

**Appendix G:**  
**Shadow Flicker Assessment**

**Richibucto Wind Project**  
**Shadow Flicker Assessment**  
**November 2017**



**CONFIDENTIALITY**

This document contains proprietary and confidential information, which is provided on a commercial in confidence basis. It may not be reproduced or provided in any manner to any third party without the consent of Natural Forces Wind Inc.

**© Copyright Natural Forces Wind Inc. 2017**

This work and the information contained in it are the copyright of Natural Forces Wind Inc. No part of this document may be reprinted or reproduced without the consent of Natural Forces Inc.

**Disclaimer**

Whilst every effort has been made to ensure the accuracy of this information, the publisher accepts no responsibility for any discrepancies and omissions that may be contained herein.

Natural Forces Wind Inc.  
1801 Hollis Street Suite 1205  
Halifax, NS B3J 3N4  
P +1 (902) 422 9663  
F +1 (902) 422 9780

## Table of Contents

Introduction .....	1
Background.....	1
Policy and Guidelines.....	2
Source of shadow .....	2
Receptors .....	3
Impact Assessment.....	3
Proposed Mitigation.....	7
Discussion and Conclusions.....	8
References.....	8

## List of Tables

Table 1: Enercon E-126 EP3 3,500kW turbine characteristics.....	2
Table 2: Predicted preliminary worst case shadow flicker for E-126 3.5 MW @ 135 m hub height for receptors exceeding the New Brunswick limits. ....	4
Table 3: Real case scenario using 1.5 m high by 1m wide windows facing the south direction. ....	6

## List of Figures

Figure 1: Front of Global Windows and Doors showing small windows that do not directly face the turbine location but may receive some of the shadow flicker predicted. Window shades can also be seen drawn in some windows which will further mitigate shadow flicker.....	4
Figure 2: Side section of Global Windows and Doors that does face the turbine location demonstrating a warehouse storage area with large bay doors.....	5
Figure 3: S & E Metal Roofing building showing few small windows that do not face the turbine location.	5

## List of Annexes

Annex A: Project layout map	
Annex B: WindPRO v3.1, Shadow Module Calculation Results – Worst Case Scenario	
Annex C: WindPRO v.3.1, Shadow Module Calculation Results – Realistic Window Sizes	

## Introduction

Natural Forces Wind Inc. has undertaken a shadow flicker impact assessment for the proposed Richibucto Wind Project to assess the potential impact of shadow flicker on the surrounding shadow receptors. Details outlining the shadow receptors, prediction methodology and assumptions made for the assessment are included herein, with the WindPRO results supplied in the annexes. This report also provides background information on the shadow flicker effect.

Under the *Additional Information Requirements for Wind Turbines* document published by New Brunswick Ministry of Environment and Local Government pursuant to Section 5(2) of the *Environmental Impact Assessment Regulation of the Clean Environment Act*, requirements regarding Visual Impacts due to shadow flicker must be limited to 30 hours per year for a maximum of 30 minutes per day based on a “worst case” calculation where mitigation is not feasible. The worst-case calculation is defined in the requirements document as the maximum shadow between sun rise and sun set on a cloudless day. These conditions have been adopted for this study.

Prior to determining the predicted amount of shadow flicker effect of a project, careful site design in the first instance is recommended, followed by industry accepted mitigation strategies. This assessment will be used as supporting documentation to demonstrate that shadow flicker is being assessed and that compliance can be reached with careful planning and mitigation.

This shadow flicker analysis was conducted using the Shadow module of the software package, WindPRO version 3.1.

## Background

Flicker is caused by incident light rays on a moving object which then casts an intermittent shadow on a receptor. This intermittent shadow, perceived as a change in light intensity to an observer, as it pertains to wind turbine generators (WTG), is referred to as shadow flicker. Shadow flicker is caused by incident sun rays on the rotor blades as they turn.

For shadow flicker to occur, the following criteria must be met:

1. The sun must be shining and not obscured by any cloud cover.
2. The wind turbine must be between the sun and the shadow receptor.
3. The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, buildings, awnings etc., will prevent shadow flicker from occurring at the receptor.
4. The shadow receptor has to be close enough to the turbine to be in the shadow of the rotor.

## Policy and Guidelines

As previously stated, there are provincial requirements for the acceptable amount of shadow flicker. These requirements are set out in the *Additional Information Requirements for Wind Turbines* document published by New Brunswick Ministry of Environment and Local Government pursuant to Section 5(2) of the *Environmental Impact Assessment Regulation* of the Clean Environment Act.

Under the requirements, mitigation measures should be applied to mitigate the shadow flicker effect on sensitive receptors such as relocation of turbines, screening of the receptors and operational controls. Where the proponent demonstrates that the mitigation of any shadow flicker effect on sensitive receptors is not feasible, the amount of shadow flicker must be limited to:

- 30 hours per year for a maximum “worst case” calculation; and
- 30 minutes per day also based on a “worst case” calculation.

The requirements also state that the “worst case” scenario describes a model that uses maximum shadow between sun rise and sun set; and assumes cloudless skies throughout the year.

## Source of shadow

The proposed Richibucto Wind Project assessment consists of one turbine located 3 km southwest of the Town of Richibucto and 1 km northwest of the Village of Rexton, Kent County, New Brunswick. The project site is situated between these communities and also in proximity to the Richibucto Parish Local Service District. A map of the project area with the proposed WTG layout is illustrated in Appendix A.

There are no existing wind turbines or known proposed wind farm projects within 5km of the Richibucto Wind Project, therefore it is unlikely any cumulative shadow flicker effects will occur.

The model of WTG being considered for the proposed wind project is the Enercon E-126 EP3 3,500 kW. The E-126 turbines have a 127m rotor diameter with a maximum hub height of 135m. This model utilizes a horizontal axis, upwind, 3-bladed, and a microprocessor pitch control system. Table 1 below outlines their main characteristics.

Table 1: Enercon E-126 EP3 3,500kW turbine characteristics.

Generator Type	Rotor Diameter (m)	Hub Height (m)	Swept area (m <sup>2</sup> )	Rated Output (MW)
E-126 3.5	127	135	12,668	3.5

## Receptors

There are 305 points of reception taken into consideration for this shadow flicker assessment. The receptors are mostly residential buildings and some businesses located within 2.5 km of the proposed WTG. A map of the project area with the receptors is illustrated in Appendix A.

## Impact Assessment

### Prediction Methodology

The shadow flicker impact was calculated at each receptor using the Shadow module of the software package, WindPRO version 3.1. The model simulates the Earth's orbit and rotation, to provide the astronomical maximum shadow, also known as the astronomical worst-case scenario. The astronomical maximum shadow calculation assumes that for every day of the year:

1. The sky is cloudless between sunrise and sunset,
2. The turbines are always in operation, and
3. The wind direction changes throughout the day such that the rotor plane is perpendicular to the incident sun rays at all times causing the maximum amount of shadow.

The position of the sun relative to the wind turbine rotor plane and the resulting shadow is calculated in steps of one-minute intervals throughout a complete year. If the rotor plane, assumed to be a solid disk equivalent in size to the swept area shown in Table 1 casts a shadow on a receptor window during one of these intervals, it is registered as one minute of potential shadow impact.

The impact of shadow flicker on surrounding receptors is limited by two factors; the first being that the angle of the sun over the horizon must be greater than 3 degrees, due to optic conditions in the atmosphere which cause the shadow to dissipate before it could potentially reach a receptor and the second is that the blade of the wind turbine must cover at least 20% of the incident solar rays in order to have a noticeable effect.

Each receptor was treated as a 'greenhouse' with 3m high by 3 m wide windows for 360° of the building. Furthermore, no topographical shielding (other buildings, barns, trees, awnings, etc.) has been considered between the wind turbines and receptors for the worst-case scenario. This worst-case assumption results in a conservative prediction of the potential shadow flicker impacts.

### Results of Shadow Flicker Predictions – green house receptors

The desired results of the shadow flicker prediction model at each receptor is to prove compliance with the New Brunswick requirements of no more than 30 hours per year of shadow, and no more than 30 minutes on the worst day of shadow under a "worst case" scenario where mitigation is not feasible.

The initial worst-case study of this particular turbine location demonstrates that that 303 of the 305 receptors located within 2.5 km of the wind turbines are subject to less than 30hrs/year and 30mins/day and of those, 145 do not observe any shadow flicker impact. The detailed results of the shadow assessment study for all receptors are included in Appendix B.

Table 2 shows the results of the receptors that are predicted to experience shadow hours exceeding the requirements in the initial worst-case assessment.

Table 2: Predicted preliminary worst case shadow flicker for E-126 3.5 MW @ 135 m hub height for receptors exceeding the New Brunswick limits.

Receptor ID	Shadow hours per year (h/year)	Max shadow hours per day (h/day)	House or Business
C	21:17	0:33	B
D	15:40	0:31	B

The receptors exceeding acceptable limits include two buildings in the Industrial Park owned by Global Windows and Doors, and S & E Metal Roofing. As shown in Figures 1 through 3, most of the industrial buildings have small windows and also feature warehouse sections with no windows facing the turbine direction, therefore, it is not expected these buildings will observe the full shadow flicker effect demonstrated in this assessment as the model assumes a greenhouse effect on all buildings.



Figure 1: Front of Global Windows and Doors showing small windows that do not directly face the turbine location but may receive some of the shadow flicker predicted. Window shades can also be seen drawn in some windows which will further mitigate shadow flicker.



Figure 2: Side section of Global Windows and Doors that does face the turbine location demonstrating a warehouse storage area with large bay doors.



Figure 3: S & E Metal Roofing building showing few small windows that do not face the turbine location.

As demonstrated, the industrial buildings have small windows that do not face the turbine location and therefore, the windows will likely be shaded by the building during times of shadow flicker occurrences limiting the amount of flicker noticed. As the 3m x 3m size windows representing a greenhouse is a worst-case scenario, a second assessment was conducted to achieve a more realistic impact on these two receptors.

