



Mulgrave Community Wind Project

Visual Simulation 4

Image Easting: 622,534
Northing: 5,054,124
Photograph Date: October 6, 2013
View Angle: 30 Degrees

Turbine Manufacturer: Enercon
Model: E92
Hub Height: 98 m
Rotor Diameter: 92 m
Rated Power: 2300 kW
Power Curve: Level 0

Coordinate System	UTM, NAD83, Zone 20	October 6, 2013
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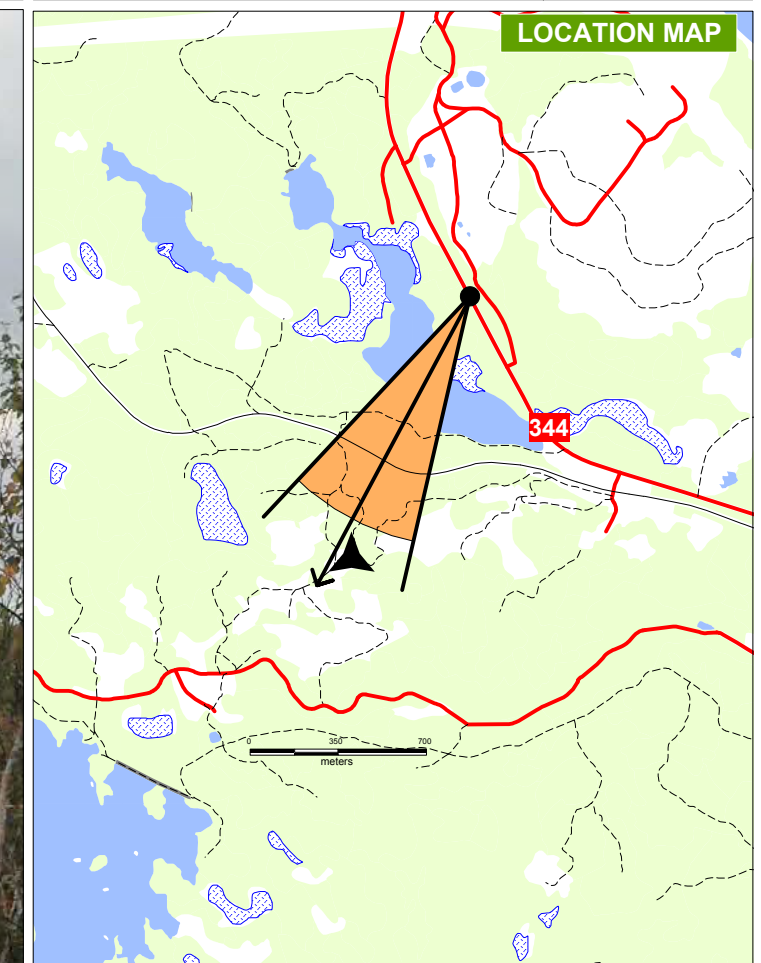
Analysis By: AL-PRO Wind Energy Consulting Canada Inc.



ORIGINAL PHOTOGRAPH



VISUAL SIMULATION



Mulgrave Community Wind Project

Zone of Visual Influence

Legend:

Turbine Visible

Project Features

- Project Area
- Existing Access Road
- Met Tower
- Proposed E92 Turbine

Existing Features

- Road
- Trail
- Abandoned Rail Road
- Stream
- Contour
- Water
- Swamp
- Building
- Forest



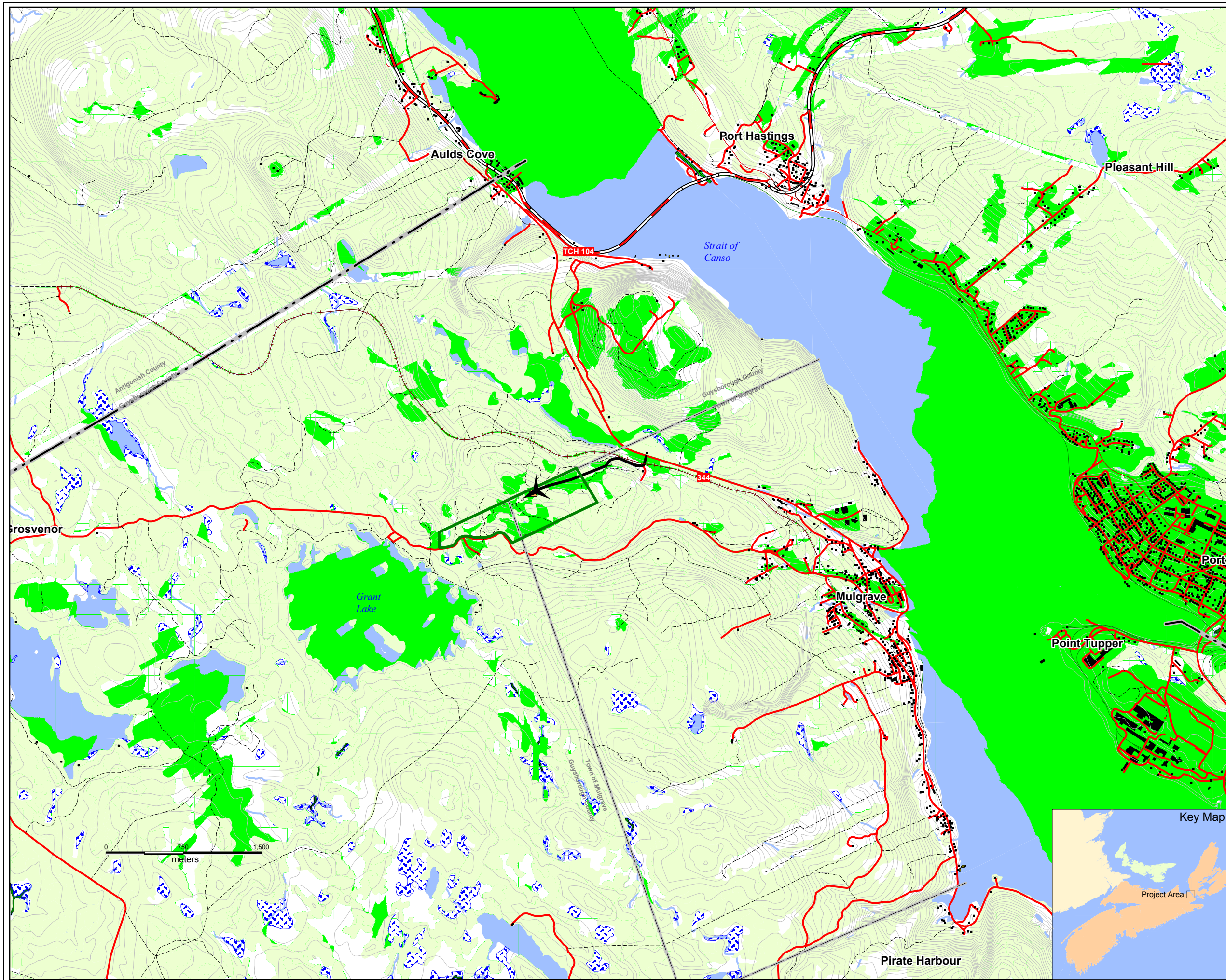
Turbine Model: Enercon E-92
 Hub Height: 98 m
 Rotor Diameter: 92 m
 Rated Power: 2,350 kW

Scale: 1: 35,000

Source: Base Data: Nova Scotia Geomatics Centre,
 Nova Scotia Topographical Database (NSTDB)

Nov 28, 2013 Coordinate System: NAD 1983 UTM Zone 20N Version: 1.1

GIS By: Nortek Resource Solutions Inc.



Appendix VIII. SHADOW FLICKER ASSESSMENT

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SHADOW - Main Result

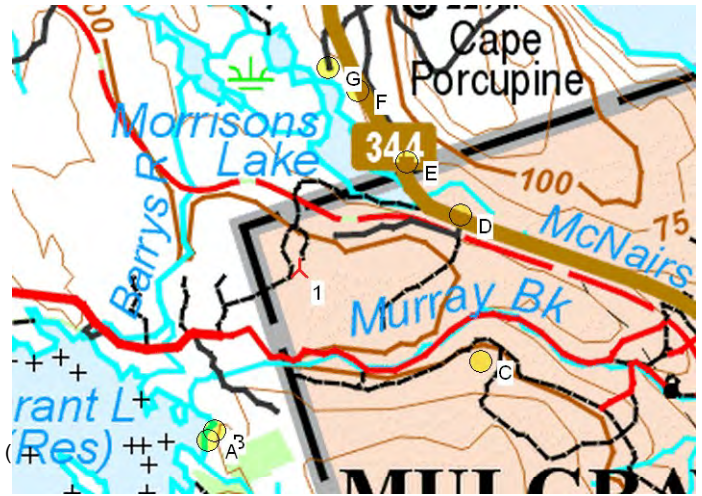
Calculation: Shadow @ Receptors E-92 98m

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: Mulgrave_environmental_contour.wpo (Res)
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m



Scale 1:50,000
New WTG Shadow receptor

WTGs

	UTM (north)-NAD83 (US+CA) Zone: 20			Row data/Description	WTG type			Shadow data				
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
1	622,056	5,053,081	120.0	ENERCON E-92 2,3 MW 2300 9...	Yes	ENERCON	E-92 2,3 MW-2,300	2,300	92.0	98.0	1,516	16.0

Shadow receptor-Input

No.	UTM (north)-NAD83 (US+CA) Zone: 20			Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
	East	North	Z						
A	621,476	5,051,934	121.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	621,520	5,052,002	124.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	623,278	5,052,499	106.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
D	623,121	5,053,462	70.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
E	622,756	5,053,807	71.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
F	622,419	5,054,274	77.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
G	622,218	5,054,421	68.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	0:00	0	0:00
C	14:00	67	0:17
D	6:06	25	0:19
E	19:43	58	0:23
F	0:00	0	0:00
G	0:00	0	0:00

