted a request to the Royal Canadian Mounted Police (RCMP) to identify their mobile and other systems that could be in the wind farm project area and they confirmed they have no system within the Adelaide wind farm area.

3.4 Point-to-point Systems

The point-to-point telecommunication systems are used to link broadcast stations to their associated studio as well as for a multitude of applications associated with different utilities. The telephony and data networks use microwave point-to-point links and especially with the expansion of the cellular systems, microwave links are used to link every base station to their associated switching centre. At UHF and microwave frequencies, point-to-point links require clear line of sight between communicating stations. The presence of structures on each side along the path may cause signal reflection partially cancelling the direct signal to the point where the communication may be disrupted.

The construction of wind turbines at close proximity to a point-to-point path is even more damaging than a static structure, considering the amplitude modulation effect and the Doppler Effect introduced by the rotation of the blades. Many references in the literature have evaluated the required clearance between the path optical line of sight and any wind turbine along the path

and most conclude that the minimum distance to be maintained to ensure an interference free operation is 3 times the first Fresnel zone radius. The first Fresnel zone radius depends on the frequency of operation of the link, the path length and the position along the path.

An additional lateral distance equivalent to the wind turbine rotor radius is also included to ensure that the rotor blades clear entirely the path exclusion corridor.

In the case of the Adelaide wind farm, three point-to-point links intersecting the proposed wind farm area have been identified. The associated exclusion corridors and consultation zones appear on the map included in the Annex 1. A fourth microwave link is terminating at proximity of the wind farm project area, at the CJMI-FM broadcast station. The associated 500 m radius consultation zone is coinciding with the FM station consultation zone. It should be noted that these corridors were calculated using the coordinates from Industry Canada's database which are known to be occasionally inaccurate with an error of up to a few hundred meters on rare occasion. Our analysis therefore included an error allowance of 100 m. If wind turbines are to be placed close to the path exclusion corridor, it would be required to verify on site the coordinates of the concerned structures, so as to validate the position and to reduce the width of the exclusion corridors to its minimum. The following table lists the sites that should potentially be verified.

Table 2 - List of sites coordinates which may require field measurements

Location	Latitude (NAD83)	Longitude (NAD83)	Elevation (m)	Operator
STRATHROY, CJMI-FM STUDIO	42° 57' 34" N	81° 36' 56" W	224	MY Bcast Corp.
STRATHROY, CJMI-FM STATION	42° 58' 01" N	81° 39' 02" W	232	MY Bcast Corp.
STRATHROY, HWY 402/WALKERS DR.	42° 58' 00" N	81° 33' 28" W	239	Rogers Wireless
WATFORD, ONTARIO	43° 00' 15" N	81° 48' 13" W	251	Rogers Wireless
STRATHROY, ONTARIO	42° 58' 53" N	81° 37' 39" W	242	Bell Mobility
WARWICK, ONTARIO	42° 59' 23" N	81° 49' 58" W	247	Bell Mobility
WATFORD (ON0545), ONTARIO	42° 58' 49" N	81° 52' 44" W	232	Telus Communic.
STRATHROY (HWY 402 - ON0539), ON	42° 58' 40" N	81° 35' 09" W	229	Telus Communic.

Because of the relatively flat topography of the region of the wind farm, it is not possible to build wind turbines directly under the microwave links, but the verification of the precise location of the microwave sites can be required.

The same clearance criteria also apply to the satellite communication earth stations typically operating in the microwave bands between 4 GHz and 14 GHz. Once azimuth and elevation angle of an earth station pointing at a specific satellite are known, the minimum distance to the

closest wind turbine in a given direction can be evaluated. There is no licensed earth station identified within the wind farm project area.

The Direct to Home (DTH) satellite TV services are very popular in these rural areas where cable networks are often non-existent. The wind turbine located near and in the southern sector of any populated cluster will require a special attention with regards to DTH satellite services. In the area of the Adelaide wind farm, the typical minimum distance required between the wind turbine and the neighbouring buildings should be sufficient to eliminate any impact on the DTH satellite reception.