#### Results of Shadow Flicker Predictions – realistic window sizes

The second model used to evaluate shadow flicker impacts for the Richibucto Wind Project makes use of new estimates derived from on site visits and uses windows that are 1.5m high to describe the receptors. The windows were then entered as a “fixed direction” demonstrating that these windows are facing southward instead of westward in the turbine direction.



The results of this study show that using a more realistic representation of the buildings near the project, all the receptors pass including C and D which did not previously meet the requirements. The new results for receptors C and D are included in Table 3 while the complete set of results for this second assessment can be found in Annex C.

Table 3: Predicted shadow flicker for E-126 3.5 MW @ 135 m hub height using windows with 1.5 m high by 1m wide dimensions facing the south direction.

Receptor ID	Shadow hours per year (h/year)	Max shadow hours per day (h/day)	House or Business
C	2:21	0:08	B
D	15:01	0:30	B

As with the worst-case scenario used for the initial assessment, the results from this second assessment using receptors with realistic characteristics based on field visits, the model assumes the turbines are always in operation, there are cloudless skies every day during daylight, and that there are no obstructions including existing vegetation obstructing the path of the shadow.

Evergreen trees are considered a mitigation measure to shadow flicker as they block or screen the shadow of the turbine from reaching the receptor. Additional screening mechanisms and altering turbine operation have also been determined as effective mitigation measures for reducing shadow flicker impact, as described in the following section.

## Proposed Mitigation

As required in the *Additional Information Requirements for Wind Turbines* report for New Brunswick, this shadow flicker assessment report also provides a description of the mitigation measures to be used to mitigate effects on sensitive receptors. These measures described in the following sections include, turbine relocation, screening of receptors using vegetation and awnings, and operational shutdowns during the expected shadow flicker times.

### Relocation

The location of the Richibucto Wind Project has been relocated from its original location twice in attempt to reduce impact to environmentally sensitive features. The current proposed location is located as far away from houses and buildings as possible without also impacting the wetland habitat that surrounds the forested habitat in which the turbine is proposed. Relocating the turbine any farther west from houses and buildings in an attempt to reduce shadow flicker impact is not a feasible mitigation measure for this particular project due to wetland constraints. However, the Proponent has adjusted the proposed technology from an E-141 with hub height of 135m and rotor diameter of 141m to an E-126 with a hub height of 135m but with a rotor diameter of 127m. This change in technology has effectively reduced the amount of impacted shadow receptors under worst-case assumptions from eight to two.

### Screening

Existing vegetation and revegetating efforts are a feasible, effective mitigation measure for reducing predicted shadow flicker impact. It is further proposed that if businesses or landowners observe an annoyingly high amount of shadow flicker impact during operation, the Proponent could propose screening methods that will provide shade to buildings and windows effectively reducing shadow flicker annoyance.

Screening can be accomplished with existing vegetation, revegetation and planting additional vegetation to the area which is experiencing shadow flicker. As well, similar results can also be obtained by installing awnings and window coverings if it would provide better screening under specific conditions or if it would be preferred by those experiencing the impact.

### Operational Controls

The Proponent feels confident that receptors will not receive exceeding amounts of shadow flicker as demonstrated in the second more realistic scenario. However, the Proponent will work closely with land and businesses owners to observe occurrences of real-case shadow flicker impact during operation and apply mitigation as mentioned.

If, during the operation of the wind turbine, receptors observe unacceptable amounts of shadow flicker after the above-mentioned mitigation is applied, operational shutdowns may be proposed and implemented. The WindPRO model outputs an additional document showing a calendar in which timeframes are produced where shadow flicker is expected. Upon reviewing the calendar outputs and observing real-case scenarios and timeframes where elevated shadow flicker is observed, the turbines can be effectively programmed to shutdown during high shadow flicker times when the sun is at the appropriate angle and wind direction is optimal for producing shadow flicker. Once the sun or wind shifts to where shadow flicker is no longer occurring on sensitive receptors, the turbine can be programmed to

restart. This mitigation measure can effectively reduce all exceeding and annoyingly high occurrences of shadow flicker on sensitive receptors.

## Discussion and Conclusions

Natural Forces Wind Inc. has completed an assessment to evaluate the astronomical worst-case shadow flicker impact of the proposed Richibucto Wind Project at receptor locations within 2.5 km of a proposed wind turbine generator.

Based on the realistic scenario modelled and the implementation of effective mitigation measures, the amount of shadow flicker predicted at each receptor will pass the requirements set out by New Brunswick's Ministry of Environment and Local Government.

Although the requirements state that there is an allowable 30 hours per year of maximum shadow, and no more than 30 minutes of maximum shadow in a single day under "worst case" scenarios at the receptor locations, mitigation measures may be applied to aid in the reduction of any shadow flicker effect experienced at receptors when necessary.

As per the *Additional Information Requirements for Wind Turbines* document published by New Brunswick Ministry of Environment and Local Government pursuant to Section 5(2) of the *Environmental Impact Assessment Regulation* of the Clean Environment Act, various measures are expected to be used to mitigate any effect of shadow flicker at sensitive receptors such as adjacent lands and public road ways. These mitigation methods may include screening of receptors using natural barriers, awnings or other structures and operational controls that would temporarily pause or rotate the turbine blades in a manner which would diminish the risk of shadow effect on receptors during specific meteorological conditions.

As a result of this study, Natural Forces will work closely with the Industrial Park and residences to monitor occurrences of shadow flicker and to propose and apply mitigation measures to further reduce the predicted effect observed by the receptors when necessary.

## References

New Brunswick Ministry of Environment and Local Government. *Environmental Impact Assessment Regulation – Clean Environment Act*. New Brunswick.

New Brunswick Ministry of Environment and Local Government. *Additional Information Requirements For Wind Turbines– Clean Environment Act*. New Brunswick.

Enercon GmbH ed. (2017). *Data Sheet – Enercon Wind Energy Converter E-126 EP3*. Germany.

Nielson, P. (2012). *Windpro 3.1 user guide*. (1st ed.). Denmark: EMD International A/S.

WEA-Schattenwurf-Hinweise (2002). *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (Notes on the identification and assessment of the optical pollutions of Wind Turbines)*. WindPRO

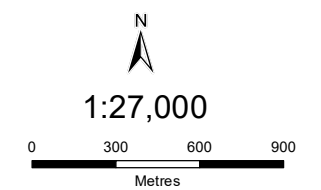
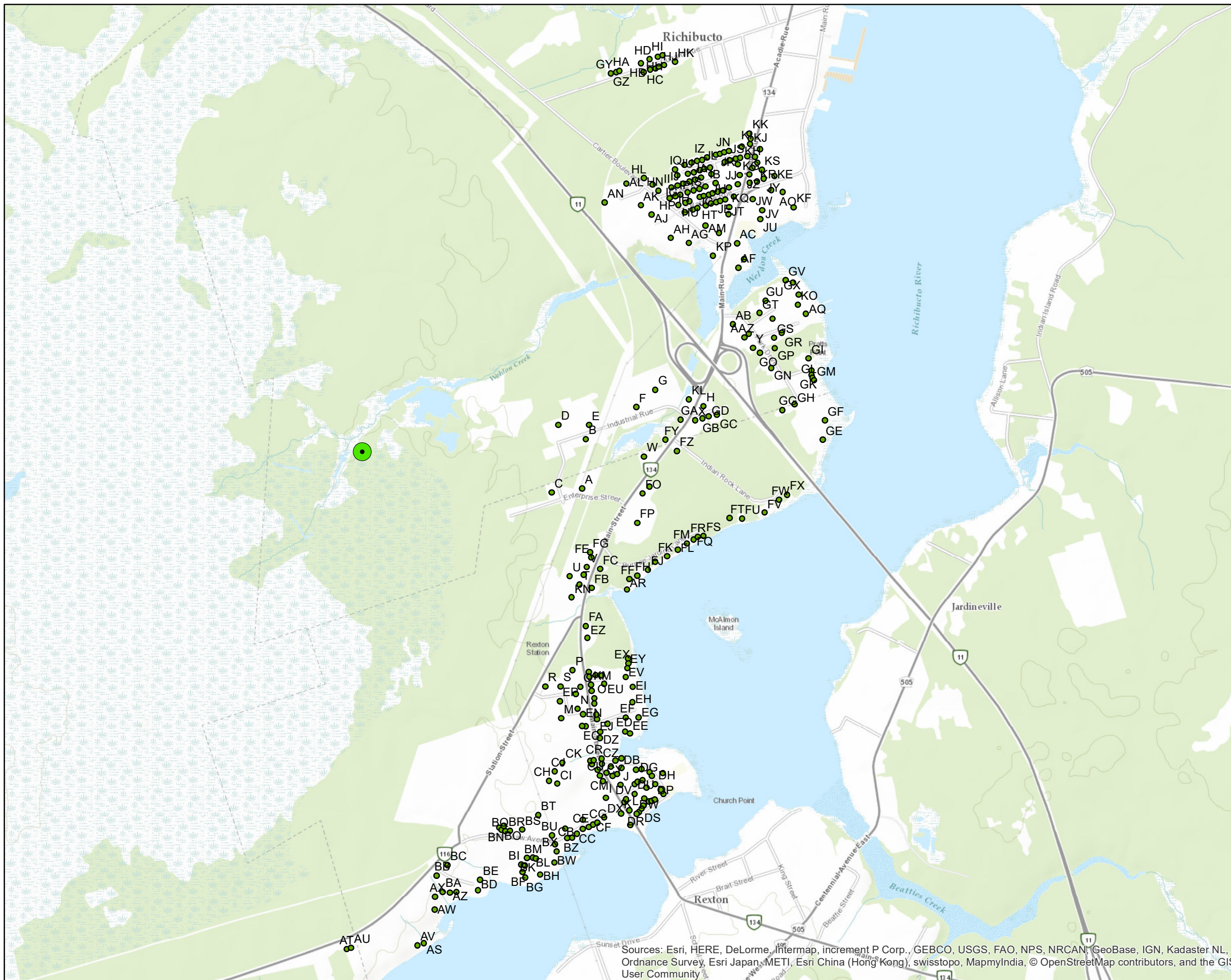
# **Annex A**