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SHADOW - Main Result

Calculation: Shadow @ Receptors E-92 98m

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)	39:49	

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SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98mShadow receptor: A - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (1)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47 16:33	07:29 17:12	06:46 17:52	06:48 19:34	05:55 20:12	05:21 20:47	05:21 20:59	05:49 20:36	06:26 19:46	07:04 18:48	06:45 16:54	07:25 16:24
2	07:47 16:34	07:27 17:13	06:44 17:54	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24
3	07:47 16:34	07:26 17:15	06:43 17:55	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24
4	07:47 16:35	07:25 17:16	06:41 17:56	06:42 19:37	05:51 20:16	05:19 20:50	05:22 20:59	05:52 20:32	06:30 19:40	07:07 18:42	06:49 16:50	07:29 16:23
5	07:47 16:36	07:24 17:18	06:39 17:58	06:41 19:39	05:49 20:17	05:19 20:51	05:23 20:58	05:54 20:30	06:31 19:38	07:09 18:40	06:51 16:49	07:30 16:23
6	07:47 16:38	07:22 17:19	06:37 17:59	06:39 19:40	05:48 20:19	05:18 20:52	05:24 20:58	05:55 20:29	06:33 19:36	07:10 18:39	06:52 16:47	07:31 16:23
7	07:47 16:39	07:21 17:20	06:35 18:00	06:37 19:41	05:47 20:20	05:18 20:52	05:24 20:57	05:56 20:27	06:34 19:34	07:11 18:37	06:53 16:46	07:32 16:23
8	07:46 16:40	07:20 17:22	07:34 19:02	06:35 19:43	05:45 20:21	05:18 20:53	05:25 20:57	05:57 20:26	06:35 19:32	07:12 18:35	06:55 16:45	07:33 16:23
9	07:46 16:41	07:18 17:23	07:32 19:03	06:33 19:44	05:44 20:22	05:17 20:54	05:26 20:57	05:58 20:25	06:36 19:31	07:14 18:33	06:56 16:43	07:34 16:22
10	07:46 16:42	07:17 17:25	07:30 19:05	06:31 19:45	05:43 20:24	05:17 20:54	05:27 20:56	06:00 20:23	06:38 19:29	07:15 18:31	06:58 16:42	07:35 16:22
11	07:45 16:43	07:15 17:26	07:28 19:06	06:29 19:47	05:41 20:25	05:17 20:55	05:27 20:56	06:01 20:22	06:39 19:27	07:16 18:29	06:59 16:41	07:36 16:22
12	07:45 16:44	07:14 17:28	07:26 19:07	06:28 19:48	05:40 20:26	05:17 20:55	05:28 20:55	06:02 20:20	06:40 19:25	07:18 18:27	07:00 16:40	07:37 16:22
13	07:45 16:46	07:13 17:29	07:24 19:09	06:26 19:49	05:39 20:27	05:17 20:56	05:29 20:54	06:03 20:18	06:41 19:23	07:19 18:26	07:02 16:39	07:38 16:23
14	07:44 16:47	07:11 17:31	07:22 19:10	06:24 19:50	05:37 20:29	05:17 20:56	05:30 20:54	06:04 20:17	06:42 19:21	07:20 18:24	07:03 16:38	07:39 16:23
15	07:43 16:48	07:10 17:32	07:20 19:11	06:22 19:52	05:36 20:30	05:16 20:57	05:31 20:53	06:06 20:15	06:44 19:19	07:22 18:22	07:05 16:37	07:39 16:23
16	07:43 16:49	07:08 17:34	07:19 19:13	06:20 19:53	05:35 20:31	05:16 20:57	05:32 20:52	06:07 20:14	06:45 19:17	07:23 18:20	07:06 16:35	07:40 16:23
17	07:42 16:51	07:06 17:35	07:17 19:14	06:19 19:54	05:34 20:32	05:16 20:58	05:33 20:51	06:08 20:12	06:46 19:15	07:24 18:19	07:07 16:34	07:41 16:23
18	07:42 16:52	07:05 17:37	07:15 19:15	06:17 19:56	05:33 20:33	05:16 20:58	05:34 20:51	06:09 20:10	06:47 19:13	07:26 18:17	07:09 16:34	07:42 16:24
19	07:41 16:53	07:03 17:38	07:13 19:17	06:15 19:57	05:32 20:34	05:17 20:58	05:35 20:50	06:11 20:09	06:49 19:11	07:27 18:15	07:10 16:33	07:42 16:24
20	07:40 16:55	07:02 17:39	07:11 19:18	06:13 19:58	05:31 20:35	05:17 20:59	05:36 20:49	06:12 20:07	06:50 19:09	07:28 18:13	07:11 16:32	07:43 16:24
21	07:39 16:56	07:00 17:41	07:09 19:19	06:12 19:59	05:30 20:37	05:17 20:59	05:37 20:48	06:13 20:05	06:51 19:07	07:30 18:12	07:13 16:31	07:43 16:25
22	07:39 16:57	06:58 17:42	07:07 19:21	06:10 20:01	05:29 20:38	05:17 20:59	05:38 20:47	06:14 20:04	06:52 19:05	07:31 18:10	07:14 16:30	07:44 16:25
23	07:38 16:59	06:57 17:44	07:05 19:22	06:08 20:02	05:28 20:39	05:17 20:59	05:39 20:46	06:15 20:02	06:53 19:03	07:32 18:08	07:15 16:29	07:44 16:26
24	07:37 17:00	06:55 17:45	07:03 19:23	06:07 20:03	05:27 20:40	05:18 20:59	05:40 20:45	06:17 20:00	06:55 19:02	07:34 18:07	07:17 16:28	07:45 16:26
25	07:36 17:02	06:53 17:47	07:01 19:24	06:05 20:05	05:26 20:41	05:18 21:00	05:41 20:44	06:18 19:58	06:56 19:00	07:35 18:05	07:18 16:28	07:45 16:27
26	07:35 17:03	06:51 17:48	06:59 19:26	06:03 20:06	05:25 20:42	05:18 21:00	05:42 20:43	06:19 19:57	06:57 18:58	07:37 18:03	07:19 16:27	07:46 16:28
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29	07:32 17:07		06:54 19:30	05:58 20:10	05:23 20:45	05:20 21:00	05:45 20:39	06:23 19:51	07:01 18:52	07:41 17:59	07:23 16:25	07:46 16:30
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31	07:30 17:10		06:50 19:32		05:22 20:47		05:48 20:37	06:25 19:47		07:44 17:56		07:47 16:31
Potential sun hours	284	290	369	405	462	469	474	437	377	340	286	272
Total, worst case												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98mShadow receptor: B - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (2)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47 16:33	07:29 17:12	06:46 17:52	06:48 19:34	05:55 20:12	05:21 20:47	05:21 20:59	05:49 20:36	06:26 19:46	07:04 18:48	06:45 16:54	07:25 16:24
2	07:47 16:34	07:27 17:13	06:44 17:54	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24
3	07:47 16:34	07:26 17:15	06:43 17:55	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24
4	07:47 16:35	07:25 17:16	06:41 17:56	06:42 19:37	05:51 20:16	05:19 20:50	05:22 20:59	05:52 20:32	06:30 19:40	07:07 18:42	06:49 16:50	07:29 16:23
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21	07:39 16:56	07:00 17:41	07:09 19:19	06:12 20:00	05:30 20:37	05:17 20:59	05:37 20:48	06:13 20:05	06:51 19:07	07:30 18:12	07:13 16:31	07:43 16:25
22	07:39 16:57	06:58 17:42	07:07 19:21	06:10 20:01	05:29 20:38	05:17 20:59	05:38 20:47	06:14 20:04	06:52 19:05	07:31 18:10	07:14 16:30	07:44 16:25
23	07:38 16:59	06:57 17:44	07:05 19:22	06:08 20:02	05:28 20:39	05:17 20:59	05:39 20:46	06:15 20:02	06:53 19:03	07:32 18:08	07:15 16:29	07:44 16:26
24	07:37 17:00	06:55 17:45	07:03 19:23	06:07 20:03	05:27 20:40	05:18 20:59	05:40 20:45	06:17 20:00	06:55 19:02	07:34 18:07	07:17 16:28	07:45 16:26
25	07:36 17:02	06:53 17:47	07:01 19:24	06:05 20:05	05:26 20:41	05:18 21:00	05:41 20:44	06:18 19:58	06:56 19:00	07:35 18:05	07:18 16:28	07:45 16:27
26	07:35 17:03	06:51 17:48	06:59 19:26	06:03 20:06	05:25 20:42	05:18 21:00	05:42 20:43	06:19 19:57	06:57 18:58	07:37 18:03	07:19 16:27	07:46 16:28
27	07:34 17:04	06:50 17:49	06:58 19:27	06:02 20:07	05:24 20:43	05:19 21:00	05:43 20:42	06:20 19:55	06:58 18:56	07:38 18:02	07:21 16:27	07:46 16:28
28	07:33 17:06	06:48 17:51	06:56 19:28	06:00 20:09	05:24 20:44	05:19 21:00	05:44 20:41	06:22 19:53	07:00 18:54	07:39 18:00	07:22 16:26	07:46 16:29
29	07:32 17:07		06:54 19:30	05:58 20:10	05:23 20:45	05:19 21:00	05:45 20:39	06:23 19:51	07:01 18:52	07:41 17:59	07:23 16:25	07:46 16:30
30	07:31 17:09		06:52 19:31	05:57 20:11	05:22 20:46	05:20 21:00	05:47 20:38	06:24 19:49	07:02 18:50	07:42 17:57	07:24 16:25	07:47 16:31
31	07:30 17:10		06:50 19:32		05:22 20:47		05:48 20:37	06:25 19:47		07:44 17:56		07:47 16:31
Potential sun hours	284	290	369	405	462	469	474	437	377	340	286	272
Total, worst case												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

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11/28/2013 4:14 PM/2.9.207

SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98mShadow receptor: D - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (4)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:47 16:32	07:29 17:12	06:46 17:52	16:54 (1) 17:13 (1)	06:48 19:33	05:55 20:12	05:21 20:47	05:20 20:59	05:49 20:36	06:26 19:46	07:03 18:48	06:45 16:54	07:25 16:24	
2	07:47 16:33	07:27 17:13	06:44 17:53	16:54 (1) 17:13 (1)	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24	
3	07:47 16:34	07:26 17:14	06:43 17:55	16:54 (1) 17:12 (1)	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24	
4	07:47 16:35	07:25 17:16	06:41 17:56	16:55 (1) 17:12 (1)	06:42 19:37	05:51 20:16	05:19 20:50	05:22 20:59	05:52 20:32	06:30 19:40	07:07 18:42	06:49 16:50	07:29 16:23	
5	07:47 16:36	07:24 17:17	06:39 17:58	16:56 (1) 17:11 (1)	06:40 19:39	05:49 20:17	05:19 20:51	05:23 20:58	05:53 20:30	06:31 19:38	07:09 18:40	06:51 16:49	07:30 16:23	
6	07:47 16:37	07:22 17:19	06:37 17:59	16:57 (1) 17:09 (1)	06:39 19:40	05:48 20:19	05:18 20:52	05:23 20:58	05:55 20:29	06:33 19:36	07:10 18:38	17:37 (1) 17:40 (1)	06:52 16:47	07:31 16:23
7	07:46 16:38	07:21 17:20	06:35 18:00	16:59 (1) 17:07 (1)	06:37 19:41	05:46 20:20	05:18 20:52	05:24 20:57	05:56 20:27	06:34 19:34	07:11 18:37	17:31 (1) 17:44 (1)	06:53 16:46	07:32 16:23
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10	07:46 16:42	07:17 17:25	07:30 19:04	17:07 (1) 19:15	06:31 19:45	05:42 20:24	05:17 20:54	05:26 20:56	05:59 20:23	06:37 19:29	07:15 18:31	17:29 (1) 17:47 (1)	06:58 16:42	07:35 16:22
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15	07:43 16:48	07:09 17:32	07:20 19:11	17:07 (1) 19:19	06:22 19:52	05:36 20:30	05:16 20:57	05:31 20:53	06:06 20:15	06:44 19:19	07:22 18:22	17:29 (1) 17:45 (1)	07:05 16:36	07:39 16:23
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17	07:42 16:51	07:06 17:35	07:17 19:14	17:07 (1) 19:24	06:18 19:54	05:34 20:32	05:16 20:58	05:33 20:51	06:08 20:12	06:46 19:15	07:24 18:18	17:30 (1) 17:42 (1)	07:07 16:34	07:41 16:23
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19	07:41 16:53	07:03 17:38	07:13 19:16	17:07 (1) 19:26	06:15 19:57	05:32 20:34	05:16 20:58	05:35 20:50	06:10 20:09	06:48 19:11	07:27 18:15	17:39 (1) 17:47 (1)	07:10 16:32	07:42 16:24
20	07:40 16:55	07:02 17:39	07:11 19:18	17:07 (1) 19:27	06:13 19:58	05:31 20:35	05:17 20:59	05:36 20:49	06:12 20:07	06:50 19:09	07:28 18:13	17:40 (1) 17:49 (1)	07:11 16:32	07:43 16:24
21	07:39 16:56	07:00 17:41	07:09 19:19	17:07 (1) 19:28	06:12 19:59	05:30 20:36	05:17 20:59	05:37 20:48	06:13 20:05	06:51 19:07	07:30 18:12	17:41 (1) 17:50 (1)	07:13 16:31	07:43 16:25
22	07:39 16:57	06:58 17:42	07:07 19:20	17:07 (1) 19:29	06:10 20:01	05:29 20:38	05:17 20:59	05:38 20:47	06:14 20:03	06:52 19:05	07:31 18:10	17:42 (1) 17:51 (1)	07:14 16:30	07:44 16:25
23	07:38 16:59	06:57 17:44	07:05 19:22	17:07 (1) 19:30	06:08 20:02	05:28 20:39	05:17 20:59	05:39 20:46	06:15 20:02	06:53 19:03	07:32 18:08	17:43 (1) 17:52 (1)	07:15 16:29	07:44 16:26
24	07:37 17:00	06:55 17:45	17:00 (1) 17:09 (1)	19:23 19:23	06:06 20:03	05:27 20:40	05:17 20:59	05:40 20:45	06:17 20:00	06:55 19:01	07:34 18:07	17:44 (1) 17:53 (1)	07:17 16:26	07:45 16:26
25	07:36 17:01	06:53 17:46	16:58 (1) 17:11 (1)	19:24 19:24	06:05 20:05	05:26 20:41	05:18 21:00	05:41 20:44	06:18 19:58	06:56 18:59	07:35 18:05	17:54 (1) 18:05 (1)	07:18 16:28	07:45 16:27
26	07:35 17:03	06:51 17:48	16:56 (1) 17:12 (1)	19:25 19:26	06:03 20:06	05:25 20:42	05:18 21:00	05:42 20:43	06:19 19:56	06:57 18:58	07:37 18:03	18:06 (1) 18:15 (1)	07:19 16:27	07:46 16:27
27	07:34 17:04	06:50 17:49	16:56 (1) 17:13 (1)	19:26 19:27	06:02 20:07	05:24 20:43	05:18 21:00	05:43 20:42	06:20 19:55	06:58 18:56	07:38 18:02	18:16 (1) 18:25 (1)	07:21 16:28	07:46 16:28
28	07:33 17:06	06:48 17:51	16:55 (1) 17:13 (1)	19:27 19:28	06:00 20:08	05:24 20:44	05:19 21:00	05:44 20:40	06:21 19:53	07:00 18:54	07:39 18:00	18:26 (1) 18:35 (1)	07:22 16:29	07:46 16:29
29	07:32 17:07		06:54 19:30	19:28 19:29	05:58 20:10	05:23 20:45	05:19 21:00	05:45 20:39	06:23 19:51	07:01 18:52	07:41 17:59	18:36 (1) 18:45 (1)	07:23 16:30	07:46 16:30
30	07:31 17:09		06:52 19:31	19:29 19:30	05:57 20:11	05:22 20:46	05:20 20:59	05:46 20:38	06:24 19:49	07:02 18:50	07:42 17:57	18:46 (1) 18:55 (1)	07:24 16:30	07:47 16:30
31	07:30 17:10		06:50 19:32	19:30 19:31	05:56 20:12	05:21 20:47	05:19 20:57	05:48 20:37	06:25 19:47	07:43 17:56	07:42 17:56	18:56 (1) 19:05 (1)	07:47 16:31	07:47 16:31
Potential sun hours	284	290	369	405	462	469	474	437	377	340	286	272		
Total, worst case		73	108							185				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
728 Mulgrave