3.5 Point-to-Multipoint Systems

Point-to-Multipoint systems are gaining in popularity in rural areas to offer services such as telephony, internet access and wireless cable TV networks. These systems operate in different frequency bands from 1.5 GHz up to 40 GHz with many different types of modulations. In the case of the point-to-multipoint systems oriented toward general public, the position of the users are unknown and the protection of these systems can be limited only to the base stations of these systems. When required, a consultation zone of 0.5 km radius is also associated with these stations as in the case of the mobile systems and the installation of wind turbines could sometimes be carried out as close as the limit of the physical protection of the radio station.

However, in the case of the point-to-multipoint systems whose remote stations require a licence from Industry Canada, they are treated like multiple point-to-point systems in our analysis and are therefore included in the previous section of this study. No such point-to-multipoint systems have been identified within the wind farm project area.

3.6 Radar Systems

Radar systems generally operate in the microwave frequencies from 1 GHz to 10 GHz or more, and use the radio wave reflection to locate and identify any eventual target. Military and civil usage of radar systems is mainly related to air traffic control and meteorology to name a few applications. Any fix structure in the radar station line of sight will reflect a part of the signal transmitted by the radar back to the radar receiver which will process it. The echo from the structure will be similar to the echo from an aircraft, but will show different particularities

designated as its radar signature and processing can differentiate between a structure signature and an aircraft signature, even between two different types of aircraft.

When the structure is fixed, filtration and processing can generally eliminate the structure signature from the radar display, reducing the impact for the radar operator. The navigational radar, especially the long range radar, typically have a slight positive antenna elevation angle, such that structures far enough from the radar station are not visible from the radar station position and generally do not cause any significant radar response. Moving structures like wind turbine cause important disturbance to radar operation, since the signature is continuously changing according to rotor speed and wind direction. Especially when many wind turbines are clustered in relatively large wind farms, the filtration and processing of these radar echoes become virtually impossible.

The meteorological radars operate in the same way and attempt to measure the cloud density and precipitation as close as possible to the earth surface. In order to achieve a larger coverage area, they are usually installed on higher platforms and their antenna elevation angles are generally close to the horizon and sometime negative, depending on local topography. The presence of fix structures can be dealt with in the same way as for the navigational radar, however since the radar beam is grazing the earth surface, echo from structure even over the horizon are often seen. Attempts to develop filtration and complex processing to cancel the responses from moving structures like wind turbine have been made with disappointing results. The research is currently oriented towards the development of rotor blades and nacelles using radar absorbing materials, but commercial availability of these “stealth” wind turbines is still for the future.

Based on the RABC/CANWEA guidelines, a consultation zone of 60 km radius is required around the Air Traffic Control (ATC) radar stations and around Canadian Coast Guard (CCG) radar station, while an 80 km radius consultation zone is required around the meteorological radar stations. Similarly, the Department of National Defence (DND) requires a 100 km consultation zone around the so called defence radar stations.

There is one Environment Canada (EC) weather radar station within an 80 km radius of the wind farm. The Exeter weather radar station is located approximately 44 km north east of the wind farm area and the final layout of the wind farm has been provided to EC for their analysis.

There is also one Nav Canada ATC radar station located within 60 km of the proposed wind farm area. The London radar station is located approximately 40 km east of the wind farm area and is including a dual frequency Primary Surveillance Radar (PSR) and a collocated Secondary Surveillance Radar (SSR). At the considered distance, the SSR will not be impacted by the wind farm, however the PSR operation does not offer the same level of resilience to the Doppler content introduced by moving targets like wind turbine blades. The Nav Canada assessment of the wind farm impact will be done through the required land use proposal process.

We also transmitted a request to the Department of National Defence (DND) to identify their communication systems, navigational aids, radar or others systems that could be in a radius of 100 km of the wind farm project area. The DND confirms that none of their communication, radar or navigational aid systems is near the wind farm project area and indicates that they have no objection with this wind farm location.

3.7 Seismological Systems

Even if the seismological stations are not really part of the telecommunication systems, the discussion which took place within the RABC/CANWEA Joint Working Group indicated that it was preferable to include these systems within the telecommunication impact study.

Seismological sensors are very sensitive equipment capable of measuring earthquake tremors much lower in amplitude than what can be felt by the population. Many different national and international seismological networks exist and some stations are also used to monitor the application of the International Nuclear Test Ban Treaty, sometimes able to detect a detonation of 100 tons of conventional explosives, more than 5000 km away. Studies have shown that the vibration of a single wind turbine transmitted to the ground through the supporting concrete pad can travel on relatively long distance and reduce significantly the sensitivity of the seismological instruments.