## **Site Layout Map**

Shadow Receptors

Legend

- Shadow Receptors
- Turbine



WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Aug 17, 2017



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

# **Annex B**

## **WindPRO v3.1, Shadow Module Calculation Results – Worst Case Scenario**

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
 1801 Hollis Street, Suite 1205  
 CA-HALIFAX, Nova Scotia B3J 3N4  
 902 422 9663  
 Katherine Dorey / kdorey@naturalforces.ca  
 Calculated:  
 10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

### Assumptions for shadow calculations

Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

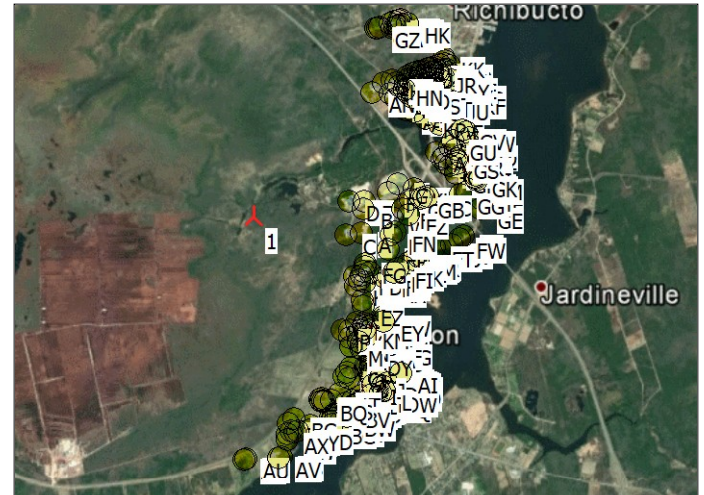
Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

The calculated times are "worst case" given by the following assumptions:  
 The sun is shining all the day, from sunrise to sunset  
 The rotor plane is always perpendicular to the line from the WTG to the sun  
 The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: Contours.wpo (1)  
 Obstacles used in calculation  
 Eye height: 1.5 m  
 Grid resolution: 10.0 m

All coordinates are in  
 UTM (north)-WGS84 Zone: 20



Scale 1:75,000  
 ▲ New WTG      ● Shadow receptor

### WTGs

Easting	Northing	Z	Row data/Description	WTG type				Shadow data			
				Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
1	355,265	5,169,414	12.2 ENERCON E126-EP3 3500 127.0 !-! hub: 135.0 m (TOT: ...No	No	ENERCON	E126-EP3-3,500	3,500	127.0	135.0	2,500	0.0

### Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
	[m]	[m]	[m]	[m]	[m]	[m]	[°]	[°]	
A	356,332	5,169,228	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
B	356,356	5,169,471	8.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
C	356,181	5,169,212	7.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
D	356,222	5,169,545	7.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
E	356,374	5,169,540	7.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
F	356,609	5,169,624	6.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
G	356,706	5,169,707	5.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
H	356,943	5,169,619	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
I	356,413	5,167,697	2.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
J	356,486	5,167,758	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
K	356,487	5,167,618	2.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
L	356,528	5,167,633	2.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
M	356,201	5,168,094	8.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
N	356,284	5,168,140	8.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
O	356,368	5,168,190	7.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
P	356,263	5,168,331	10.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Q	356,300	5,168,248	8.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
R	356,126	5,168,254	10.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
S	356,201	5,168,252	8.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
T	356,308	5,168,753	7.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
U	356,260	5,168,795	9.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
V	356,346	5,168,839	9.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
W	356,642	5,169,378	8.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
X	356,900	5,169,551	6.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Y	357,195	5,169,902	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
Z	357,153	5,169,954	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AA	357,176	5,169,972	4.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AB	357,098	5,170,021	4.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AC	357,128	5,170,420	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AD	357,041	5,170,474	3.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AE	357,162	5,170,341	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663

Katherine Dorey / kdorey@naturalforges.ca

Calculated:

10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
AF	357,132	5,170,300	2.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AG	356,889	5,170,427	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AH	356,801	5,170,455	5.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AI	356,698	5,167,812	2.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AJ	356,708	5,170,573	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AK	356,657	5,170,619	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AL	356,587	5,170,727	6.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AM	356,974	5,170,512	3.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AN	356,477	5,170,638	7.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AO	357,361	5,170,668	3.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AP	357,198	5,170,718	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AQ	357,462	5,170,065	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AR	356,542	5,168,723	4.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AS	355,493	5,167,000	4.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AT	355,111	5,166,979	12.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AU	355,132	5,166,986	12.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AV	355,462	5,166,990	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AW	355,551	5,167,165	6.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AX	355,554	5,167,228	8.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AY	355,661	5,167,249	5.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
AZ	355,628	5,167,246	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BA	355,593	5,167,251	6.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BB	355,564	5,167,333	9.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BC	355,620	5,167,383	9.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BD	355,769	5,167,255	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BE	355,780	5,167,307	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BF	355,990	5,167,339	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BG	356,004	5,167,312	3.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BH	356,079	5,167,325	1.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BI	355,986	5,167,377	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BJ	356,004	5,167,372	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BK	356,014	5,167,410	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BL	356,044	5,167,410	3.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BM	356,059	5,167,406	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BN	355,881	5,167,562	9.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BO	355,892	5,167,551	9.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BP	355,903	5,167,571	9.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BQ	355,911	5,167,543	8.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BR	355,934	5,167,544	8.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BS	355,995	5,167,549	7.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BT	356,076	5,167,619	8.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BU	356,141	5,167,517	4.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BV	356,156	5,167,474	3.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BW	356,150	5,167,383	2.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BX	356,163	5,167,438	3.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BY	356,217	5,167,502	2.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
BZ	356,241	5,167,503	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CA	356,208	5,167,549	2.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CB	356,265	5,167,522	1.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CC	356,294	5,167,545	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CD	356,295	5,167,591	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CE	356,324	5,167,554	2.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CF	356,347	5,167,566	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CG	356,368	5,167,575	1.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CH	356,134	5,167,788	10.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CI	356,174	5,167,772	8.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CJ	356,163	5,167,834	9.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CK	356,202	5,167,876	7.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CL	356,400	5,167,780	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CM	356,385	5,167,806	3.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CN	356,376	5,167,836	3.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CO	356,347	5,167,864	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CP	356,340	5,167,881	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CQ	356,358	5,167,884	4.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CR	356,397	5,167,891	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...



Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663  
Katherine Dorey / kdorey@naturalforges.ca  
Calculated:  
10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
CS	356,441	5,167,850	2.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CT	356,398	5,167,865	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CU	356,419	5,167,820	2.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CV	356,448	5,167,803	2.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CW	356,473	5,167,813	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CX	356,493	5,167,844	2.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CY	356,465	5,167,880	2.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
CZ	356,494	5,167,891	2.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DA	356,565	5,167,832	2.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DB	356,594	5,167,835	1.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DC	356,557	5,167,760	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DD	356,572	5,167,773	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DE	356,597	5,167,780	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DF	356,633	5,167,818	1.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DG	356,644	5,167,799	1.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DH	356,660	5,167,758	2.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DI	356,685	5,167,730	2.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DJ	356,699	5,167,709	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DK	356,615	5,167,741	2.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DL	356,603	5,167,688	2.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DM	356,598	5,167,654	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DN	356,627	5,167,674	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DO	356,640	5,167,676	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DP	356,654	5,167,683	1.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DQ	356,531	5,167,560	2.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DR	356,576	5,167,623	1.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DS	356,589	5,167,639	1.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DT	356,505	5,167,674	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DU	356,556	5,167,712	3.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DV	356,513	5,167,688	2.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DW	356,563	5,167,615	1.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DX	356,403	5,167,599	1.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DY	356,390	5,167,993	4.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
DZ	356,393	5,168,022	4.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EA	356,430	5,168,063	4.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EB	356,323	5,168,052	6.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EC	356,304	5,168,054	6.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
ED	356,516	5,168,022	1.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EE	356,540	5,168,012	0.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EF	356,521	5,168,091	2.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EG	356,585	5,168,091	0.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EH	356,556	5,168,167	0.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EI	356,560	5,168,242	1.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EJ	356,378	5,168,086	6.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EK	356,375	5,168,110	6.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EL	356,368	5,168,165	7.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EM	356,355	5,168,227	8.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EN	356,309	5,168,112	7.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EO	356,276	5,168,213	9.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EP	356,196	5,168,180	8.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EQ	356,343	5,168,321	8.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
ER	356,345	5,168,296	8.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
ES	356,377	5,168,303	8.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
ET	356,407	5,168,302	8.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EU	356,419	5,168,260	7.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EV	356,526	5,168,290	4.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EW	356,540	5,168,383	5.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EX	356,541	5,168,358	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EY	356,535	5,168,335	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
EZ	356,341	5,168,489	7.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FA	356,334	5,168,548	8.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FB	356,367	5,168,735	8.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FC	356,411	5,168,828	10.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FD	356,329	5,168,801	8.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FE	356,369	5,168,885	10.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663

Katherine Dorey / kdorey@naturalforges.ca

Calculated:

10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
FF	356,555	5,168,775	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FG	356,363	5,168,912	10.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FH	356,595	5,168,790	6.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FI	356,686	5,168,858	7.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FJ	356,649	5,168,818	7.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FK	356,745	5,168,882	6.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FL	356,799	5,168,914	6.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FM	356,845	5,168,943	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FN	356,667	5,169,230	8.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FO	356,631	5,169,196	10.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FP	356,601	5,169,051	11.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FQ	356,879	5,168,962	5.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FR	356,900	5,168,974	5.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FS	356,927	5,168,978	5.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FT	357,058	5,169,065	7.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FU	357,121	5,169,060	3.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FV	357,233	5,169,087	4.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FW	357,306	5,169,148	5.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FX	357,347	5,169,173	6.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FY	356,750	5,169,459	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
FZ	356,805	5,169,402	8.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GA	356,828	5,169,557	6.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GB	356,937	5,169,560	6.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GC	357,008	5,169,575	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GD	356,967	5,169,568	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GE	357,530	5,169,441	4.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GF	357,543	5,169,536	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GG	357,333	5,169,592	7.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GH	357,394	5,169,618	9.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GI	357,468	5,169,843	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GJ	357,483	5,169,783	2.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GK	357,482	5,169,762	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GL	357,486	5,169,747	2.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GM	357,494	5,169,734	2.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GN	357,283	5,169,801	8.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GO	357,229	5,169,877	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GP	357,303	5,169,897	7.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GQ	357,296	5,170,044	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GR	357,339	5,169,973	5.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GS	357,301	5,169,949	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GT	357,232	5,170,074	5.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GU	357,264	5,170,134	4.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GV	357,364	5,170,233	2.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GW	357,401	5,170,220	2.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GX	357,428	5,170,160	3.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GY	356,524	5,171,275	5.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
GZ	356,550	5,171,280	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HA	356,566	5,171,286	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HB	356,673	5,171,321	5.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HC	356,686	5,171,277	5.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HD	356,716	5,171,340	5.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HE	356,718	5,171,289	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HF	356,745	5,171,292	4.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HG	356,762	5,171,301	4.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HH	356,758	5,171,351	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HI	356,782	5,171,357	5.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HJ	356,788	5,171,309	5.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HK	356,842	5,171,325	4.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HL	356,675	5,170,754	8.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HM	356,716	5,170,720	8.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HN	356,745	5,170,690	7.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HO	356,800	5,170,651	6.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HP	356,842	5,170,617	6.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HQ	356,873	5,170,580	5.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HR	356,913	5,170,591	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663  
Katherine Dorey / kdorey@naturalforges.ca  
Calculated:  
10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
HS	356,937	5,170,599	4.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HT	356,978	5,170,610	5.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HU	356,877	5,170,627	6.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HV	356,898	5,170,634	5.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HW	356,948	5,170,653	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HX	356,969	5,170,658	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HY	356,994	5,170,664	5.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
HZ	357,013	5,170,671	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IA	357,039	5,170,678	4.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IB	357,029	5,170,720	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IC	356,978	5,170,705	5.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
ID	356,948	5,170,694	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IE	356,919	5,170,687	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IF	356,890	5,170,678	6.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IG	356,853	5,170,667	7.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IH	356,828	5,170,659	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
II	356,810	5,170,703	7.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IJ	356,840	5,170,713	7.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IK	356,869	5,170,721	7.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IL	356,900	5,170,731	7.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IM	356,929	5,170,740	7.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IN	356,957	5,170,749	6.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IO	357,009	5,170,764	6.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IP	356,840	5,170,763	7.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IQ	356,830	5,170,792	7.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IR	356,877	5,170,813	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IS	356,893	5,170,769	7.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IT	356,911	5,170,823	7.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IU	356,923	5,170,776	7.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IV	356,940	5,170,832	6.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IW	356,952	5,170,786	6.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IX	356,965	5,170,837	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IY	356,976	5,170,792	6.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
IZ	356,989	5,170,848	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JA	357,004	5,170,798	6.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JB	357,004	5,170,620	5.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JC	357,029	5,170,627	4.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JD	357,050	5,170,632	4.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JE	357,076	5,170,638	4.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JF	357,119	5,170,651	4.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JG	357,066	5,170,684	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JH	357,095	5,170,697	4.6	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JI	357,138	5,170,711	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JJ	357,149	5,170,757	5.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JK	357,033	5,170,859	6.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JL	357,054	5,170,864	6.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JM	357,075	5,170,872	6.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JN	357,098	5,170,877	5.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JO	357,077	5,170,823	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JP	357,100	5,170,832	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JQ	357,132	5,170,839	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JR	357,141	5,170,810	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JS	357,154	5,170,843	6.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JT	357,090	5,170,566	4.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JU	357,246	5,170,536	2.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JV	357,257	5,170,580	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JW	357,211	5,170,636	4.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JX	357,305	5,170,679	3.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JY	357,268	5,170,736	4.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
JZ	357,198	5,170,758	5.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KA	357,213	5,170,791	5.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KB	357,239	5,170,815	5.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KC	357,226	5,170,846	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KD	357,252	5,170,882	5.4	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KE	357,322	5,170,748	5.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
KF	357,413	5,170,591	4.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KG	357,189	5,170,849	6.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KH	357,163	5,170,897	6.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KI	357,205	5,170,909	6.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KJ	357,208	5,170,936	6.3	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KK	357,203	5,170,961	6.1	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KL	356,872	5,169,655	5.2	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KM	356,352	5,168,257	8.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KN	356,267	5,168,692	7.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KO	357,423	5,170,110	2.8	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KP	357,008	5,170,362	2.9	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KQ	357,093	5,170,600	4.5	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KR	357,235	5,170,724	4.7	3.0	3.0	1.0	0.0	90.0	"Green house mode"
KS	357,259	5,170,780	5.0	3.0	3.0	1.0	0.0	90.0	"Green house mode"

## Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year	Shadow days per year	Max shadow hours per day
	[h/year]	[days/year]	[h/day]
A	14:36	40	0:28
B	12:21	35	0:28
C	21:17	51	0:33
D	15:40	40	0:31
E	11:49	35	0:27
F	7:59	29	0:22
G	6:47	26	0:21
H	4:49	23	0:18
I	0:00	0	0:00
J	0:00	0	0:00
K	0:00	0	0:00
L	0:00	0	0:00
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	7:55	32	0:18
U	10:31	37	0:21
V	26:38	68	0:27
W	7:58	29	0:22
X	5:12	24	0:19
Y	3:10	19	0:15
Z	3:19	20	0:15
AA	3:14	20	0:15
AB	3:42	21	0:16
AC	3:39	23	0:14
AD	4:14	26	0:14
AE	3:28	22	0:15
AF	3:28	22	0:14
AG	5:39	30	0:17
AH	7:07	36	0:17
AI	0:00	0	0:00
AJ	12:51	53	0:18
AK	9:32	40	0:18
AL	0:00	0	0:00
AM	5:05	30	0:15
AN	0:00	0	0:00
AO	2:27	22	0:11
AP	3:32	28	0:12
AQ	2:06	16	0:12

To be continued on next page...

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
AR	21:44	66	0:23
AS	0:00	0	0:00
AT	0:00	0	0:00
AU	0:00	0	0:00
AV	0:00	0	0:00
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	0:00	0	0:00
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	0:00	0	0:00
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	0:00	0	0:00
BJ	0:00	0	0:00
BK	0:00	0	0:00
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00
BT	0:00	0	0:00
BU	0:00	0	0:00
BV	0:00	0	0:00
BW	0:00	0	0:00
BX	0:00	0	0:00
BY	0:00	0	0:00
BZ	0:00	0	0:00
CA	0:00	0	0:00
CB	0:00	0	0:00
CC	0:00	0	0:00
CD	0:00	0	0:00
CE	0:00	0	0:00
CF	0:00	0	0:00
CG	0:00	0	0:00
CH	0:00	0	0:00
CI	0:00	0	0:00
CJ	0:00	0	0:00
CK	0:00	0	0:00
CL	0:00	0	0:00
CM	0:00	0	0:00
CN	0:00	0	0:00
CO	0:00	0	0:00
CP	0:00	0	0:00
CQ	0:00	0	0:00
CR	0:00	0	0:00
CS	0:00	0	0:00
CT	0:00	0	0:00
CU	0:00	0	0:00
CV	0:00	0	0:00
CW	0:00	0	0:00
CX	0:00	0	0:00
CY	0:00	0	0:00
CZ	0:00	0	0:00
DA	0:00	0	0:00
DB	0:00	0	0:00
DC	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
DD	0:00	0	0:00
DE	0:00	0	0:00
DF	0:00	0	0:00
DG	0:00	0	0:00
DH	0:00	0	0:00
DI	0:00	0	0:00
DJ	0:00	0	0:00
DK	0:00	0	0:00
DL	0:00	0	0:00
DM	0:00	0	0:00
DN	0:00	0	0:00
DO	0:00	0	0:00
DP	0:00	0	0:00
DQ	0:00	0	0:00
DR	0:00	0	0:00
DS	0:00	0	0:00
DT	0:00	0	0:00
DU	0:00	0	0:00
DV	0:00	0	0:00
DW	0:00	0	0:00
DX	0:00	0	0:00
DY	0:00	0	0:00
DZ	0:00	0	0:00
EA	0:00	0	0:00
EB	0:00	0	0:00
EC	0:00	0	0:00
ED	0:00	0	0:00
EE	0:00	0	0:00
EF	0:00	0	0:00
EG	0:00	0	0:00
EH	0:00	0	0:00
EI	0:00	0	0:00
EJ	0:00	0	0:00
EK	0:00	0	0:00
EL	0:00	0	0:00
EM	0:00	0	0:00
EN	0:00	0	0:00
EO	0:00	0	0:00
EP	0:00	0	0:00
EQ	0:00	0	0:00
ER	0:00	0	0:00
ES	0:00	0	0:00
ET	0:00	0	0:00
EU	0:00	0	0:00
EV	0:00	0	0:00
EW	0:00	0	0:00
EX	0:00	0	0:00
EY	0:00	0	0:00
EZ	0:00	0	0:00
FA	0:00	0	0:00
FB	12:16	42	0:22
FC	26:39	74	0:25
FD	19:56	55	0:26
FE	28:34	82	0:27
FF	20:44	78	0:23
FG	26:22	86	0:26
FH	14:42	54	0:22
FI	9:46	38	0:21
FJ	11:18	43	0:21
FK	8:15	33	0:20
FL	7:16	31	0:19
FM	6:35	29	0:19
FN	7:51	29	0:22
FO	8:30	30	0:22

To be continued on next page...

Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663  
Katherine Dorey / kdorey@naturalforges.ca  
Calculated:  
10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
FP	9:35	34	0:23
FQ	6:11	28	0:19
FR	5:54	27	0:18
FS	5:36	26	0:18
FT	4:11	22	0:16
FU	4:01	22	0:16
FV	3:22	20	0:15
FW	2:51	19	0:14
FX	2:38	18	0:13
FY	6:34	26	0:20
FZ	6:04	26	0:20
GA	5:48	25	0:20
GB	4:50	22	0:18
GC	4:19	22	0:17
GD	4:37	22	0:17
GE	1:58	16	0:12
GF	1:53	16	0:11
GG	2:32	17	0:13
GH	2:17	16	0:13
GI	2:04	15	0:12
GJ	2:06	16	0:12
GK	2:06	16	0:13
GL	2:05	16	0:12
GM	2:04	15	0:12
GN	2:39	17	0:14
GO	2:59	19	0:14
GP	2:34	18	0:13
GQ	2:39	18	0:14
GR	2:27	17	0:13
GS	2:39	18	0:14
GT	2:55	19	0:14
GU	2:47	18	0:14
GV	2:21	17	0:12
GW	2:16	17	0:12
GX	2:08	17	0:12
GY	0:00	0	0:00
GZ	0:00	0	0:00
HA	0:00	0	0:00
HB	0:00	0	0:00
HC	0:00	0	0:00
HD	0:00	0	0:00
HE	0:00	0	0:00
HF	0:00	0	0:00
HG	0:00	0	0:00
HH	0:00	0	0:00
HI	0:00	0	0:00
HJ	0:00	0	0:00
HK	0:00	0	0:00
HL	0:00	0	0:00
HM	3:56	24	0:12
HN	7:42	36	0:16
HO	10:56	48	0:17
HP	10:03	58	0:16
HQ	7:16	44	0:16
HR	6:27	40	0:15
HS	6:06	38	0:15
HT	5:37	36	0:15
HU	8:51	58	0:15
HV	8:17	60	0:16
HW	6:50	47	0:15
HX	6:21	44	0:15
HY	5:55	40	0:14
HZ	5:43	38	0:15
IA	5:15	36	0:14

To be continued on next page...

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
IB	6:13	49	0:14
IC	7:37	56	0:14
ID	8:20	54	0:14
IE	9:05	54	0:16
IF	9:41	52	0:16
IG	10:17	50	0:16
IH	10:39	50	0:16
II	9:16	40	0:16
IJ	9:32	42	0:16
IK	9:31	44	0:16
IL	9:15	46	0:15
IM	9:02	46	0:15
IN	8:43	48	0:15
IO	8:01	50	0:14
IP	6:27	33	0:15
IQ	3:46	24	0:11
IR	4:28	27	0:12
IS	7:59	38	0:15
IT	5:11	30	0:13
IU	8:18	40	0:15
IV	5:52	32	0:14
IW	8:18	42	0:15
IX	6:25	34	0:14
IY	8:11	42	0:14
IZ	6:35	34	0:14
JA	8:04	44	0:14
JB	5:15	34	0:15
JC	4:59	34	0:14
JD	4:49	32	0:14
JE	4:30	30	0:14
JF	4:06	30	0:13
JG	4:49	34	0:13
JH	4:33	32	0:13
JI	4:03	32	0:13
JJ	4:15	32	0:12
JK	6:54	38	0:14
JL	7:00	38	0:13
JM	7:00	40	0:13
JN	6:55	42	0:13
JO	7:11	48	0:13
JP	6:54	48	0:13
JQ	6:17	50	0:13
JR	5:10	45	0:12
JS	5:46	50	0:12
JT	3:58	27	0:14
JU	3:01	22	0:13
JV	2:56	22	0:12
JW	3:13	24	0:12
JX	2:44	22	0:12
JY	3:01	25	0:11
JZ	3:40	30	0:12
KA	3:40	30	0:12
KB	3:41	32	0:11
KC	3:59	36	0:12
KD	4:00	37	0:11
KE	2:38	24	0:11
KF	2:11	18	0:11
KG	4:49	49	0:12
KH	6:16	44	0:12
KI	5:40	46	0:11
KJ	5:50	42	0:11
KK	5:42	38	0:11
KL	5:20	23	0:19
KM	0:00	0	0:00

To be continued on next page...



Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc

1801 Hollis Street, Suite 1205

CA-HALIFAX, Nova Scotia B3J 3N4

902 422 9663

Katherine Dorey / kdorey@naturalforges.ca

Calculated:

10/19/2017 11:25 AM/3.1.617

## SHADOW - Main Result

Calculation: E126 135 v2

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
KN	0:00	0	0:00
KO	2:12	17	0:12
KP	4:23	26	0:15
KQ	4:05	28	0:14
KR	3:15	26	0:12
KS	3:11	26	0:12

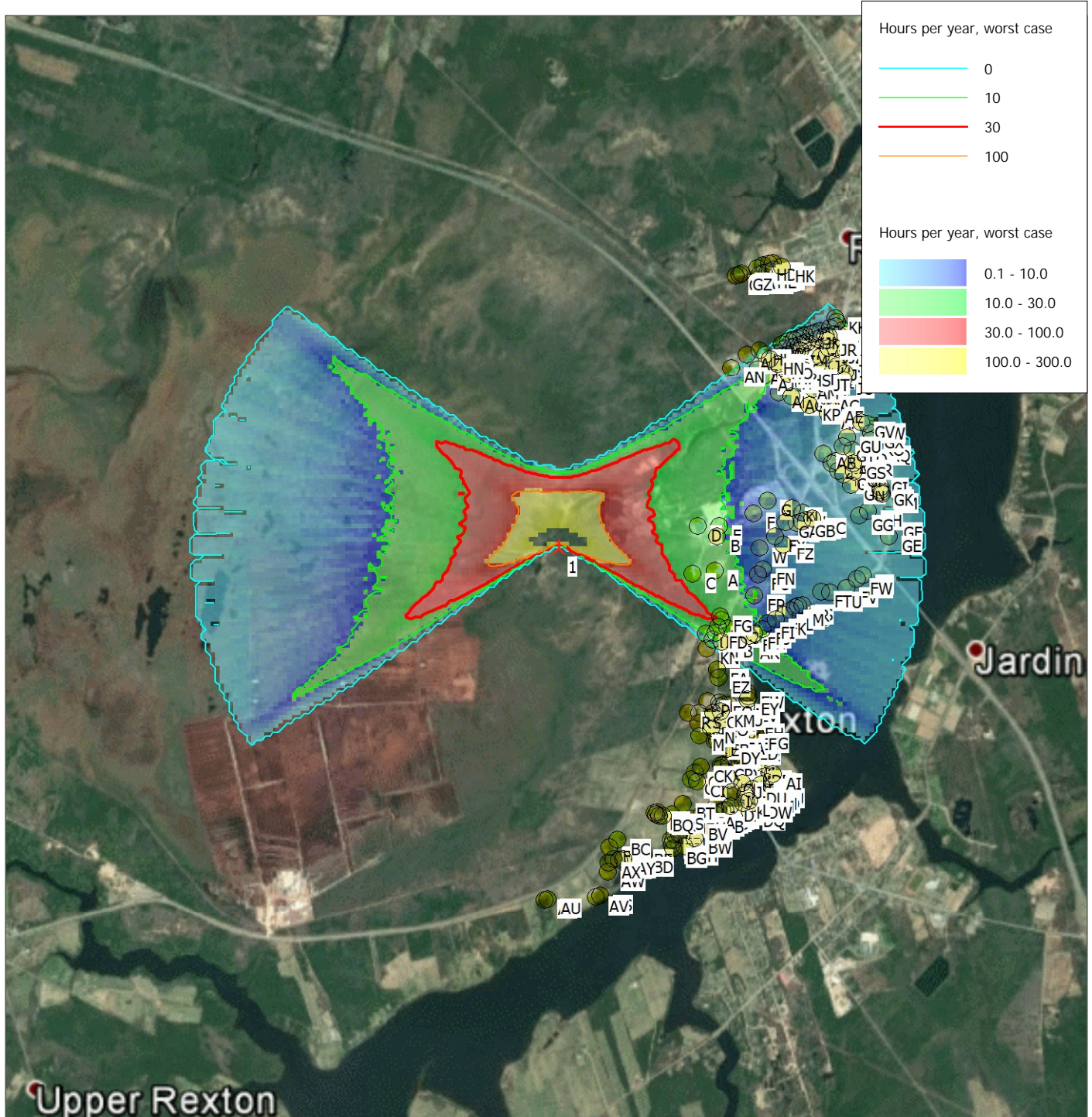
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
1	ENERCON E126-EP3 3500 127.0 !-! hub: 135.0 m (TOT: 198.5 m) (7)	182:44

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Map

Calculation: E126 135 v2



Map: WindPRO map , Print scale 1:40,000, Map center UTM (north)-WGS84 Zone: 20 East: 355,260 North: 5,169,420

New WTG

Shadow receptor

Flicker map level: Height Contours: Contours.wpo (1)

# **Annex C**

**WindPRO v3.1, Shadow Module Calculation**

**Results – Realistic Window Sizes**

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
 1801 Hollis Street, Suite 1205  
 CA-HALIFAX, Nova Scotia B3J 3N4  
 902 422 9663  
 Katherine Dorey / kdorey@naturalforces.ca  
 Calculated:  
 11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