Printed/Page
11/28/2013 4:14 PM / 7

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Kirk Schmidt / kirk.schmidt@al-pro.ca
Calculated:
11/28/2013 4:14 PM/2.9.207

SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98mShadow receptor: E - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (5)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:47 16:32	15:15 (1) 15:37 (1)	07:29 17:12	06:46 17:52	06:48 19:34	05:55 20:12	05:21 20:47	05:20 20:59	05:49 20:36	06:26 19:46	07:03 18:48	06:45 16:54	07:25 16:24	15:02 (1) 21 15:23 (1)
2	07:47 16:33	15:15 (1) 15:38 (1)	07:27 17:13	06:44 17:53	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24	15:02 (1) 22 15:24 (1)
3	07:47 16:34	15:16 (1) 15:38 (1)	07:26 17:15	06:43 17:55	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24	15:02 (1) 22 15:24 (1)
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17	07:42 16:51	15:26 (1) 15:40 (1)	07:06 17:35	07:17 19:14	06:18 19:54	05:34 20:32	05:16 20:58	05:33 20:51	06:08 20:12	06:46 19:15	07:24 18:18	07:07 16:34	07:41 16:23	15:08 (1) 22 15:30 (1)
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28	07:33 17:06	15:38 (1) 15:40 (1)	07:00 17:51	07:00 19:28	06:00 20:09	05:24 20:44	05:19 21:00	05:44 20:41	06:21 19:53	07:00 18:54	07:39 18:00	07:22 16:26	07:46 16:29	15:13 (1) 22 15:35 (1)
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Potential sun hours	283	290	369	405	462	469	474	437	377	340	286	272	272	692
Total, worst case	368										123			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
728 Mulgrave

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11/28/2013 4:14 PM / 8

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Calculated:
11/28/2013 4:14 PM/2.9.207

SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98m Shadow receptor: F - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (6)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47 16:32	07:29 17:12	06:46 17:52	06:48 19:34	05:55 20:12	05:21 20:48	05:20 20:59	05:49 20:36	06:26 19:46	07:03 18:48	06:45 16:54	07:26 16:24
2	07:47 16:33	07:27 17:13	06:44 17:53	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24
3	07:47 16:34	07:26 17:15	06:43 17:55	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24
4	07:47 16:35	07:25 17:16	06:41 17:56	06:42 19:37	05:51 20:16	05:19 20:50	05:22 20:59	05:52 20:32	06:30 19:40	07:07 18:42	06:49 16:50	07:29 16:23
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8	07:46 16:40	07:20 17:22	07:34 19:02	06:35 19:43	05:45 20:21	05:18 20:53	05:25 20:57	05:57 20:26	06:35 19:32	07:12 18:35	06:55 16:45	07:33 16:22
9	07:46 16:41	07:18 17:23	07:32 19:03	06:33 19:44	05:44 20:22	05:17 20:54	05:26 20:57	05:58 20:25	06:36 19:30	07:14 18:33	06:56 16:43	07:34 16:22
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11	07:45 16:43	07:15 17:26	07:28 19:06	06:29 19:47	05:41 20:25	05:17 20:55	05:27 20:56	06:01 20:22	06:39 19:27	07:16 18:29	06:59 16:41	07:36 16:22
12	07:45 16:44	07:14 17:28	07:26 19:07	06:27 19:48	05:40 20:26	05:17 20:55	05:28 20:55	06:02 20:20	06:40 19:25	07:18 18:27	07:00 16:40	07:37 16:22
13	07:45 16:45	07:13 17:29	07:24 19:09	06:26 19:49	05:39 20:27	05:16 20:56	05:29 20:54	06:03 20:18	06:41 19:23	07:19 18:26	07:02 16:39	07:38 16:22
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15	07:44 16:48	07:09 17:32	07:20 19:11	06:22 19:52	05:36 20:30	05:16 20:57	05:31 20:53	06:06 20:15	06:44 19:19	07:22 18:22	07:05 16:36	07:39 16:23
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19	07:41 16:53	07:03 17:38	07:13 19:17	06:15 19:57	05:32 20:34	05:16 20:58	05:35 20:50	06:10 20:09	06:48 19:11	07:27 18:15	07:10 16:32	07:42 16:24
20	07:40 16:55	07:02 17:39	07:11 19:18	06:13 19:58	05:31 20:35	05:17 20:59	05:36 20:49	06:12 20:07	06:50 19:09	07:28 18:13	07:11 16:32	07:43 16:24
21	07:39 16:56	07:00 17:41	07:09 19:19	06:12 19:59	05:30 20:37	05:17 20:59	05:37 20:48	06:13 20:05	06:51 19:07	07:30 18:12	07:13 16:31	07:43 16:25
22	07:39 16:57	06:58 17:42	07:07 19:20	06:10 20:01	05:29 20:38	05:17 20:59	05:38 20:47	06:14 20:04	06:52 19:05	07:31 18:10	07:14 16:30	07:44 16:25
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24	07:37 17:00	06:55 17:45	07:03 19:23	06:06 20:03	05:27 20:40	05:17 21:00	05:40 20:45	06:17 20:00	06:55 19:01	07:34 18:07	07:17 16:28	07:45 16:26
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27	07:34 17:04	06:50 17:49	06:58 19:27	06:02 20:07	05:24 20:43	05:18 21:00	05:43 20:42	06:20 19:55	06:58 18:56	07:38 18:02	07:21 16:26	07:46 16:28
28	07:33 17:06	06:48 17:51	06:56 19:28	06:00 20:09	05:24 20:44	05:19 21:00	05:44 20:41	06:21 19:53	07:00 18:54	07:39 18:00	07:22 16:26	07:46 16:29
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31	07:30 17:10		06:50 19:32		05:21 20:47		05:48 20:37	06:25 19:47		07:44 17:56		07:47 16:31
Potential sun hours	283	290	369	405	462	469	474	437	377	340	286	272
Total, worst case												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

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Calculated:
11/28/2013 4:14 PM/2.9.207

SHADOW - Calendar

Calculation: Shadow @ Receptors E-92 98mShadow receptor: G - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (7)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47 16:32	07:29 17:12	06:46 17:52	06:48 19:34	05:55 20:12	05:21 20:48	05:20 20:59	05:49 20:36	06:26 19:46	07:03 18:48	06:45 16:54	07:26 16:24
2	07:47 16:33	07:27 17:13	06:44 17:53	06:46 19:35	05:54 20:14	05:20 20:48	05:21 20:59	05:50 20:34	06:28 19:44	07:05 18:46	06:46 16:53	07:27 16:24
3	07:47 16:34	07:26 17:15	06:43 17:55	06:44 19:36	05:52 20:15	05:20 20:49	05:22 20:59	05:51 20:33	06:29 19:42	07:06 18:44	06:48 16:51	07:28 16:24
4	07:47 16:35	07:25 17:16	06:41 17:56	06:42 19:37	05:51 20:16	05:19 20:50	05:22 20:59	05:52 20:32	06:30 19:40	07:07 18:42	06:49 16:50	07:29 16:23
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20	07:40 16:55	07:02 17:39	07:11 19:18	06:13 19:58	05:31 20:35	05:17 20:59	05:36 20:49	06:12 20:07	06:50 19:09	07:28 18:13	07:11 16:32	07:43 16:24
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22	07:39 16:57	06:58 17:42	07:07 19:20	06:10 20:01	05:29 20:38	05:17 20:59	05:38 20:47	06:14 20:04	06:52 19:05	07:31 18:10	07:14 16:30	07:44 16:25
23	07:38 16:59	06:57 17:44	07:05 19:22	06:08 20:02	05:28 20:39	05:17 20:59	05:39 20:46	06:15 20:02	06:53 19:03	07:32 18:08	07:15 16:29	07:44 16:26
24	07:37 17:00	06:55 17:45	07:03 19:23	06:06 20:03	05:27 20:40	05:17 21:00	05:40 20:45	06:17 20:00	06:55 19:01	07:34 18:07	07:17 16:28	07:45 16:26
25	07:36 17:02	06:53 17:46	07:01 19:24	06:05 20:05	05:26 20:41	05:18 21:00	05:41 20:44	06:18 19:58	06:56 19:00	07:35 18:05	07:18 16:28	07:45 16:27
26	07:35 17:03	06:51 17:48	06:59 19:26	06:03 20:06	05:25 20:42	05:18 21:00	05:42 20:43	06:19 19:57	06:57 18:58	07:37 18:03	07:19 16:27	07:46 16:28
27	07:34 17:04	06:50 17:49	06:58 19:27	06:02 20:07	05:24 20:43	05:18 21:00	05:43 20:42	06:20 19:55	06:58 18:56	07:38 18:02	07:21 16:26	07:46 16:28
28	07:33 17:06	06:48 17:51	06:56 19:28	06:00 20:09	05:24 20:44	05:19 21:00	05:44 20:41	06:21 19:53	07:00 18:54	07:39 18:00	07:22 16:26	07:46 16:29
29	07:32 17:07		06:54 19:30	05:58 20:10	05:23 20:45	05:19 21:00	05:45 20:39	06:23 19:51	07:01 18:52	07:41 17:59	07:23 16:25	07:46 16:30
30	07:31 17:09		06:52 19:31	05:57 20:11	05:22 20:46	05:20 21:00	05:46 20:38	06:24 19:49	07:02 18:50	07:42 17:57	07:24 16:25	07:47 16:30
31	07:30 17:10		06:50 19:32		05:21 20:47		05:48 20:37	06:25 19:47		07:44 17:56		07:47 16:31
Potential sun hours	283	290	369	405	462	469	474	437	377	340	286	272
Total, worst case												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

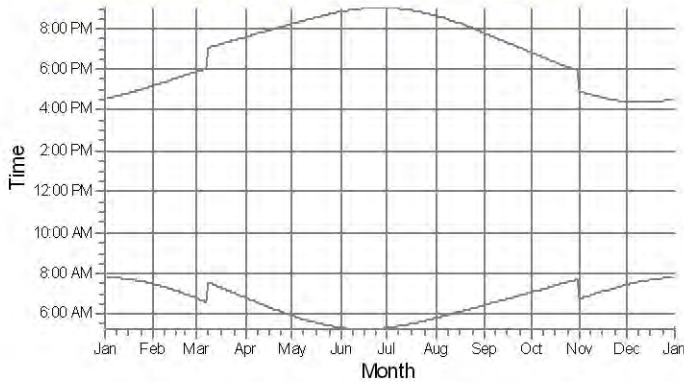
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Calculated:
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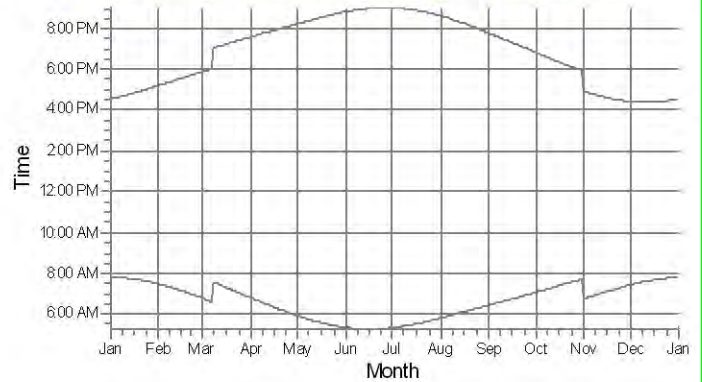
SHADOW - Calendar, graphical

Calculation: Shadow @ Receptors E-92 98m

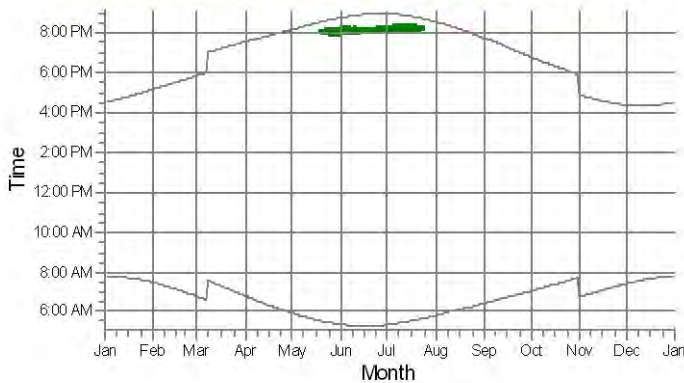
A: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (1)



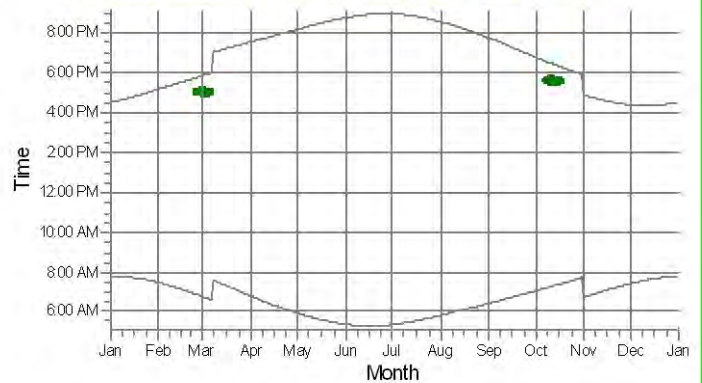
B: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (2)