It has been agreed within the Joint Working Group that a consultation distance of 50 km from a seismological monitoring array and 10 km from a single monitoring station would be required and that the impact of any wind farm project located within these distances from a seismological station should be analyzed on a case by case basis.

There is a seismological station located approximately 32 km of the proposed wind farm area. The Elginfield station is made of a basic accelerometer seismological station which should not be impacted by the wind farm installation, however it is also equipped with an infrasound measurement array which could suffer a significant reduction in sensitivity caused by the infrasound generated by the wind turbines and transmitted to the ground through the wind turbine concrete pads. There is no specific consultation zone defined for that type of infrasound station, however consultation with Natural Resources Canada and the University of Western Ontario who are operating that station has been initiated.

4 CONCLUSION

The inventory and preliminary analysis of every telecommunication systems listed in the Industry Canada database and located within 100 km of the wind farm project area, allowed to identify the systems which could suffer interference from the planned Adelaide wind farm project.

The quality of the analog TV reception within or in the vicinity of the wind farm area will not require further analysis during the detailed impact study, since all analog TV stations should be shut down before august 31, 2011, hence prior or approximately at the same time as the expected date of implementation of the wind farm. In the case of the DTV stations which will replace most of the current analog TV stations, the currently available information indicates that there should not be any significant impact from the wind farm on the DTV performance with regard to static structures, however the movement of the rotating blades could cause quality of reception degradation at proximity of the wind turbines. Further analysis of digital TV signal reception could be required, once the operational parameters of these stations will be made available.

There is no TV or AM transmitter station located within or at proximity of the wind farm area itself. There is however an FM broadcast station located at proximity of the wind farm project area. A 500 m radius consultation zone has been defined around that station and if no wind turbines are placed within that consultation zone, no further analysis will be required.

Our analysis identified three microwave links intersecting the proposed wind farm area. The appropriate exclusion corridors are presented in Annex 1 and all wind turbines have been positioned with due consideration of these corridors. The coordinates of the microwave terminal stations for the related links should be measured with precision in the field, in order to validate the Industry Canada data and allow a substantial reduction of the width of the exclusion corridors.

There is no mobile telecommunication systems located within the proposed wind farm area. The Royal Canadian Mounted Police (RCMP) confirmed that they do not have any mobile or other systems located within the wind farm project area.

There is one Environment Canada weather radar station located within 80 km of the proposed wind farm area. The final layout of the wind farm has been submitted to EC for further analysis.

There is one Nav Canada ATC radar station located within 60 km of the proposed wind farm area. Nav Canada will evaluate the potential impact through the required Land Use Proposal process.

The DND confirms that they have no objection with the proposed wind farm area with regards to communication, radar or navigational aids systems.

There is also an infrasound measurement station located approximately 32 km from the wind farm area. Consultation with the University of Western Ontario has been initiated, allowing them to evaluate the potential impact the wind farm could have on the performance of this infrasound station.

It is necessary to add that all these evaluations, the produced exclusion or consultation zones and the conclusions of this report are primarily based on the information published in the database of Industry Canada or other sources. Some of these information could have to be validated during or prior to the detailed impact study.