### Assumptions for shadow calculations

Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

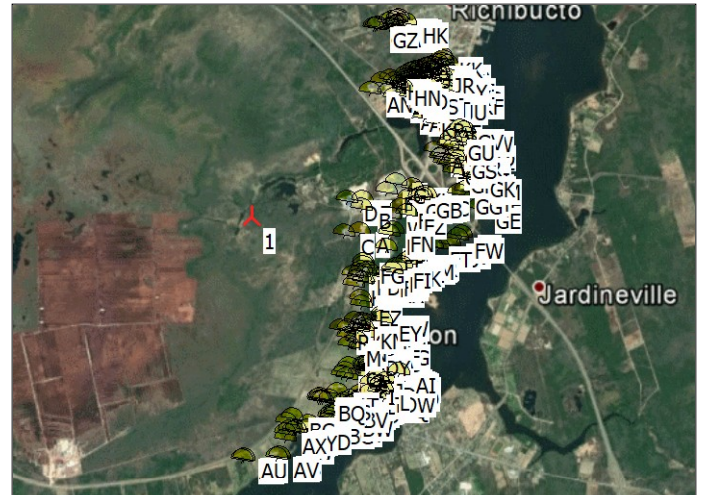
Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

The calculated times are "worst case" given by the following assumptions:  
 The sun is shining all the day, from sunrise to sunset  
 The rotor plane is always perpendicular to the line from the WTG to the sun  
 The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: Contours.wpo (1)  
 Obstacles used in calculation  
 Eye height: 1.5 m  
 Grid resolution: 10.0 m

All coordinates are in  
 UTM (north)-WGS84 Zone: 20



▲ New WTG

● Shadow receptor

### WTGs

Easting	Northing	Z	Row data/Description	WTG type				Shadow data			
				Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
1	355,265	5,169,414	12.2 ENERCON E126-EP3 3500 127.0 !-! hub: 135.0 m (TOT: ...No	...	ENERCON	E126-EP3-3,500	3,500	127.0	135.0	2,500	12.4

### Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
	[m]	[m]	[m]	[m]	[m]	[m]	[°]	[°]	
A	356,332	5,169,228	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
B	356,356	5,169,471	8.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
C	356,181	5,169,212	7.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
D	356,222	5,169,545	7.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
E	356,374	5,169,540	7.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
F	356,609	5,169,624	6.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
G	356,706	5,169,707	5.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
H	356,943	5,169,619	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
I	356,413	5,167,697	2.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
J	356,486	5,167,758	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
K	356,487	5,167,618	2.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
L	356,528	5,167,633	2.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
M	356,201	5,168,094	8.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
N	356,284	5,168,140	8.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
O	356,368	5,168,190	7.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
P	356,263	5,168,331	10.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
Q	356,300	5,168,248	8.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
R	356,126	5,168,254	10.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
S	356,201	5,168,252	8.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
T	356,308	5,168,753	7.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
U	356,260	5,168,795	9.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
V	356,346	5,168,839	9.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
W	356,642	5,169,378	8.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
X	356,900	5,169,551	6.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
Y	357,195	5,169,902	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
Z	357,153	5,169,954	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
AA	357,176	5,169,972	4.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
AB	357,098	5,170,021	4.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
AC	357,128	5,170,420	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
AD	357,041	5,170,474	3.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
AE	357,162	5,170,341	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction

To be continued on next page...

Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663

Katherine Dorey / kdorey@naturalforges.ca

Calculated:

11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
AF	357,132	5,170,300	2.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
AG	356,889	5,170,427	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
AH	356,801	5,170,455	5.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
AI	356,698	5,167,812	2.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
AJ	356,708	5,170,573	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
AK	356,657	5,170,619	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
AL	356,587	5,170,727	6.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
AM	356,974	5,170,512	3.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
AN	356,477	5,170,638	7.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
AO	357,361	5,170,668	3.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
AP	357,198	5,170,718	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
AQ	357,462	5,170,065	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
AR	356,542	5,168,723	4.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
AS	355,493	5,167,000	4.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
AT	355,111	5,166,979	12.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
AU	355,132	5,166,986	12.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
AV	355,462	5,166,990	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
AW	355,551	5,167,165	6.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
AX	355,554	5,167,228	8.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
AY	355,661	5,167,249	5.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
AZ	355,628	5,167,246	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
BA	355,593	5,167,251	6.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
BB	355,564	5,167,333	9.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
BC	355,620	5,167,383	9.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
BD	355,769	5,167,255	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
BE	355,780	5,167,307	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
BF	355,990	5,167,339	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
BG	356,004	5,167,312	3.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
BH	356,079	5,167,325	1.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
BI	355,986	5,167,377	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
BJ	356,004	5,167,372	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
BK	356,014	5,167,410	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
BL	356,044	5,167,410	3.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
BM	356,059	5,167,406	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
BN	355,881	5,167,562	9.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
BO	355,892	5,167,551	9.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
BP	355,903	5,167,571	9.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
BQ	355,911	5,167,543	8.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
BR	355,934	5,167,544	8.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
BS	355,995	5,167,549	7.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
BT	356,076	5,167,619	8.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
BU	356,141	5,167,517	4.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
BV	356,156	5,167,474	3.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
BW	356,150	5,167,383	2.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
BX	356,163	5,167,438	3.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
BY	356,217	5,167,502	2.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
BZ	356,241	5,167,503	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CA	356,208	5,167,549	2.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
CB	356,265	5,167,522	1.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
CC	356,294	5,167,545	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CD	356,295	5,167,591	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CE	356,324	5,167,554	2.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
CF	356,347	5,167,566	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CG	356,368	5,167,575	1.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
CH	356,134	5,167,788	10.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
CI	356,174	5,167,772	8.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CJ	356,163	5,167,834	9.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
CK	356,202	5,167,876	7.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
CL	356,400	5,167,780	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CM	356,385	5,167,806	3.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
CN	356,376	5,167,836	3.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
CO	356,347	5,167,864	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
CP	356,340	5,167,881	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
CQ	356,358	5,167,884	4.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
CR	356,397	5,167,891	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction

To be continued on next page...

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663  
Katherine Dorey / kdorey@naturalforces.ca  
Calculated:  
11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
CS	356,441	5,167,850	2.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
CT	356,398	5,167,865	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
CU	356,419	5,167,820	2.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
CV	356,448	5,167,803	2.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
CW	356,473	5,167,813	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
CX	356,493	5,167,844	2.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
CY	356,465	5,167,880	2.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
CZ	356,494	5,167,891	2.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
DA	356,565	5,167,832	2.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
DB	356,594	5,167,835	1.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
DC	356,557	5,167,760	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
DD	356,572	5,167,773	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
DE	356,597	5,167,780	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DF	356,633	5,167,818	1.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
DG	356,644	5,167,799	1.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
DH	356,660	5,167,758	2.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
DI	356,685	5,167,730	2.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
DJ	356,699	5,167,709	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DK	356,615	5,167,741	2.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
DL	356,603	5,167,688	2.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
DM	356,598	5,167,654	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DN	356,627	5,167,674	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DO	356,640	5,167,676	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DP	356,654	5,167,683	1.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
DQ	356,531	5,167,560	2.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
DR	356,576	5,167,623	1.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
DS	356,589	5,167,639	1.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
DT	356,505	5,167,674	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
DU	356,556	5,167,712	3.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
DV	356,513	5,167,688	2.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
DW	356,563	5,167,615	1.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
DX	356,403	5,167,599	1.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
DY	356,390	5,167,993	4.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
DZ	356,393	5,168,022	4.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
EA	356,430	5,168,063	4.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
EB	356,323	5,168,052	6.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
EC	356,304	5,168,054	6.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
ED	356,516	5,168,022	1.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
EE	356,540	5,168,012	0.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
EF	356,521	5,168,091	2.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
EG	356,585	5,168,091	0.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
EH	356,556	5,168,167	0.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
EI	356,560	5,168,242	1.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
EJ	356,378	5,168,086	6.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
EK	356,375	5,168,110	6.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
EL	356,368	5,168,165	7.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
EM	356,355	5,168,227	8.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
EN	356,309	5,168,112	7.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
EO	356,276	5,168,213	9.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
EP	356,196	5,168,180	8.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
EQ	356,343	5,168,321	8.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
ER	356,345	5,168,296	8.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
ES	356,377	5,168,303	8.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
ET	356,407	5,168,302	8.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
EU	356,419	5,168,260	7.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
EV	356,526	5,168,290	4.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
EW	356,540	5,168,383	5.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
EX	356,541	5,168,358	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
EY	356,535	5,168,335	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
EZ	356,341	5,168,489	7.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
FA	356,334	5,168,548	8.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
FB	356,367	5,168,735	8.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
FC	356,411	5,168,828	10.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
FD	356,329	5,168,801	8.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
FE	356,369	5,168,885	10.0	1.0	1.5	1.0	10.0	90.0	Fixed direction

To be continued on next page...

Project:

# Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663  
Katherine Dorey / kdorey@naturalforges.ca  
Calculated:  
11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
FF	356,555	5,168,775	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
FG	356,363	5,168,912	10.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
FH	356,595	5,168,790	6.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
FI	356,686	5,168,858	7.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
FJ	356,649	5,168,818	7.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
FK	356,745	5,168,882	6.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FL	356,799	5,168,914	6.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FM	356,845	5,168,943	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
FN	356,667	5,169,230	8.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
FO	356,631	5,169,196	10.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
FP	356,601	5,169,051	11.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
FQ	356,879	5,168,962	5.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FR	356,900	5,168,974	5.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
FS	356,927	5,168,978	5.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FT	357,058	5,169,065	7.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
FU	357,121	5,169,060	3.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FV	357,233	5,169,087	4.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
FW	357,306	5,169,148	5.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
FX	357,347	5,169,173	6.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
FY	356,750	5,169,459	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
FZ	356,805	5,169,402	8.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
GA	356,828	5,169,557	6.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
GB	356,937	5,169,560	6.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
GC	357,008	5,169,575	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
GD	356,967	5,169,568	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
GE	357,530	5,169,441	4.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
GF	357,543	5,169,536	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
GG	357,333	5,169,592	7.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
GH	357,394	5,169,618	9.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
GI	357,468	5,169,843	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
GJ	357,483	5,169,783	2.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
GK	357,482	5,169,762	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
GL	357,486	5,169,747	2.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
GM	357,494	5,169,734	2.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
GN	357,283	5,169,801	8.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
GO	357,229	5,169,877	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
GP	357,303	5,169,897	7.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
GQ	357,296	5,170,044	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
GR	357,339	5,169,973	5.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
GS	357,301	5,169,949	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
GT	357,232	5,170,074	5.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
GU	357,264	5,170,134	4.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
GV	357,364	5,170,233	2.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
GW	357,401	5,170,220	2.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
GX	357,428	5,170,160	3.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
GY	356,524	5,171,275	5.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
GZ	356,550	5,171,280	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
HA	356,566	5,171,286	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
HB	356,673	5,171,321	5.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
HC	356,686	5,171,277	5.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
HD	356,716	5,171,340	5.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
HE	356,718	5,171,289	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
HF	356,745	5,171,292	4.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
HG	356,762	5,171,301	4.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
HH	356,758	5,171,351	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
HI	356,782	5,171,357	5.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
HJ	356,788	5,171,309	5.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
HK	356,842	5,171,325	4.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
HL	356,675	5,170,754	8.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
HM	356,716	5,170,720	8.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
HN	356,745	5,170,690	7.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
HO	356,800	5,170,651	6.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
HP	356,842	5,170,617	6.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
HQ	356,873	5,170,580	5.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
HR	356,913	5,170,591	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction

To be continued on next page...

Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
1801 Hollis Street, Suite 1205  
CA-HALIFAX, Nova Scotia B3J 3N4  
902 422 9663

Katherine Dorey / kdorey@naturalforces.ca

Calculated:

11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height	Degrees from	Slope of	Direction mode
			[m]	[m]	[m]	a.g.l.	south cw	window	
						[m]	[°]	[°]	
HS	356,937	5,170,599	4.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
HT	356,978	5,170,610	5.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
HU	356,877	5,170,627	6.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
HV	356,898	5,170,634	5.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
HW	356,948	5,170,653	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
HX	356,969	5,170,658	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
HY	356,994	5,170,664	5.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
HZ	357,013	5,170,671	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
IA	357,039	5,170,678	4.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
IB	357,029	5,170,720	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
IC	356,978	5,170,705	5.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
ID	356,948	5,170,694	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
IE	356,919	5,170,687	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
IF	356,890	5,170,678	6.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
IG	356,853	5,170,667	7.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
IH	356,828	5,170,659	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
II	356,810	5,170,703	7.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
IJ	356,840	5,170,713	7.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
IK	356,869	5,170,721	7.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
IL	356,900	5,170,731	7.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
IM	356,929	5,170,740	7.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
IN	356,957	5,170,749	6.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
IO	357,009	5,170,764	6.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
IP	356,840	5,170,763	7.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
IQ	356,830	5,170,792	7.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
IR	356,877	5,170,813	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
IS	356,893	5,170,769	7.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
IT	356,911	5,170,823	7.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
IU	356,923	5,170,776	7.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
IV	356,940	5,170,832	6.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
IW	356,952	5,170,786	6.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
IX	356,965	5,170,837	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
IY	356,976	5,170,792	6.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
IZ	356,989	5,170,848	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JA	357,004	5,170,798	6.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
JB	357,004	5,170,620	5.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JC	357,029	5,170,627	4.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
JD	357,050	5,170,632	4.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JE	357,076	5,170,638	4.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JF	357,119	5,170,651	4.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
JG	357,066	5,170,684	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
JH	357,095	5,170,697	4.6	1.0	1.5	1.0	10.0	90.0	Fixed direction
JI	357,138	5,170,711	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
JJ	357,149	5,170,757	5.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
JK	357,033	5,170,859	6.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
JL	357,054	5,170,864	6.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
JM	357,075	5,170,872	6.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
JN	357,098	5,170,877	5.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
JO	357,077	5,170,823	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
JP	357,100	5,170,832	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JQ	357,132	5,170,839	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JR	357,141	5,170,810	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
JS	357,154	5,170,843	6.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
JT	357,090	5,170,566	4.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
JU	357,246	5,170,536	2.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
JV	357,257	5,170,580	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
JW	357,211	5,170,636	4.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
JX	357,305	5,170,679	3.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
JY	357,268	5,170,736	4.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
JZ	357,198	5,170,758	5.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
KA	357,213	5,170,791	5.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
KB	357,239	5,170,815	5.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
KC	357,226	5,170,846	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
KD	357,252	5,170,882	5.4	1.0	1.5	1.0	10.0	90.0	Fixed direction
KE	357,322	5,170,748	5.3	1.0	1.5	1.0	10.0	90.0	Fixed direction

To be continued on next page...



Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc  
 1801 Hollis Street, Suite 1205  
 CA-HALIFAX, Nova Scotia B3J 3N4  
 902 422 9663  
 Katherine Dorey / kdorey@naturalforces.ca  
 Calculated:  
 11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
KF	357,413	5,170,591	4.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
KG	357,189	5,170,849	6.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
KH	357,163	5,170,897	6.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
KI	357,205	5,170,909	6.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
KJ	357,208	5,170,936	6.3	1.0	1.5	1.0	10.0	90.0	Fixed direction
KK	357,203	5,170,961	6.1	1.0	1.5	1.0	10.0	90.0	Fixed direction
KL	356,872	5,169,655	5.2	1.0	1.5	1.0	10.0	90.0	Fixed direction
KM	356,352	5,168,257	8.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
KN	356,267	5,168,692	7.0	1.0	1.5	1.0	10.0	90.0	Fixed direction
KO	357,423	5,170,110	2.8	1.0	1.5	1.0	10.0	90.0	Fixed direction
KP	357,008	5,170,362	2.9	1.0	1.5	1.0	10.0	90.0	Fixed direction
KQ	357,093	5,170,600	4.5	1.0	1.5	1.0	10.0	90.0	Fixed direction
KR	357,235	5,170,724	4.7	1.0	1.5	1.0	10.0	90.0	Fixed direction
KS	357,259	5,170,780	5.0	1.0	1.5	1.0	10.0	90.0	Fixed direction

## Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year	Shadow days per year	Max shadow hours per day
	[h/year]	[days/year]	[h/day]
A	7:08	33	0:20
B	11:58	34	0:27
C	2:21	24	0:08
D	15:02	39	0:30
E	11:19	33	0:26
F	7:42	27	0:22
G	6:40	26	0:20
H	4:40	22	0:18
I	0:00	0	0:00
J	0:00	0	0:00
K	0:00	0	0:00
L	0:00	0	0:00
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	7:35	28	0:22
X	4:59	23	0:18
Y	3:05	19	0:15
Z	3:14	19	0:15
AA	3:10	20	0:15
AB	3:36	21	0:15
AC	3:35	23	0:14
AD	4:05	26	0:14
AE	3:20	22	0:14
AF	3:24	21	0:14
AG	5:29	30	0:16
AH	6:52	36	0:17
AI	0:00	0	0:00
AJ	12:36	52	0:18
AK	9:10	40	0:17
AL	0:00	0	0:00
AM	4:52	30	0:15
AN	0:00	0	0:00
AO	2:23	22	0:11
AP	3:24	26	0:12
AQ	2:04	16	0:12

To be continued on next page...

## SHADOW - Main Result

...continued from previous page  
Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	0:00	0	0:00
AU	0:00	0	0:00
AV	0:00	0	0:00
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	0:00	0	0:00
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	0:00	0	0:00
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	0:00	0	0:00
BJ	0:00	0	0:00
BK	0:00	0	0:00
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00
BT	0:00	0	0:00
BU	0:00	0	0:00
BV	0:00	0	0:00
BW	0:00	0	0:00
BX	0:00	0	0:00
BY	0:00	0	0:00
BZ	0:00	0	0:00
CA	0:00	0	0:00
CB	0:00	0	0:00
CC	0:00	0	0:00
CD	0:00	0	0:00
CE	0:00	0	0:00
CF	0:00	0	0:00
CG	0:00	0	0:00
CH	0:00	0	0:00
CI	0:00	0	0:00
CJ	0:00	0	0:00
CK	0:00	0	0:00
CL	0:00	0	0:00
CM	0:00	0	0:00
CN	0:00	0	0:00
CO	0:00	0	0:00
CP	0:00	0	0:00
CQ	0:00	0	0:00
CR	0:00	0	0:00
CS	0:00	0	0:00
CT	0:00	0	0:00
CU	0:00	0	0:00
CV	0:00	0	0:00
CW	0:00	0	0:00
CX	0:00	0	0:00
CY	0:00	0	0:00
CZ	0:00	0	0:00
DA	0:00	0	0:00
DB	0:00	0	0:00
DC	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

...continued from previous page  
Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
DD	0:00	0	0:00
DE	0:00	0	0:00
DF	0:00	0	0:00
DG	0:00	0	0:00
DH	0:00	0	0:00
DI	0:00	0	0:00
DJ	0:00	0	0:00
DK	0:00	0	0:00
DL	0:00	0	0:00
DM	0:00	0	0:00
DN	0:00	0	0:00
DO	0:00	0	0:00
DP	0:00	0	0:00
DQ	0:00	0	0:00
DR	0:00	0	0:00
DS	0:00	0	0:00
DT	0:00	0	0:00
DU	0:00	0	0:00
DV	0:00	0	0:00
DW	0:00	0	0:00
DX	0:00	0	0:00
DY	0:00	0	0:00
DZ	0:00	0	0:00
EA	0:00	0	0:00
EB	0:00	0	0:00
EC	0:00	0	0:00
ED	0:00	0	0:00
EE	0:00	0	0:00
EF	0:00	0	0:00
EG	0:00	0	0:00
EH	0:00	0	0:00
EI	0:00	0	0:00
EJ	0:00	0	0:00
EK	0:00	0	0:00
EL	0:00	0	0:00
EM	0:00	0	0:00
EN	0:00	0	0:00
EO	0:00	0	0:00
EP	0:00	0	0:00
EQ	0:00	0	0:00
ER	0:00	0	0:00
ES	0:00	0	0:00
ET	0:00	0	0:00
EU	0:00	0	0:00
EV	0:00	0	0:00
EW	0:00	0	0:00
EX	0:00	0	0:00
EY	0:00	0	0:00
EZ	0:00	0	0:00
FA	0:00	0	0:00
FB	0:00	0	0:00
FC	0:00	0	0:00
FD	0:00	0	0:00
FE	0:00	0	0:00
FF	0:00	0	0:00
FG	0:00	0	0:00
FH	0:00	0	0:00
FI	0:00	0	0:00
FJ	0:00	0	0:00
FK	0:00	0	0:00
FL	0:00	0	0:00
FM	0:00	0	0:00
FN	7:33	28	0:21
FO	5:54	28	0:19

To be continued on next page...