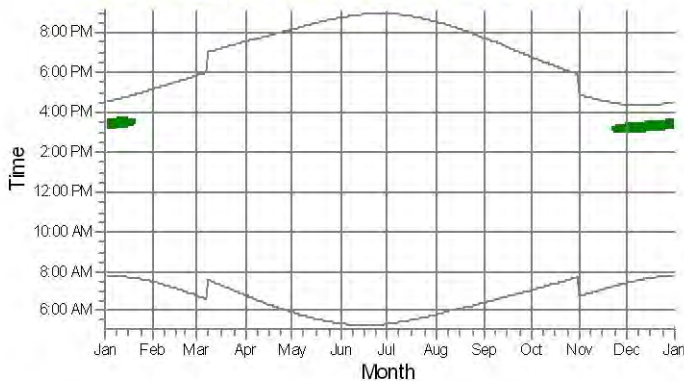
C: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (3)



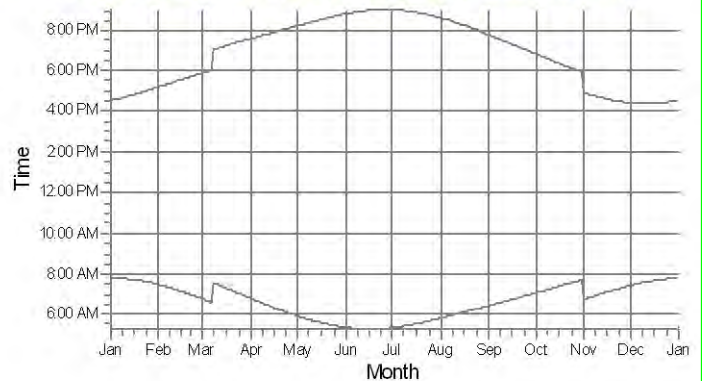
D: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (4)



E Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (5)



F: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (6)



WTGs

- 1: ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)

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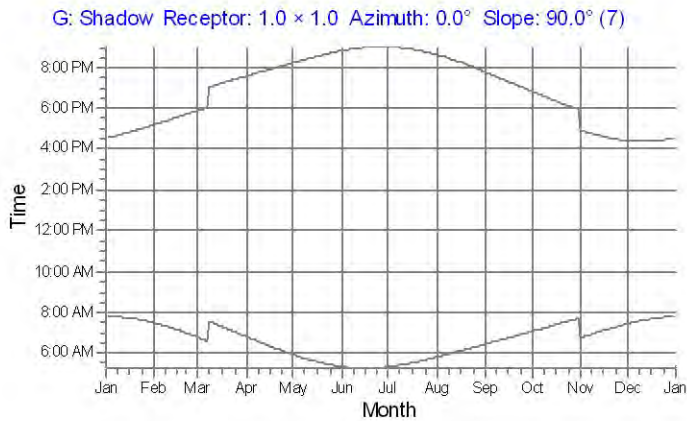
Kirk Schmidt / kirk.schmidt@al-pro.ca

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SHADOW - Calendar, graphical

Calculation: Shadow @ Receptors E-92 98m



WTGs

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SHADOW - Calendar per WTG

Calculation: Shadow @ Receptors E-92 98mWTG: 1 - ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)

Assumptions for shadow calculations

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

	January	February	March	April	May	June
1	07:47 15:15-15:37/22 16:33	07:29 17:12	06:46 16:54-17:13/19 17:52	06:48 19:34	05:55 20:12	05:21 20:00-20:17/17 20:48
2	07:47 15:15-15:38/23 16:33	07:27 17:13	06:44 16:54-17:13/19 17:53	06:46 19:35	05:54 20:14	05:20 20:00-20:16/16 20:48
3	07:47 15:16-15:38/22 16:34	07:26 17:15	06:43 16:54-17:12/18 17:55	06:44 19:36	05:52 20:15	05:20 20:01-20:17/16 20:49
4	07:47 15:16-15:39/23 16:35	07:25 17:16	06:41 16:55-17:12/17 17:56	06:42 19:37	05:51 20:16	05:19 20:00-20:16/16 20:50
5	07:47 15:17-15:39/22 16:36	07:24 17:17	06:39 16:56-17:11/15 17:58	06:40 19:39	05:49 20:17	05:19 20:01-20:17/16 20:51
6	07:47 15:17-15:39/22 16:37	07:22 17:19	06:37 16:57-17:09/12 17:59	06:39 19:40	05:48 20:19	05:18 20:02-20:17/15 20:52
7	07:47 15:17-15:40/23 16:39	07:21 17:20	06:35 16:59-17:07/8 18:00	06:37 19:41	05:47 20:20	05:18 20:02-20:16/14 20:52
8	07:46 15:18-15:40/22 16:40	07:20 17:22	07:34 19:02	06:35 19:43	05:45 20:21	05:18 20:02-20:16/14 20:53
9	07:46 15:18-15:40/22 16:41	07:18 17:23	07:32 19:03	06:33 19:44	05:44 20:22	05:17 20:03-20:16/13 20:54
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15	07:43 15:23-15:40/17 16:48	07:09 17:32	07:20 19:11	06:22 19:52	05:36 20:30	05:16 20:06-20:16/10 20:57
16	07:43 15:25-15:40/15 16:49	07:08 17:34	07:19 19:13	06:20 19:53	05:35 20:31	05:16 20:06-20:16/10 20:57
17	07:42 15:26-15:40/14 16:51	07:06 17:35	07:17 19:14	06:19 19:54	05:34 20:32	05:16 20:07-20:16/9 20:58
18	07:42 15:27-15:38/11 16:52	07:05 17:36	07:15 19:15	06:17 19:56	05:33 20:33	05:16 20:07-20:16/9 20:58
19	07:41 15:29-15:37/8 16:53	07:03 17:38	07:13 19:17	06:15 19:57	05:32 20:06-20:07/1 20:34	05:16 20:07-20:15/8 20:58
20	07:40 16:55	07:02 17:39	07:11 19:18	06:13 19:58	05:31 20:04-20:09/5 20:35	05:17 20:08-20:16/8 20:59
21	07:39 16:56	07:00 17:41	07:09 19:19	06:12 20:00	05:30 20:02-20:10/8 20:37	05:17 20:08-20:16/8 20:59
22	07:39 16:57	06:58 17:42	07:07 19:20	06:10 20:01	05:29 20:01-20:11/10 20:38	05:17 20:08-20:16/8 20:59
23	07:38 16:59	06:57 17:44	07:05 19:22	06:08 20:02	05:28 20:00-20:12/12 20:39	05:17 20:08-20:16/8 20:59
24	07:37 17:00	06:55 17:00-17:09/9 17:45	07:03 19:23	06:07 20:03	05:27 20:00-20:13/13 20:40	05:17 20:09-20:18/9 20:59
25	07:36 17:02	06:53 16:58-17:11/13 17:46	07:01 19:24	06:05 20:05	05:26 19:59-20:13/14 20:41	05:18 20:09-20:18/9 21:00
26	07:35 17:03	06:51 16:56-17:12/16 17:48	06:59 19:26	06:03 20:06	05:25 20:00-20:15/15 20:42	05:18 20:08-20:18/10 21:00
27	07:34 17:04	06:50 16:56-17:13/17 17:49	06:58 19:27	06:02 20:07	05:24 19:59-20:16/17 20:43	05:19 20:09-20:19/10 21:00
28	07:33 17:06	06:48 16:55-17:13/18 17:51	06:56 19:28	06:00 20:09	05:24 19:59-20:16/17 20:44	05:19 20:08-20:19/11 21:00
29	07:32 17:07		06:54 19:30	05:58 20:10	05:23 19:59-20:16/17 20:45	05:19 20:08-20:19/11 21:00
30	07:31 17:09		06:52 19:31	05:57 20:11	05:22 20:00-20:16/16 20:46	05:20 20:08-20:20/12 21:00
31	07:30 17:10		06:50 19:32		05:22 19:59-20:16/17 20:47	
Potential sun hours	284	290	369	405	462	469
Sum of minutes with flicker	368	73	108	0	162	347

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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SHADOW - Calendar per WTG

Calculation: Shadow @ Receptors E-92 98mWTG: 1 - ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)

Assumptions for shadow calculations

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

	July	August	September	October	November	December
1	05:20 20:09-20:21/12	05:49	06:26	07:03	06:45	07:25 15:02-15:23/21
	20:59	20:36	19:46	18:48	16:54	16:24
2	05:21 20:08-20:21/13	05:50	06:28	07:05	06:46	07:27 15:02-15:24/22
	20:59	20:34	19:44	18:46	16:53	16:24
3	05:22 20:08-20:21/13	05:51	06:29	07:06	06:48	07:28 15:02-15:24/22
	20:59	20:33	19:42	18:44	16:51	16:24
4	05:22 20:08-20:21/13	05:52	06:30	07:07	06:49	07:29 15:02-15:24/22
	20:59	20:32	19:40	18:42	16:50	16:23
5	05:23 20:08-20:22/14	05:54	06:31	07:09	06:51	07:30 15:02-15:25/23
	20:58	20:30	19:38	18:40	16:49	16:23
6	05:24 20:08-20:23/15	05:55	06:33	07:10 17:37-17:40/3	06:52	07:31 15:03-15:25/22
	20:58	20:29	19:36	18:39	16:47	16:23
7	05:24 20:07-20:23/16	05:56	06:34	07:11 17:34-17:44/10	06:53	07:32 15:03-15:26/23
	20:58	20:27	19:34	18:37	16:46	16:23
8	05:25 20:08-20:23/15	05:57	06:35	07:12 17:31-17:45/14	06:55	07:33 15:04-15:27/23
	20:57	20:26	19:32	18:35	16:45	16:22
9	05:26 20:08-20:24/16	05:58	06:36	07:14 17:30-17:46/16	06:56	07:34 15:05-15:27/22
	20:57	20:25	19:31	18:33	16:43	16:22
10	05:27 20:07-20:24/17	06:00	06:37	07:15 17:29-17:47/18	06:58	07:35 15:04-15:27/23
	20:56	20:23	19:29	18:31	16:42	16:22
11	05:27 20:07-20:24/17	06:01	06:39	07:16 17:28-17:47/19	06:59	07:36 15:05-15:27/22
	20:56	20:22	19:27	18:29	16:41	16:22
12	05:28 20:08-20:24/16	06:02	06:40	07:18 17:28-17:47/19	07:00	07:37 15:05-15:28/23
	20:55	20:20	19:25	18:27	16:40	16:22
13	05:29 20:08-20:25/17	06:03	06:41	07:19 17:28-17:47/19	07:02	07:38 15:06-15:28/22
	20:54	20:18	19:23	18:26	16:39	16:22
14	05:30 20:08-20:25/17	06:04	06:42	07:20 17:28-17:46/18	07:03	07:39 15:06-15:29/23
	20:54	20:17	19:21	18:24	16:38	16:23
15	05:31 20:08-20:25/17	06:06	06:44	07:22 17:29-17:45/16	07:05	07:39 15:07-15:30/23
	20:53	20:15	19:19	18:22	16:36	16:23
16	05:32 20:09-20:25/16	06:07	06:45	07:23 17:29-17:44/15	07:06	07:40 15:07-15:29/22
	20:52	20:14	19:17	18:20	16:35	16:23
17	05:33 20:08-20:24/16	06:08	06:46	07:24 17:30-17:42/12	07:07	07:41 15:08-15:30/22
	20:51	20:12	19:15	18:19	16:34	16:23
18	05:34 20:09-20:23/14	06:09	06:47	07:26 17:33-17:39/6	07:09	07:42 15:09-15:31/22
	20:51	20:10	19:13	18:17	16:33	16:24
19	05:35 20:09-20:23/14	06:10	06:49	07:27	07:10	07:42 15:08-15:31/23
	20:50	20:09	19:11	18:15	16:33	16:24
20	05:36 20:10-20:22/12	06:12	06:50	07:28	07:11	07:43 15:09-15:31/22
	20:49	20:07	19:09	18:13	16:32	16:24
21	05:37 20:10-20:21/11	06:13	06:51	07:30	07:13	07:43 15:10-15:32/22
	20:48	20:05	19:07	18:12	16:31	16:25
22	05:38 20:11-20:20/9	06:14	06:52	07:31	07:14	07:44 15:10-15:32/22
	20:47	20:04	19:05	18:10	16:30	16:25
23	05:39 20:12-20:19/7	06:15	06:53	07:32	07:15 15:06-15:14/8	07:44 15:10-15:32/22
	20:46	20:02	19:03	18:08	16:29	16:26
24	05:40 20:14-20:18/4	06:17	06:55	07:34	07:17 15:04-15:15/11	07:45 15:11-15:33/22
	20:45	20:00	19:01	18:07	16:28	16:26
25	05:41	06:18	06:56	07:35	07:18 15:04-15:18/14	07:45 15:11-15:34/23
	20:44	19:58	19:00	18:05	16:28	16:27
26	05:42	06:19	06:57	07:37	07:19 15:03-15:18/15	07:46 15:12-15:34/22
	20:43	19:57	18:58	18:03	16:27	16:28
27	05:43	06:20	06:58	07:38	07:21 15:02-15:19/17	07:46 15:13-15:35/22
	20:42	19:55	18:56	18:02	16:26	16:28
28	05:44	06:22	07:00	07:39	07:22 15:02-15:21/19	07:46 15:13-15:35/22
	20:41	19:53	18:54	18:00	16:26	16:29
29	05:45	06:23	07:01	07:41	07:23 15:02-15:21/19	07:46 15:13-15:36/23
	20:39	19:51	18:52	17:59	16:25	16:30
30	05:46	06:24	07:02	07:42	07:24 15:02-15:22/20	07:47 15:14-15:36/22
	20:38	19:49	18:50	17:57	16:25	16:31
31	05:48	06:25		07:44		07:47 15:14-15:37/23
	20:37	19:47		17:56		16:31
Potential sun hours	474	437	377	340	286	272
Sum of minutes with flicker	331	0	0	185	123	692