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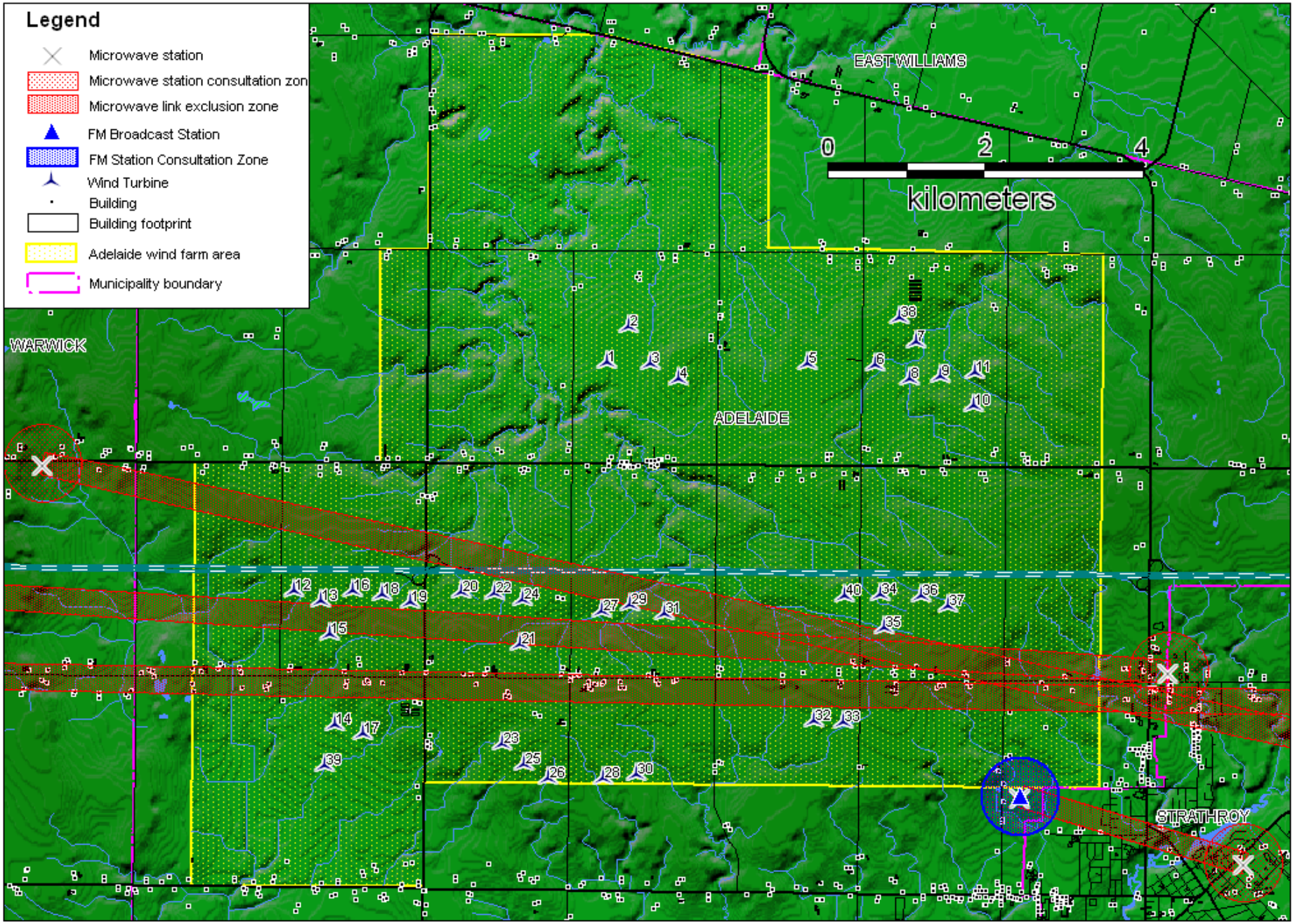
RABC/CANWEA “Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines on Radiocommunication, Radar and Seismoacoustic System” April 2007.

Canadian Radio-television and Telecommunications Commission, ‘’Broadcasting Public Notice CRTC 2007-53’’, 17 may 2007.