Project:

Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc

1801 Hollis Street, Suite 1205

CA-HALIFAX, Nova Scotia B3J 3N4

902 422 9663

Katherine Dorey / kdorey@naturalforges.ca

Calculated:

11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
FP	0:00	0	0:00
FQ	0:00	0	0:00
FR	0:00	0	0:00
FS	0:00	0	0:00
FT	0:50	14	0:05
FU	1:00	14	0:06
FV	2:10	19	0:11
FW	2:49	19	0:13
FX	2:34	18	0:12
FY	6:22	26	0:20
FZ	5:54	25	0:19
GA	5:30	23	0:19
GB	4:42	22	0:18
GC	4:13	21	0:17
GD	4:24	22	0:17
GE	1:56	15	0:12
GF	1:49	16	0:11
GG	2:29	17	0:13
GH	2:13	16	0:13
GI	2:00	15	0:11
GJ	2:04	16	0:12
GK	2:03	16	0:12
GL	2:01	15	0:12
GM	2:02	15	0:12
GN	2:37	17	0:14
GO	2:54	18	0:14
GP	2:31	18	0:13
GQ	2:35	18	0:14
GR	2:22	17	0:13
GS	2:38	18	0:14
GT	2:51	19	0:14
GU	2:43	18	0:13
GV	2:18	17	0:12
GW	2:12	17	0:12
GX	2:07	17	0:12
GY	0:00	0	0:00
GZ	0:00	0	0:00
HA	0:00	0	0:00
HB	0:00	0	0:00
HC	0:00	0	0:00
HD	0:00	0	0:00
HE	0:00	0	0:00
HF	0:00	0	0:00
HG	0:00	0	0:00
HH	0:00	0	0:00
HI	0:00	0	0:00
HJ	0:00	0	0:00
HK	0:00	0	0:00
HL	0:00	0	0:00
HM	3:37	24	0:11
HN	7:38	36	0:16
HO	10:48	48	0:16
HP	9:42	58	0:16
HQ	7:07	44	0:16
HR	6:25	40	0:15
HS	5:59	38	0:15
HT	5:21	35	0:15
HU	8:39	58	0:15
HV	8:03	60	0:15
HW	6:41	47	0:15
HX	6:13	43	0:15
HY	5:51	40	0:14
HZ	5:32	38	0:14
IA	5:12	36	0:14

To be continued on next page...

## SHADOW - Main Result

...continued from previous page  
Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
IB	5:59	45	0:14
IC	7:31	56	0:14
ID	8:04	54	0:14
IE	8:51	54	0:14
IF	9:30	52	0:16
IG	10:08	50	0:16
IH	10:27	50	0:16
II	9:04	40	0:16
IJ	9:23	42	0:16
IK	9:20	44	0:16
IL	9:06	44	0:15
IM	8:50	46	0:14
IN	8:37	48	0:15
IO	7:54	50	0:14
IP	6:20	32	0:14
IQ	3:36	24	0:11
IR	4:21	26	0:12
IS	7:51	38	0:15
IT	5:08	30	0:13
IU	8:06	40	0:15
IV	5:47	32	0:14
IW	8:09	42	0:15
IX	6:20	34	0:14
IY	8:06	42	0:14
IZ	6:30	34	0:14
JA	7:57	44	0:14
JB	5:10	34	0:14
JC	4:48	32	0:14
JD	4:39	32	0:14
JE	4:24	30	0:14
JF	3:57	30	0:13
JG	4:47	34	0:13
JH	4:31	32	0:13
JI	3:56	30	0:13
JJ	4:11	32	0:12
JK	6:48	38	0:13
JL	6:55	38	0:13
JM	6:53	40	0:13
JN	6:44	41	0:13
JO	7:03	47	0:13
JP	6:49	48	0:13
JQ	6:12	50	0:13
JR	5:05	45	0:12
JS	5:38	50	0:12
JT	3:54	26	0:14
JU	2:59	22	0:13
JV	2:52	22	0:12
JW	3:06	24	0:12
JX	2:42	22	0:12
JY	2:55	24	0:11
JZ	3:34	30	0:12
KA	3:37	30	0:12
KB	3:33	32	0:11
KC	3:55	36	0:12
KD	3:55	36	0:11
KE	2:38	24	0:11
KF	2:06	18	0:11
KG	4:41	43	0:12
KH	6:11	44	0:12
KI	5:35	46	0:11
KJ	5:44	42	0:11
KK	5:40	38	0:11
KL	5:11	23	0:18
KM	0:00	0	0:00

To be continued on next page...

Project:

## Richibucto Wind Project

Licensed user:

Natural Forces Wind Inc

1801 Hollis Street, Suite 1205

CA-HALIFAX, Nova Scotia B3J 3N4

902 422 9663

Katherine Dorey / kdorey@naturalforces.ca

Calculated:

11/21/2017 12:20 PM/3.1.617

## SHADOW - Main Result

...continued from previous page

Shadow, worst case

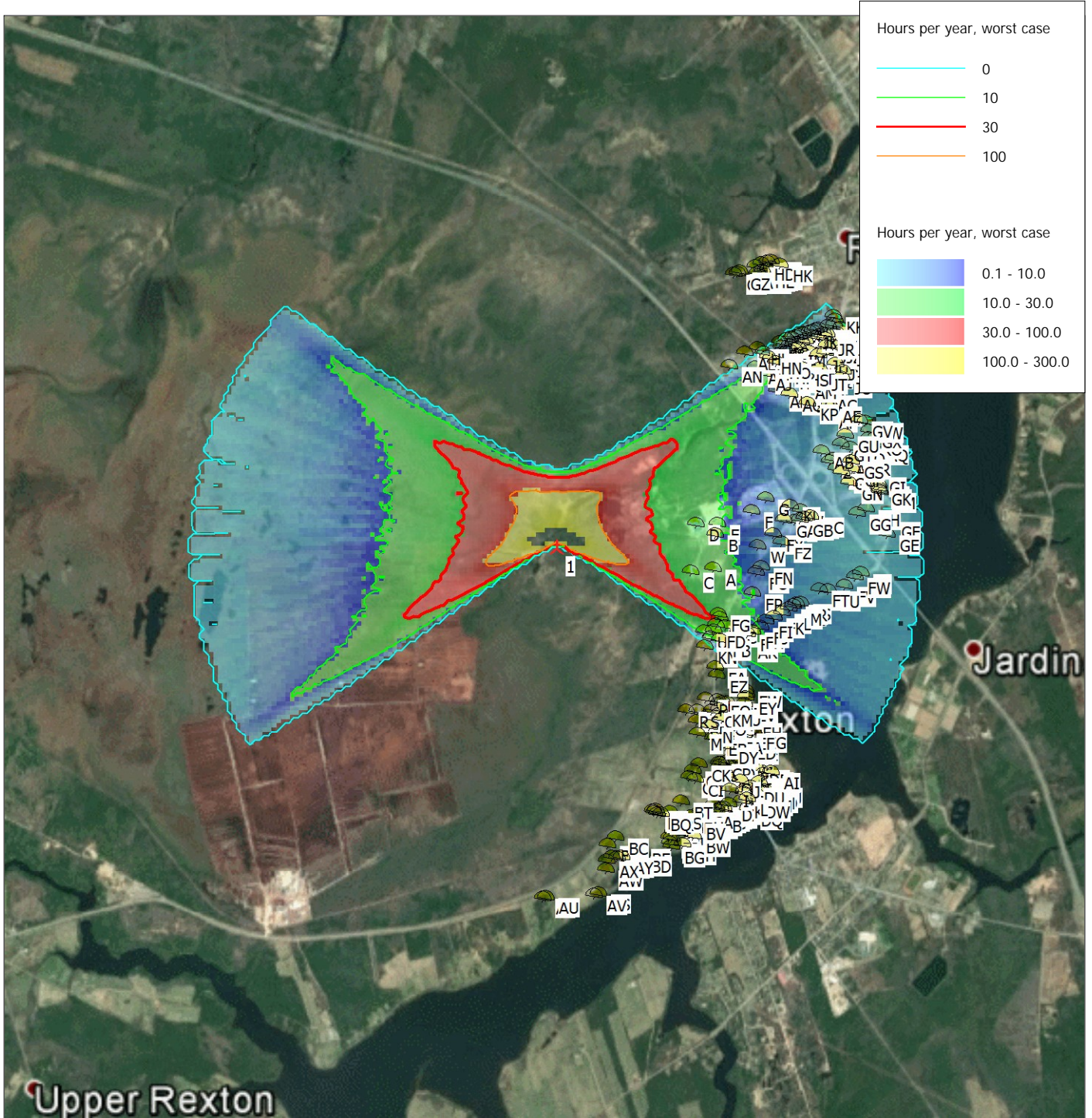
No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
KN	0:00	0	0:00
KO	2:09	17	0:12
KP	4:16	26	0:15
KQ	4:00	28	0:14
KR	3:11	26	0:12
KS	3:02	26	0:11

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
1	ENERCON E126-EP3 3500 127.0 !-! hub: 135.0 m (TOT: 198.5 m) (7)	97:07

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Map



Map: WindPRO map , Print scale 1:40,000, Map center UTM (north)-WGS84 Zone: 20 East: 355,260 North: 5,169,420

New WTG

Shadow receptor

Flicker map level: Height Contours: Contours.wpo (1)