Table layout: For each day in each month the following matrix apply

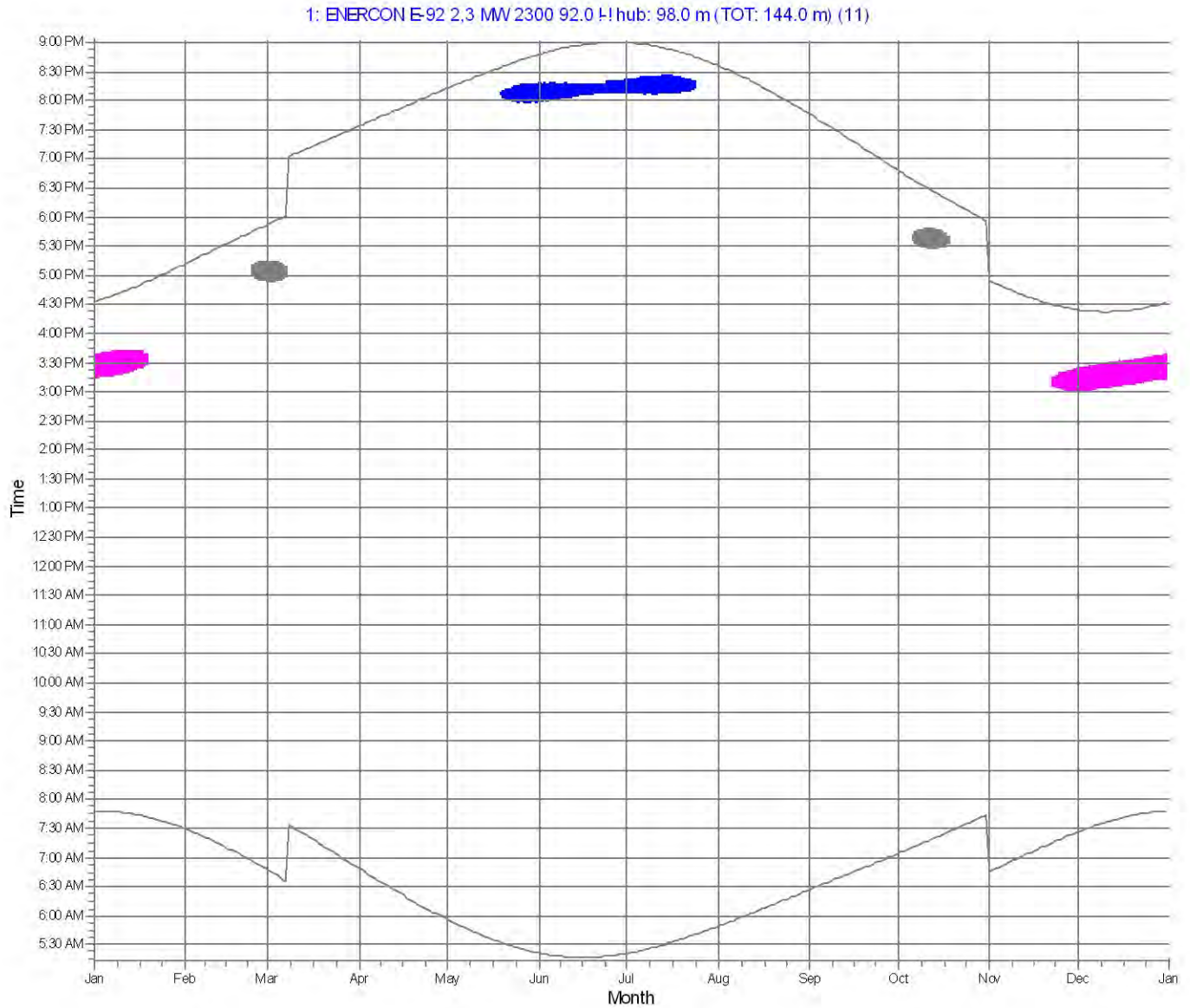
Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

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SHADOW - Calendar per WTG, graphical

Calculation: Shadow @ Receptors E-92 98m **WTG: 1 - ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)**



Shadow receptors

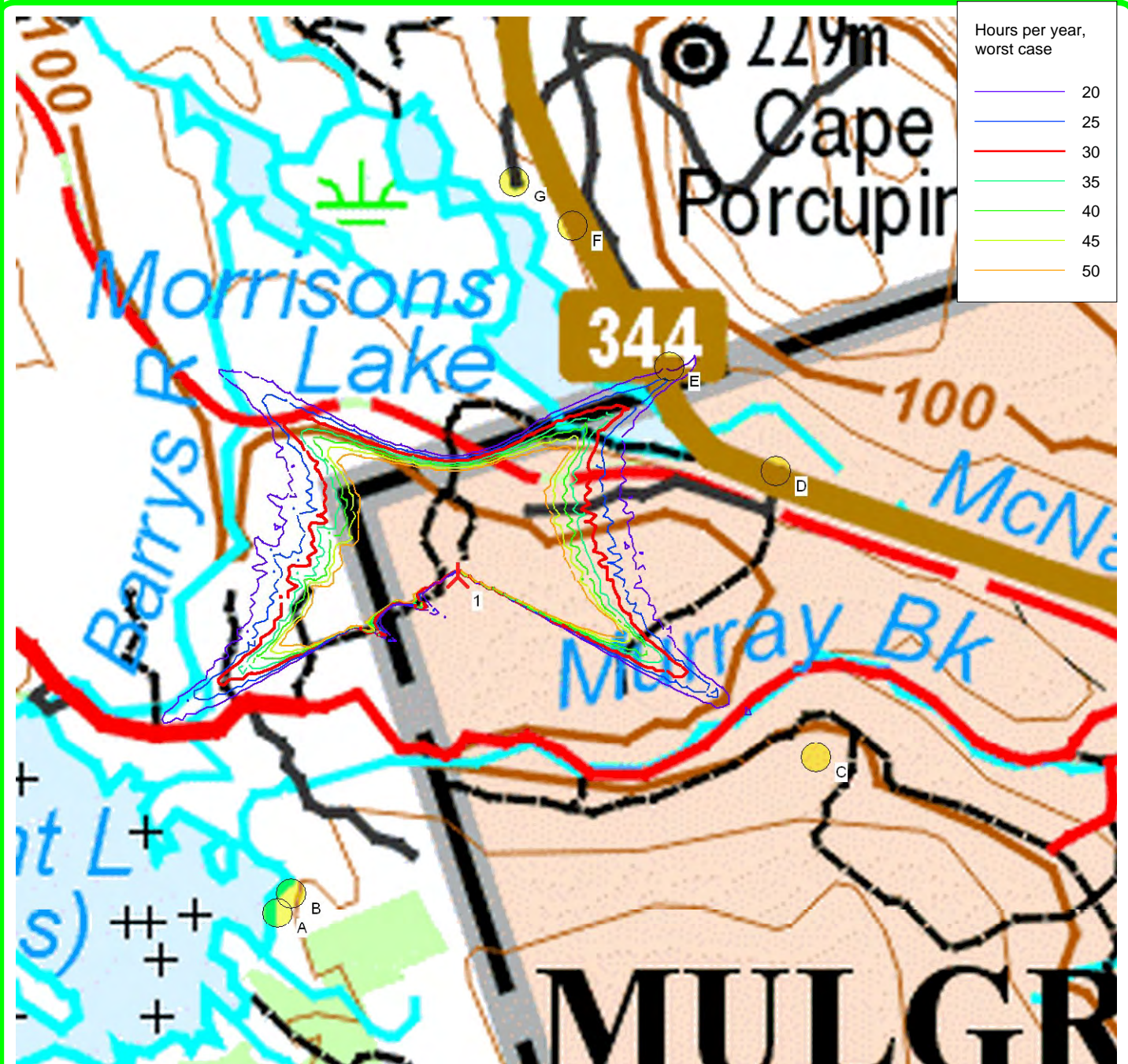
- C: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (3)
- D: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (4)
- E: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (5)

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SHADOW - Map

Calculation: Shadow @ Receptors E-92 98mWTG: 1 - ENERCON E-92 2,3 MW 2300 92.0 !-! hub: 98.0 m (TOT: 144.0 m) (11)



Map: mulgrave_bkgnd map , Print scale 1:20,000, Map center UTM (north)-NAD83 (US+CA) Zone: 20 East: 622,377 North: 5,053,177
 ▲ New WTG ● Shadow receptor
 Flicker map level: Height Contours: Mulgrave_environmental_contour.wpo (6)

Appendix IX. EMI REPORT WITH REGULATORY CORRESPONDENCE

Preliminary EMI Report
for the
Mulgrave Community Wind Project

Prepared For

McCallum Environmental Ltd.

November 29, 2013

Prepared By



Nortek Resource Solutions Inc.
RR # 1
Thorburn, Nova Scotia
B0K 1W0
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1.0 Introduction

The proposed Mulgrave Community Wind Project is located approximately 3 km west of Mulgrave, Nova Scotia in Guysborough County and approximately 2.5 km south of the mainland side of the Canso Causeway. The proposed wind project consists of 1 wind turbine that has a hub height of 98 m and a rotor diameter of 92 m.

This preliminary EMI Study is designed to apply the guidelines identified by the joint *Radio Advisory Board of Canada and Canadian Wind Energy Association Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*¹ (herein after referred to as the RABC). The technical guidelines have been developed to apply a consistent approach to determining if wind energy developments may impact existing radio, telecommunication and radar systems.

Additionally, CBC/Radio Canada has specific requirements to ensure that proposed wind farms will not have a negative influence on existing CBC/Radio signals. CBC/Radio Canada requires that specific spatial analysis and mapping be included in this preliminary report.

2.0 Point-to-Point Systems above 890 MHz

The existing RABC guidelines describe consultation zones for Point-to-Point Systems above 890 MHz include a 1.0 km consultation zone around existing transmitters and receivers as well as a variable “cylinder” between links that are based on the distance between links and the licensed frequencies.

A variable consultation zone along the line of sight between the transmitter and receiver recommended by RABC is calculated using::

$$L_C = R + 52\sqrt{D/F}$$

Where:

D = Path length in kilometers

F = Frequency in gigahertz

L_C = Diameter of the cylinder in meters

R = Wind turbine rotor diameter in meters

Data obtained from the Industry Canada Technical and Administrative Frequency Lists accessed through the Spectrum Direct web site² is summarized in Figure 1.

There are no links that are located within the RABC recommended consultation zones.