Annex 1

General View of the Adelaide Wind Farm Project

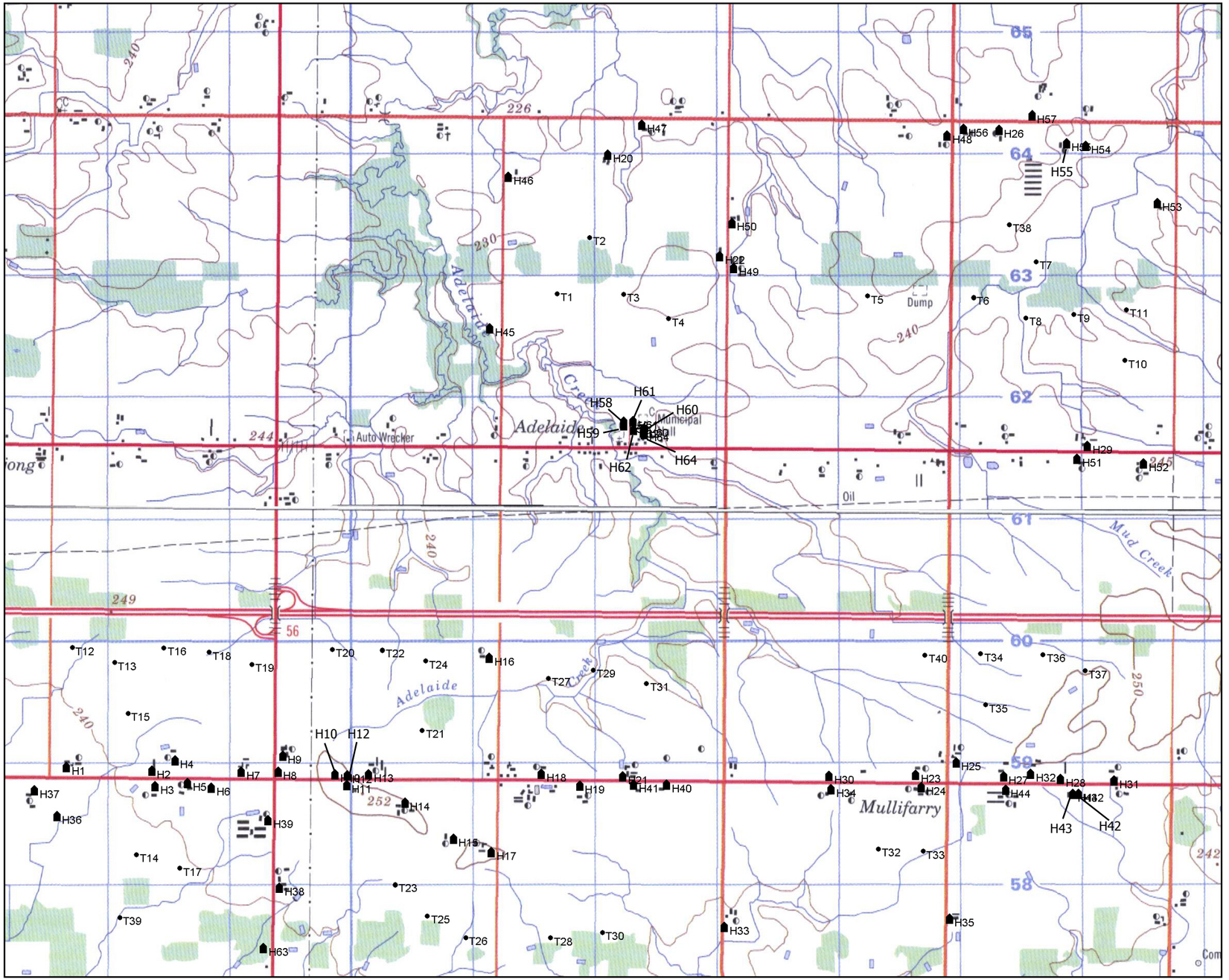
OVERVIEW OF THE ADELAIDE WIND FARM PROJECT
AND ASSOCIATED TELECOMMUNICATION CONSULTATION ZONES



APPENDIX G

SHADOW FLICKER

SHADOW FLICKER ANALYSIS



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Note

Potential receptors were initially identified as residential properties located within 10 blade diameters of a wind turbine - in this case 900 metres. These locations were input into the software model and a potential level of shadow flicker effect produced for each location. (See next page)