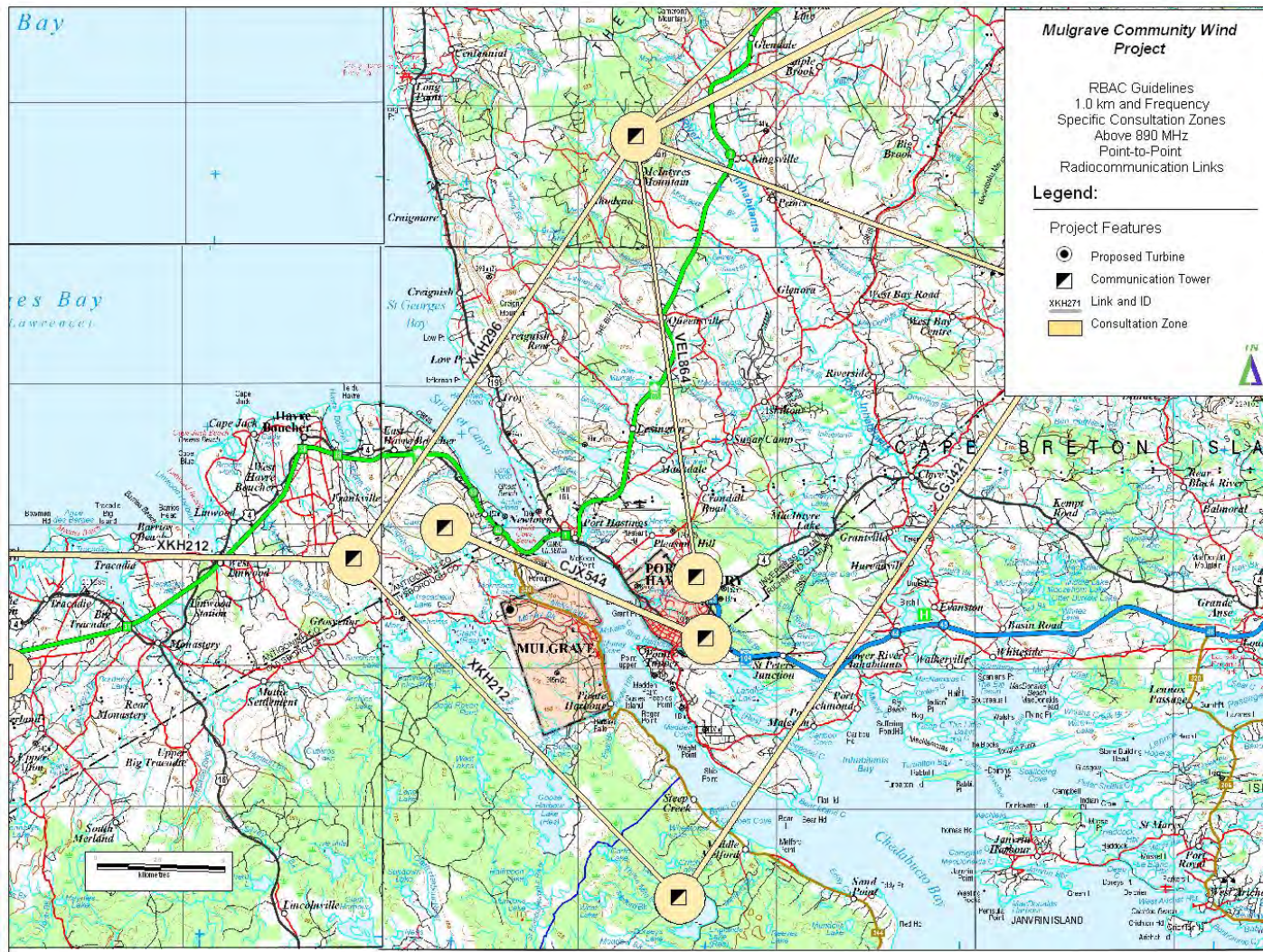


Figure 1: RBAC Guideline Consultation Zones for Point-to-Point Radio Links above 890 MHz. There are no Point-to-Point Radio Links Located within the Frequency Specific Consultation Zones.

3.0 **Broadcast Transmitters**

3.1 **AM Transmitters**

A 15 km consultation zone is recommended by RABC for AM radio transmitters utilizing multiple tower antenna systems. For single tower systems, a 5 km consultation zone is required. CIGO-AM Broadcasts at 1,410 kHz from Troy, Nova Scotia and is the closet AM transmitter, located 7.0 km from the proposed wind turbine (Figure 2).

The proposed wind farm is not within the 5 km consultation zone recommended for omnidirectional AM Radio transmitters.

3.2 **FM Transmitters**

For proximity reasons, the RABC suggests a 2.0 km consultation zone around existing FM transmitters. There are 3 transmitter locations located within 5 km of the proposed turbine (Table 1 and Figure 3).

Table 1: Summary of Closest FM Transmitters to the Mulgrave Wind Turbine

Call Sign	Frequency	Distance to Turbine
CBH-FM-2	103.1	2.96 km
CBC111-FM	105.7	
CBHB-FM	106.7	
CBAF-FM-11	107.5	
ED021-FM	99.7	4.06 km
CIGO-FM	101.5	4.09 km

The proposed wind project is not within the 2.0 km consultation zone recommended by RABC for FM transmitters.

3.3 **TV Transmitters**

The closest TV Transmitter is located approximately 3 km south east of the proposed wind turbine and is located in the Town of Mulgrave, Nova Scotia (Figure 4).

There are no Television Transmitters located within recommended 2 km consultation zone.

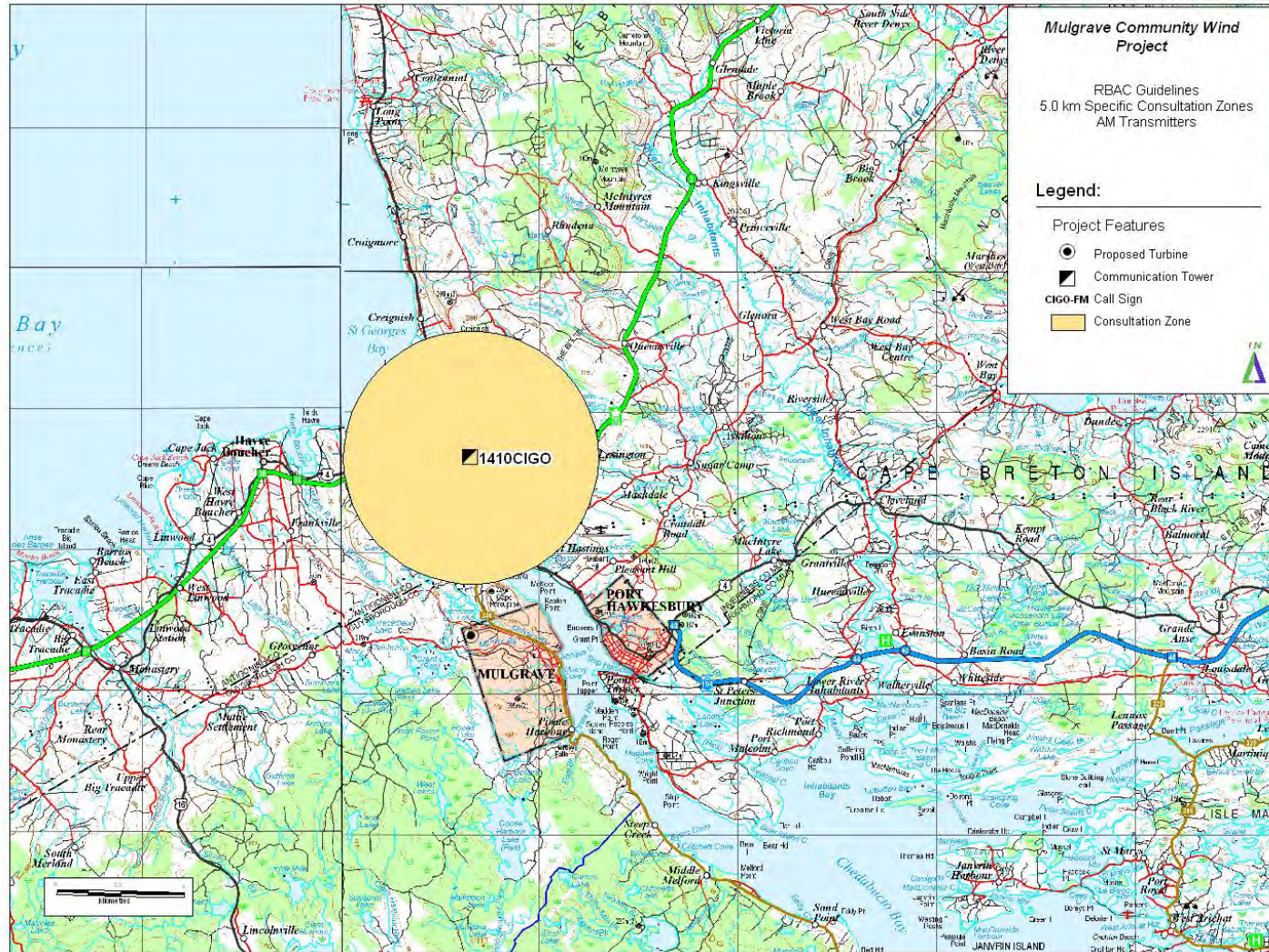


Figure 2: RBAC Guideline Consultation Zones for Omnidirectional AM Radio Transmitters. There are no TV Transmitters Located within 2.0 Km of the Proposed Wind Turbine.

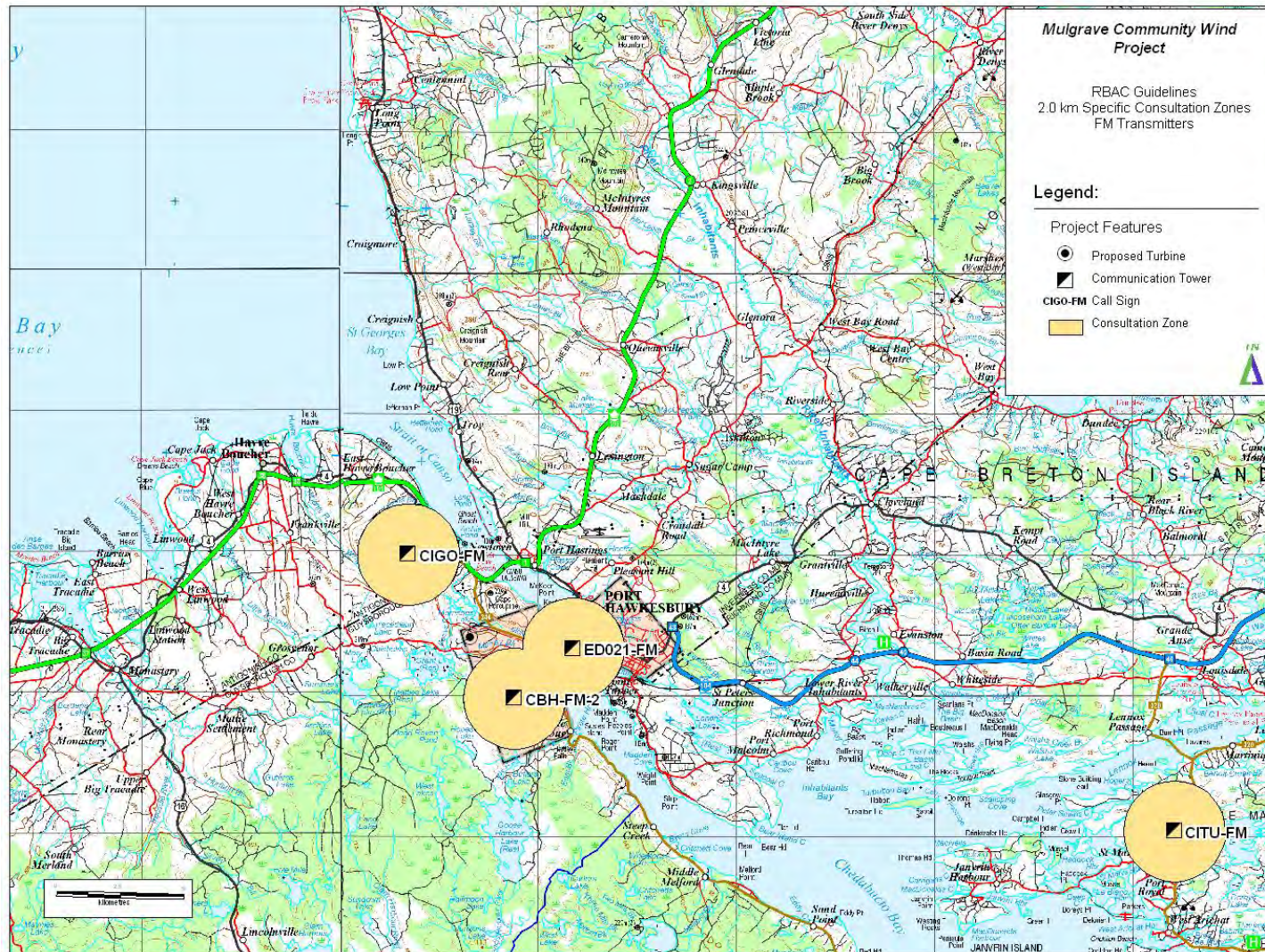


Figure 3: RBAC Guideline Consultation Zones for FM Radio Transmitters. There are no TV Transmitters Located within 2.0 Km of the Proposed Wind Turbine.