Title

Shadow Flicker

Potential receptors and turbines

Project

Adelaide Wind Farm
Adelaide, Ontario

Project : Adelaide Wind Farm

SUMMARY OF SHADOW TIMES ON EACH WINDOW

House/ Window	Easting	Northing	Width (m)	Depth (m)	Height (m)	Degrees from North	Tilt angle	Days per year	Max hours per day	Mean hours per day	Total hours	Total adjusted hours
1/ 1	437663	4758959	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
2/ 1	438366	4758931	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
3/ 1	438393	4758804	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
4/ 1	438555	4759018	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
5/ 1	438660	4758829	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
6/ 1	438852	4758789	1.0	1.0	2.0	0.0	90.0	25	0.28	0.23	5.7	**2.17**
7/ 1	439100	4758923	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
8/ 1	439403	4758925	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
9/ 1	439439	4759052	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
10/ 1	439871	4758902	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
11/ 1	439966	4758815	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
12/ 1	439969	4758896	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
13/ 1	440146	4758903	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
14/ 1	440444	4758671	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
15/ 1	440842	4758373	1.0	1.0	2.0	0.0	90.0	79	0.59	0.53	42.2	**16.12**
16/ 1	441138	4759860	1.0	1.0	2.0	0.0	90.0	84	1.52	0.96	80.2	**30.64** (see next page)
17/ 1	441155	4758263	1.0	1.0	2.0	0.0	90.0	39	0.46	0.35	13.8	**5.27**
18/ 1	441565	4758907	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
19/ 1	441880	4758811	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
20/ 1	442112	4763995	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
21/ 1	442236	4758885	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
22/ 1	443031	4763157	1.0	1.0	2.0	0.0	90.0	40	0.45	0.35	14.1	**5.39**
23/ 1	444640	4758898	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
24/ 1	444685	4758797	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
25/ 1	444973	4758997	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
26/ 1	445326	4764198	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
27/ 1	445363	4758884	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
28/ 1	445830	4758866	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
29/ 1	446051	4761600	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
30/ 1	443927	4758891	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
31/ 1	446272	4758850	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
32/ 1	445585	4758904	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
33/ 1	443071	4757649	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
34/ 1	443944	4758781	1.0	1.0	2.0	0.0	90.0	52	0.51	0.43	22.3	**8.52**
35/ 1	444917	4757714	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
36/ 1	437584	4758558	1.0	1.0	2.0	0.0	90.0	42	0.52	0.41	17.1	**6.53**
37/ 1	437399	4758772	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
38/ 1	439413	4757971	1.0	1.0	2.0	0.0	90.0	38	0.45	0.35	13.4	**5.12**
39/ 1	439320	4758524	1.0	1.0	2.0	0.0	90.0	55	0.48	0.37	20.4	**7.79**
40/ 1	442596	4758817	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
41/ 1	442323	4758818	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
42/ 1	445978	4758740	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
43/ 1	445930	4758743	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
44/ 1	445381	4758774	1.0	1.0	2.0	0.0	90.0	63	0.45	0.39	24.4	**9.32**
45/ 1	441142	4762567	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
46/ 1	441293	4763813	1.0	1.0	2.0	0.0	90.0	52	0.47	0.37	19.1	**7.30**
47/ 1	442390	4764241	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
48/ 1	444900	4764150	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
49/ 1	443145	4763062	1.0	1.0	2.0	0.0	90.0	76	0.53	0.48	36.3	**13.87**
50/ 1	443129	4763433	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
51/ 1	445967	4761495	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
52/ 1	446513	4761457	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
53/ 1	446625	4763598	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
54/ 1	446037	4764066	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
55/ 1	445879	4764088	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
56/ 1	445032	4764206	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
57/ 1	445596	4764316	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
58/ 1	442243	4761799	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
59/ 1	442243	4761770	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
60/ 1	442406	4761740	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
61/ 1	442321	4761805	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
62/ 1	442323	4761729	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
63/ 1	439283	4757476	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	
64/ 1	442410	4761701	1.0	1.0	2.0	0.0	90.0	0	0.00	0.00	0.0	

A total adjusted figure, in bold, is included in the data table to accommodate the Sunshine Index factor (see below). As can be seen above, only one receptor, House 16, has the potential to exceed the internationally accepted annual limit of 30-hours. This is before other mitigating factors such as tree screening and window locations are taken into consideration.

A more detailed study was made of the potential effect at this receptor. (See following page)

Weather Data from London Airport Database - Sunshine Index

Bright Sunshine	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total hours	65.9	91.5	119.5	162.1	220.6	243.4	262	221.9	162.8	128.2	69.7	52.4
Days with measurable sunshine	18.6	19.6	22.5	24.6	27.4	28.6	30.2	29.1	26.3	25.7	18.7	16.4
% of daylight hours	22.6	30.9	32.4	40.4	48.6	53	56.3	51.4	43.3	37.4	23.8	18.6

Sunshine Index

The figures in the data table (left) are taken from weather database at London Airport.

The figures reveal an average incidence of sunshine over the year of 38.22% against total daylight hours. These measurements indicate that the figures determined from the WindFarm model would need to be adjusted to give a more accurate reading of potential shadow flicker.

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Note

To approximate the level of effect at each location, these shadow times have been assessed on a worst-case-scenario: a horizontal 1.0 metre square window with an unimpeded view of the sun. This does not take into account any other conditions which might affect the intensity and/or duration of shadow flicker.

Title

Shadow Flicker Data
Tables of shadow times at all potential receptors
Layout 27 - March 2009

Project

Adelaide Wind Farm
Adelaide, Ontario

Data Table : Levels of shadow flicker effect at five individual windows on the most affected house from the main shadow flicker analysis table, identified as House 16 located on Brown Road.

The photograph above shows the northwest corner of the house. Windows are affected on all four walls, however there will be some masking from the surrounding trees. Application of the Sunshine Index brings the level of effect on all windows to well below the annually accepted levels.

Project : ADELAIDE

Run Name : **C:\WINDFARMR4\ADELAIDE\KADELAIDE003.WFK**
Title : Most Affected participating house
Time : 15:22:30, 10 Apr 2009

SUMMARY OF SHADOW TIMES ON EACH WINDOW

House/ Window	Easting	Northing	Width (m)	Depth (m)	Height (m)	Degrees from North	Tilt angle	Days per year	Max hours per day	Mean hours per day	Total hours	Total adjusted hours per year
16/ 1	441138	4759860	0.8	1.2	2.0	0.0	0.0	34	0.43	0.33	11.3	4.3166
16/ 2	441138	4759860	0.7	1.0	4.0	90.0	0.0	76	0.80	0.55	41.7	15.93
16/ 3	441138	4759860	0.8	1.0	2.0	180.0	0.0	87	1.43	0.81	70.3	26.86
16/ 4	441138	4759860	2.0	1.0	2.0	270.0	0.0	55	1.03	0.73	40.2	15.36
16/ 5	441138	4759860	0.8	1.0	4.0	0.0	0.0	33	0.43	0.34	11.2	4.28

Consultation

Given that there is the potential for shadow flicker to be marginally above the internationally recognised 30 hour threshold at House 16, a detailed consultation was entered into with the owner of the property.

It is important to note that the owner of House 16 has signed an Option/Lease agreement with AET and therefore is considered a participating receptor.

AET prepared literature and held a private scheduled meeting with the owners (15/12/08) to discuss the impacts and demonstrate the effects.

Using "WindFarm" software it was possible to show more precisely the potential times and durations of the shadow flicker effect. The owner agreed in writing that these levels were acceptable and that there were potential mitigating measures which could be put in place should the effect cause annoyance.

A copy of the agreement can be supplied on request.

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Note

SUNSHINE INDEX
The total adjusted hours figures reflect the average incidence of sunshine over the year of 38.22% against total daylight hours. See previous page.

Title

Shadow Flicker Data
Shadow times at House 16

Project

Adelaide Wind Farm
Adelaide, Ontario

tci renewables

To Whom it may concern;

I [redacted] ("The Grantor") have entered into a License & Option Agreement with AET (Air Energy TCI, Inc.) ("The Grantee") on the 30th May 2008. As part of this agreement AET have agreed to consult with landowners regarding the location of wind turbines.

I can confirm that AET has consulted with me in detail regarding the location of wind turbines and I have reviewed and understand the attached information regarding the potential for shadow flicker occurrence at my home.

I understand that there are mitigation measures which can be implemented including; window blinds, vegetative screening and AET agrees to pay for an independent consultant to review and advise on the most appropriate mitigation scheme. AET also agrees to pay for any measure(s) suggested by the independent consultant i.e. installation of blinds, planting of trees, hedging, etc.

In the understanding of the above I therefore have no objection to the locations of the turbines as shown in the attached drawing and I am fully supportive of the Adelaide Wind Farm project as presented.