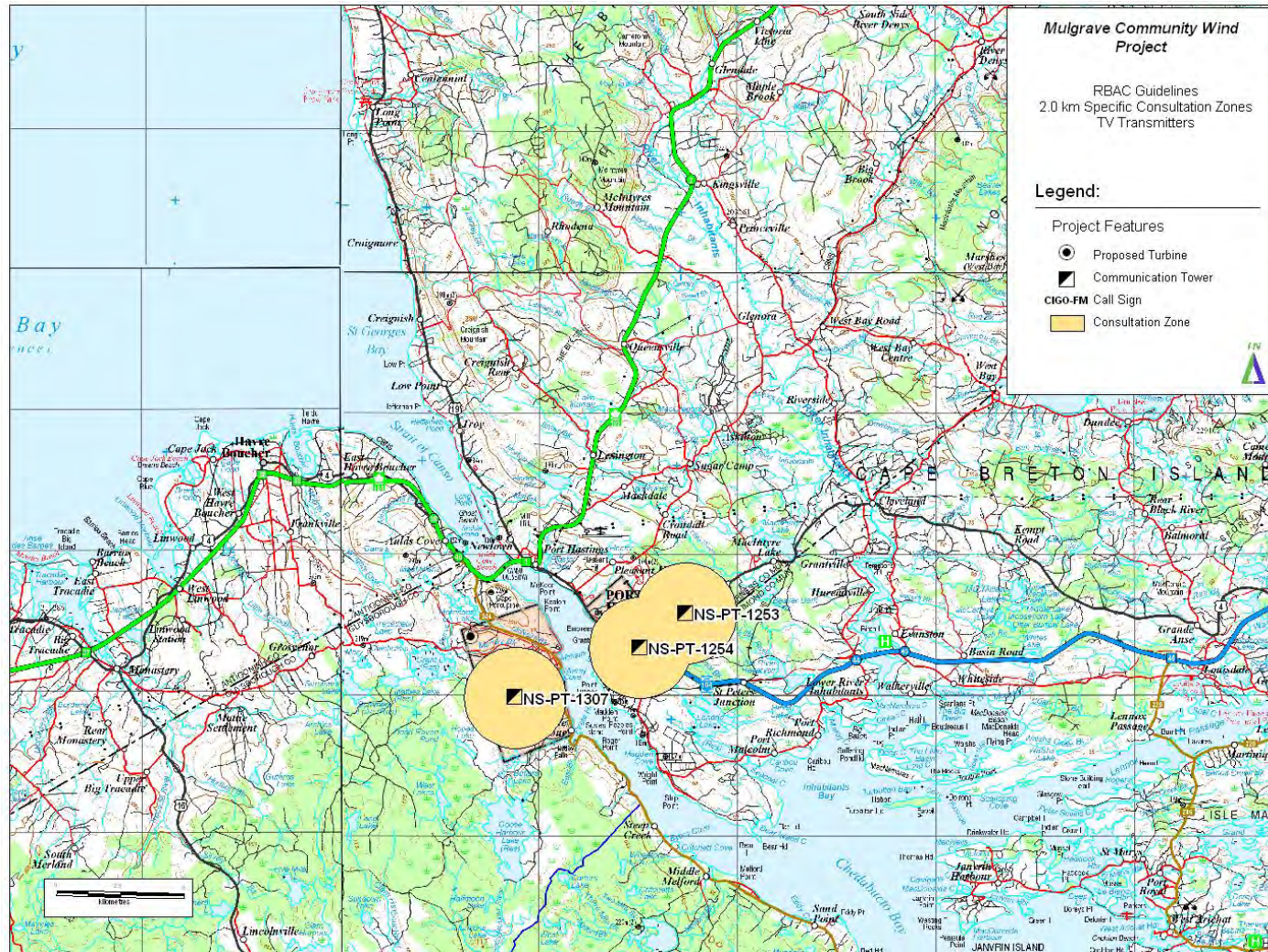


Figure 4: RBAC Guideline 2.0 km Consultation Zones for Television Transmitters. There are no TV Transmitters Located within 2.0 Km of the Proposed Wind Turbine.

3.4 CBC Radio Transmitters

The following section describes the components outlined in the *CBC/Radio-Canada Involvement and Requirements Concerning Wind Energy Projects*³ for a preliminary report.

The closest CBC radio transmitter site (FM) is located 3 km east the proposed wind farm and the site is situated in Mulgrave, Nova Scotia. The next nearest CBC transmitter site (FM) is located 68 km north of the proposed wind turbine at Inverness, Nova Scotia (Table 2).

Table 2: Locations and Distances of the Two Closest CBC FM Transmitter Sites.

Location	Latitude	Longitude	Call Sign	Distance to Wind Farm (km)
Mulgrave	45,35,56	61,24,44	CBH-FM-2	3
			CBC111-FM	
			CBHB-FM	
			CBAF-FM-11	
Inverness	46,06,08	61,17,21	CBHI-FM	68

There is one CBC FM Radio Transmitter site located within 5 km of the proposed wind farm. CBC Radio-Canada has been notified of the proposed project.

3.5 CBC Television Transmitters

On July 31, 2012, CBC phased out its analogue television service. This process involved the shut down and/or decommissioning of analogue transmitter sites across Canada.

There are no digital CBC Television Transmitters within 89 km of the wind turbine.

The closest Digital CBC television transmitter is located in Halifax, Nova Scotia which is approximately 200 km south west of the proposed wind turbine.

4.0 Over-the-Air Reception

As of August 31, 2011, the CRTC has required that all TV transmitters that serve markets with a population greater than 300,000 be converted to digital technology. Typically, digital signals have a shorter reception range than analog signals and in some cases, channels and associated frequencies have been changed to free up limited band spectrum in crowded markets. In most cases, transmitters in larger urban areas have

been upgraded to digital and re-transmitters that serve a smaller population base continue to operate with analog equipment until August 31, 2012.

The RABC recommends television receiver consultation zones based on the whether the broadcast is delivered using analogue or digital signals with consultation zones of 15 km and 10 km respectively. Television signals received within close proximity to the proposed wind farm are currently broadcast using analogue signals.

The 15 km consultation zone covers a relatively large area and extends into the Havre Boucher in the west, Creignish to the north and Port Hawkesbury to the east (Figure 6).

A Baseline Broadcast Reception Study is recommended to quantify the strength of current broadcast signals at various locations throughout the 15 km consultation zone. It is anticipated that this study will be initiated prior to the start of construction.

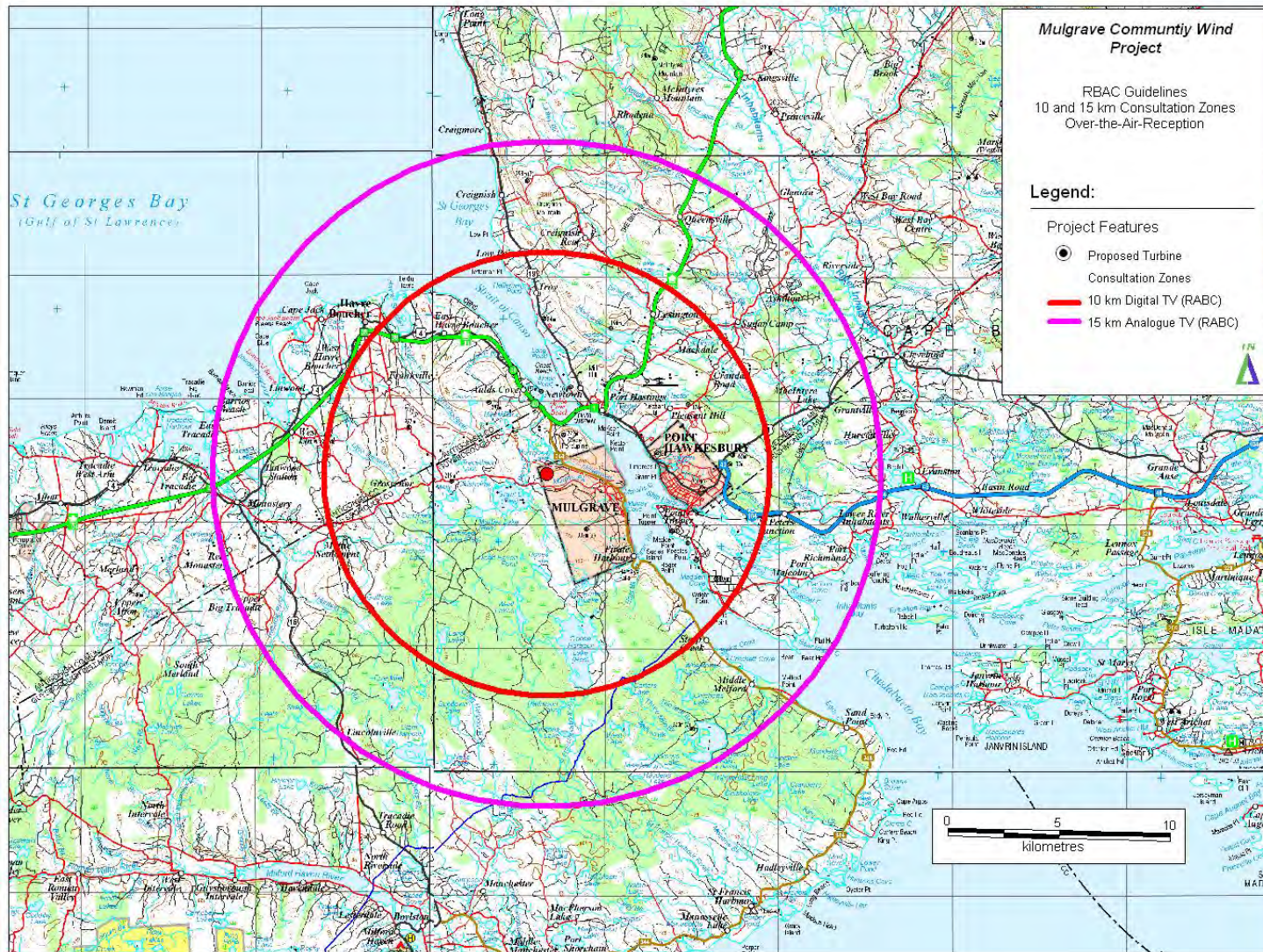


Figure 6: RBAC Guideline 10 km and 15 km Consultation Zones for Over-the-Air-Reception.

5.0 Cellular Type Networks

There are no cell phone transmitter sites located within the 1.0 km consultation zone recommended by the RABC (Figure 7). The closest cell phone tower is located over 3 km from the proposed wind farm.

There are no cellular transmitters located within the 1.0 km consultation zone as outlined in RABC.

6.0 Land Mobile Radio Networks and Point-to-Point Systems below 890MHz.

6.1 Land Mobile Radio Networks

There are no radio networks (< 890 MHz) that are located within 1.0 km of the proposed wind farm (Figure 7).

6.2 Non Disclosed Radio Operators

The RCMP were contacted on Sept 24 via email as per the RBAC Guidelines (Appendix 2). No issues are expected to be identified.

6.3 Point-to-Point Systems below 890 MHz

There are no radio links that operate below 890 MHz that are located within the 1.0 km recommended consultation zone (Figure 7).

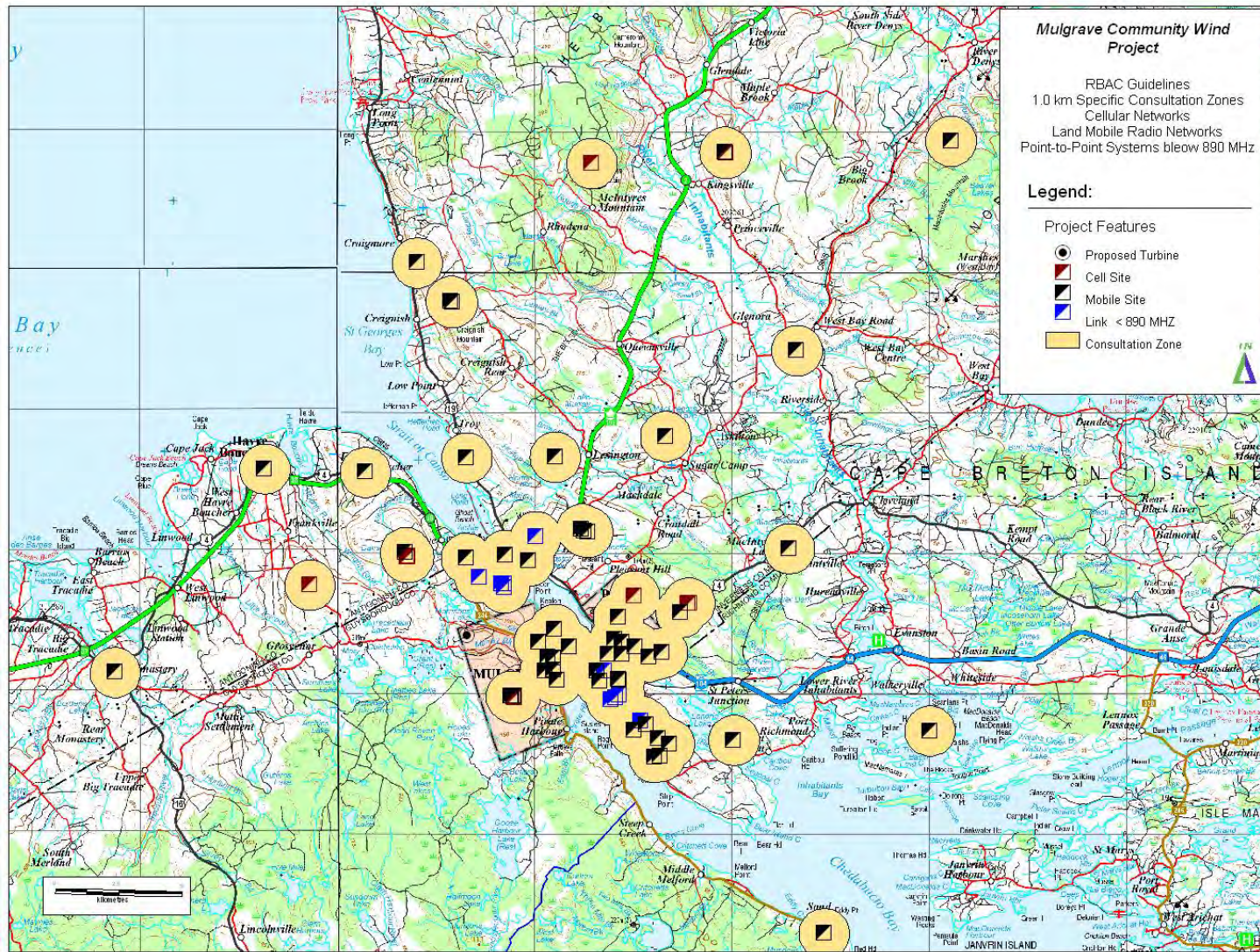


Figure 7: RBAC Guideline 1.0 km Consultation Zones for Cellular Networks, Land Mobile Networks and Point-to-Point Systems Below 890 MHz.