Yours Faithfully,

[redacted]

Date: Dec 5/2008

Mark Gallagher

Date: 11/12/08

Mark Gallagher
Development Manager – Air Energy TCI, Inc. ("Grantee")

APPENDIX H

ACRONYMS AND UNITS

Table H-1: List of Common Acronyms Used in the Adelaide Wind Farm Project ESR/EIS

Acronym	Descriptive Term
AADT	Average Annual Daily Traffic
ABCA	Ausable Bayfield Conservation Authority
AET	Air Energy TCI Inc
ANSI	Area of Natural and Scientific Interest
AUS	Avian Use Survey
BAT	Binary Acoustic Technology
BMP	Best Management Practices
CadnaA	Computer Aided Noise Attenuation
CanWEA	Canadian Wind Energy Association
CCVT	Current Controlled Voltage Transformer
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act / Agency
CO	Carbon Monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CT	Current Transformer
CWS	Canadian Wildlife Service
DAR	Development Assessment Report
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAA	(Ontario) Environmental Assessment Act
EAAB	Environmental Assessment and Approvals Branch (MOE)
EC	Environment Canada
EHC	Environmental Health Criteria
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
END	Endangered
EO	Element Occurrence
ESA	(Ontario) Endangered Species Act
ESR	Environmental Screening Report
FA	Federal Authority
FIT	Feed-in Tariff
FPTRPC	Federal-Provincial-Territorial Radiation Protection Committee

Acronym	Descriptive Term
GHG	Greenhouse Gases
Golder	Golder Associates Ltd.
GPA	Peak Ground Acceleration
HADD	Harmful Alteration, Disruption or Destruction (of fish habitat)
HC	Health Canada
IARC	International Agency for Research on Cancer
IEC	International Electrotechnical Commission
IESO	Independent Electricity System Operator
INAC	Indian and Northern Affairs Canada
LSA	Local Study Area
MAA	(Ontario) Ministry of Aboriginal Affairs
MCL	(Ontario) Ministry of Culture
MMAH	(Ontario) Ministry of Municipal Affairs and Housing
MNR	(Ontario) Ministry of Natural Resources
MOE	(Ontario) Ministry of the Environment
MTO	(Ontario) Ministry of Transportation
NHIC	Natural Heritage Information Centre
NO_2	Nitrogen Dioxide
NOC	Notice of Commencement
NRCan	Natural Resources Canada
NRO	Noise Restricted Operation
NRVIS	Natural Resource Values Information System
O_3	Ozone
OBBA	Ontario Breeding Bird Atlas
OBM	Ontario Base Map
OGS	Ontario Geological Survey
OPA	Ontario Power Authority
PAH	Polycyclic Aromatic Hydrocarbon
$PM_{2.5}$	Fine Particles (2.5 micrometres in diameter)
POR	Points of Reception
PPE	Personal Protective Equipment
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
RA	Responsible Authority
RABC	Radio Advisory Board of Canada
RES	Renewable Energy Supply

Acronym	Descriptive Term
RFP	Request for Proposals
ROW	Right of Way
RSA	Regional Study Area
Sa	Spectral Acceleration
SAR	Species at Risk
SARA	(Federal) Species at Risk Act
SARO	Species at Risk in Ontario
SC	Special Concern
SCRCA	St. Clair Region Conservation Authority
SMP	Soil Management Plan
SO_2	Sulphur Dioxide
SSA	Site Study Area
StatsCan	Statistics Canada
TAM	Township of Adelaide Metcalfe
THR	Threatened
TSS	Total Suspended Solids
Twp	Township
UNESCO	United Nations Educational, Scientific and Cultural Organization
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound
WHO	World Health Organization
WPPI	Wind Power Production Incentive

Table H-2: List of Common Units Used in the AET Adelaide Wind Farm ESR/EIS

Units/Symbols	Descriptive Term
cm	Centimetre
cm/s	Centimetres per Second
cm/y	Centimetres per Year
dBA	Decibels
fgbs	Feet Below Ground Surface
G	Ground Absorption
G	Gauss
GHz	Gigahertz
GWh	Gigawatt hours
ha	Hectares
Hz	Hertz
Igpm	Imperial gallons per minute
in	Inch
kg	Kilogram
km	Kilometre
Km/h	Kilometres per Hour
km^2	Square Kilometres
kV	Kilovolt
kV/m	Kilovolts per Metre
kVA	Kilovolt Ampere
kWh	Kilowatt hours
L/day	Litres per day
L/min/m	Litres per minute per metre
m	Metre
m/s	Metres per Second
m^2	Square metres
m^2/day	Metres squared per Day
mbgs	Metres Below Ground Surface
MVA	Megavolt Ampere
MW	Megawatt
^oC	Degrees Celsius
rpm	Rotations per minute
T	Teslas
V	Volt
V/m	Volts per Metre