7.0 Satellite Systems

7.1 Satellite Ground Stations

There are no satellite ground stations located within 500 m of the proposed wind farm. A 500 m consultation zone is recommended by RABC.

7.2 DTH Receivers

A preliminary review of Direct to Home Satellite receivers has been completed. The analysis is based on the physical turbine dimensions which are:

Hub Height = 98 m
Rotor Diameter = 92.0 m

The RABC recommends the following formula for determining the size of the cone:

$$L_{c(m)} = R + 104\sqrt{D/F}$$

where: L_c = Diameter of the cylinder (m)
D = Distance from the ground satellite receiver (km)
F = Frequency in GHz (11.7)
R = Rotor Diameter (92.0 m)

$$L_{c(1 \text{ km})} = 122.4 \text{ m}$$

$$L_{c(10 \text{ km})} = 177.2 \text{ m}$$

A cone based on 11.7 GHz was calculated and the satellite data from Table 3 were used for the analysis. The analysis involved identifying both horizontal and vertical zones where dwellings may be impacted by a wind turbine. The intersect of these two zones resulted in the final consultation zone (Figure 8).

There are no buildings located within the consultation zones identified in this analysis.

Table 3: Direct-To-Home Geostationary Satellite Parameters.

Service Provider	Satellite ID	Geostationary Satellite Orbit (Lat, Long)	Local Azimuth (True North)	Local Inclination
Bell Expressvu	Nimiq 1 Nimiq 3	0° N, 91° W	218.4°	29.9°
Bell Expressvu	Nimiq 2 Nimiq 4iR	0° N, 82° W	207.7°	33.7°
Star Choice	Anik F2	0° N, 111.1° W	238.8°	18.7°

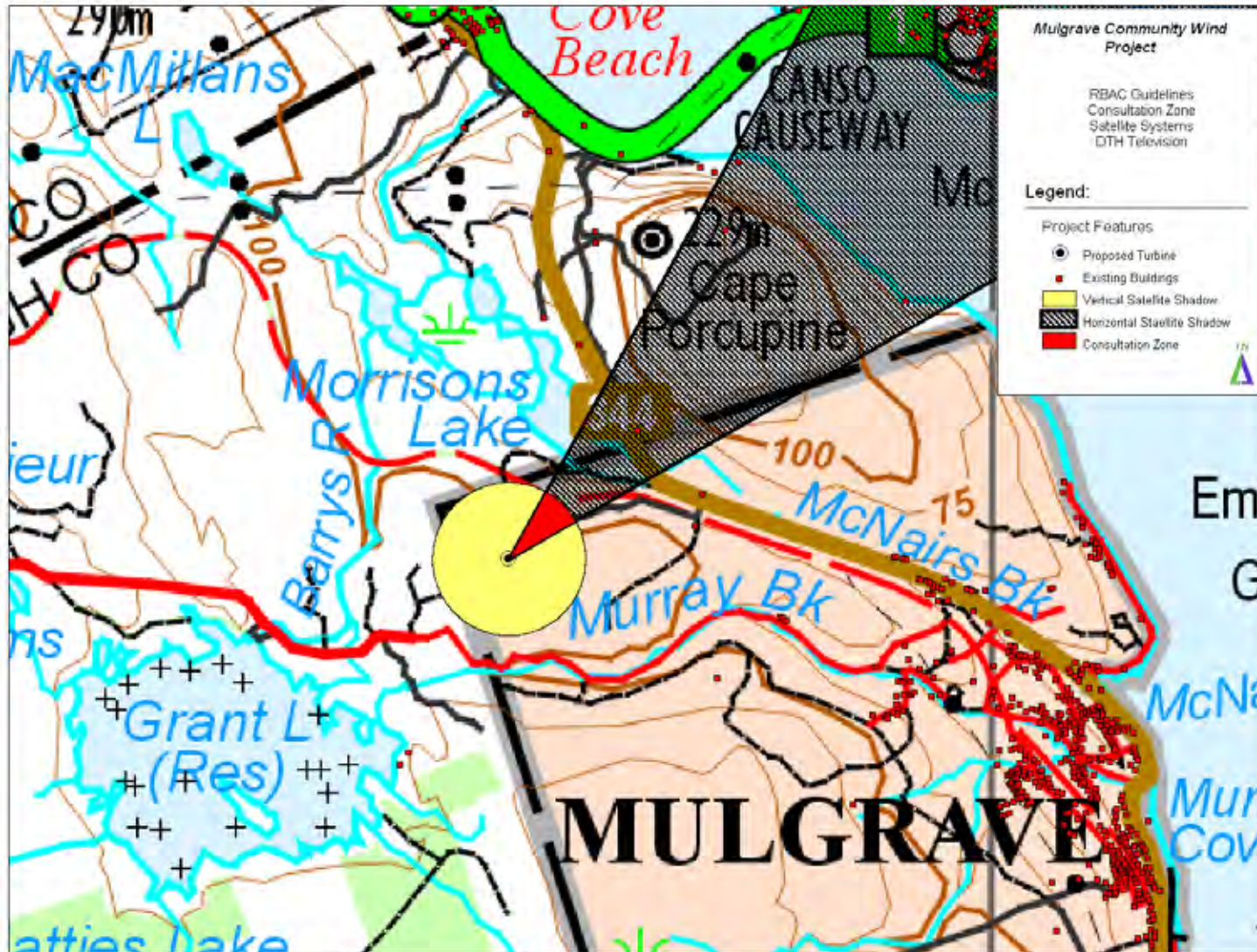


Figure 8: RABC Guideline Consultation Zones for Satellite Receivers Based on Line of Sight Cones.

8.0 Radar Systems

8.1 Air Defence Radar

DND has been contacted and is currently completing an internal analysis to determine if the proposed wind turbine may impact an existing radar installation. The project proponents will work with DND to develop a mitigation plan if there is a deemed impact on existing radar systems (Appendix 2).

DND is currently completing an internal analysis of the proposed wind farm. The project proponents will work towards a mitigation plan if interference issues are identified.

8.2 Vessel Traffic Radar

The Canadian Coast Guard (CCG) monitors vessel traffic through a series of radar installations. The RABC has recommended a 60 km consultation zone around existing stations. The Eddy Point radar installation is designed to monitor vessel traffic that enters Chedabucto Bay bound for Ship Point and Point Tupper. The radar installation is located 18 km from the proposed wind farm and therefore falls within the 60 km consultation zone. The Canadian Coast Guard has been contacted and they are not concerned with any interference issues (Appendix 2).

No issues in regard to interference with existing vessel traffic radar systems.

8.3 Air Traffic Control Radars

Air Traffic Control Primary Surveillance Radars (PSR) are a critical component for aircraft safety. The three closest civilian ATC radars to the proposed wind farm are located in Charlottetown, Halifax and Moncton (Table 4). The RABC recommends that an 80 km consultation zone be applied around PSR's and there are no PSR sites located within the 80 km consultation zone. Nav Canada has been contacted to verify that they have no concerns in regard to the proposed wind farm (Appendix 2).

Table 4: Nearest Air Traffic Control Radars.

ID	Latitude	Longitude	Distance to Wind Farm (km)
Sydney (SSR)	46.153	-60.056	122
Charlottetown (PSR)	44.910	-63.429	150
Halifax (PSR)	44.910	-63.429	184
Moncton (PSR)	46.189	-64.570	258

RABC recommends a 10 km consultation zone be established around the proposed wind farm in regard to existing Secondary Surveillance Radar (SSR) sites. The closest SSR site is located at Sydney Airport which is approximately 122 km from the proposed wind farm (Table 4).

Additionally, RABC recommends a 10 km consultation zone be applied around major civilian and military airfields. There are no major civilian airfields located within the 10 km consultation zone. The closest civilian airfield is Port Hawkesbury (CYPD) which is located approximately 6 km north east of the proposed wind turbine. The airfield has a Non-directional Beacon (NDB) navigation aid and will be contacted to discuss the proximity to the airfield. No issues are expected.

There are no Primary Surveillance Air Traffic Control radars located within 80 km of the proposed wind farm. Additionally, there are no Secondary Surveillance Air Traffic Control radars located within 10 km of the proposed wind farm. The operator of the Port Hawkesbury Airport will be contacted to discuss the project.

8.4 Weather Radars

Environment Canada operates a network of Doppler radar sites across the country that collectively is known as the Canadian Weather Radar Network. The radars are used for meteorological forecasting and detecting severe weather events as they occur. Weather radar picks up the Doppler signal from the tips of the rotating blades and the wake turbulence produced as the blades pass through the air.

There are two Doppler weather radar stations that are located in Nova Scotia and one in New Brunswick (Table 5). The closest weather radar site is located 103 km away from the proposed wind farm and is located at Marion Bridge, NS. This site is located outside the 50 km consultation zone recommended by RABC and Environment Canada has been contacted to discuss any potential issues or concerns in regard to the proposed wind farm (Appendix 2).

Table 5: Nearest Weather Radar Sites.

ID and Location	Latitude	Longitude	Distance to Wind Farm (km)
XMB Marion Bridge, NS	45.984	-60.212	103
XGO Halifax, NS	45.114	-63.711	186
XNC Chipman, NB	46.220	-65.726	340

There are no Environment Canada Doppler radar sites located within the recommended 50 km consultation zone. Environment Canada has been contacted and has confirmed that interference issues are expected to be negligible.

9.0 VHF Omnidirectional Range (VOR)

These systems are ground based, short distance navigation aids which provide pilots with 360 degree directional information to or from a station. The frequency range is 108.1 to 117.956 MHz.

There are no VOR sites located within 15 km of the proposed wind farm. The Sydney (114.9 MHz) VOR site is located 122 km from the proposed wind farm and the next closest station is the Charlottetown (113.8 MHz) VOR site located 150 km from the proposed wind farm.

10.0 Summary

Table 6: Summary Results from the Preliminary EMI Report

System	Result
Point-to-Point Systems above 890 MHz	There are no radio link transmitters or receivers that are within 1.0 km of the proposed wind farm. Additionally, there are no links that pass within the recommended consultation zone.
Broadcast Transmitters	No AM transmitters within the 5 km omnidirectional antennae consultation zone. No FM Transmitters located within the 2.0 km consultation zone. No TV Transmitters within the 2.0 km consultation zone.
Over-the-Air Reception	A number of potential receivers are located within the 10 km consultation zone recommended by the RABC for digital Television transmitters. A Broadcast Reception Study will be initiated.
Cellular Type Networks	No cellular networks located within the 1.0 km consultation zone.
Land Mobile Radio Networks and Point-to-point Systems below 890 MHz	Non within the 1.0 km consultation zone
Satellite Systems	No ground satellite stations located within 500 m of the proposed wind farm. No dwellings or buildings located within the projected consultation cone.
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars and Weather Radars	DND Contacted – No Issues perceived Nav Canada Contacted – No radar sites within the recommended consultation zones. Vessel Traffic Systems – No Issues Weather Radar – Environment Canada contacted – No Issues Port Hawkesbury Airfield located within the 10 km consultation zone. The airfield operator will be contacted.
CBC Preliminary Report	One CBC FM Transmitter within 5 km of proposed wind farm. CBC has been contacted in regard to the proposed wind project. No digital TV Transmitters within 89 km of the site
VOR	There are no VOR sites located within the 15 km consultation zone.

11.0 References

- [1] Radio Advisory Board of Canada and Canadian Wind Energy Association (CanWEA), *Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*, December, 2010.
- [2] Strategis data base, Industry Canada, TAFL database, <<http://spectrum.ic.gc.ca/tafl/tafindxe.html>>, Accessed April 2012.
- [3] CBC/Radio-Canada Involvement and Requirements Concerning Wind Energy Projects, CBC, 1400 Rene-Levesque Blvd. East, Montreal, Quebec. H2L 2M2.

Appendix 1
Proposed Turbine Coordinates
And Elevations

Mulgrave Community Wind Project - Preferred Proposed Turbine Coordinates and Base Elevations

Turbine ID	UTM, NAD83, Zone20		Base	Hub	Rotor	Tip	WGS84	
	Easting	Northing	Elev (m)	Height (m)	Dia. (m)	Elev. (m)	Long	Lat
1	622,056	5,053,081	120	98	92	251	-61.4344	45.6205

Appendix 2
Correspondence with Key Agencies

NAV Canada

From: Coyle, Steven [mailto:Steven.Coyle@navcanada.ca]
Sent: Friday, November 29, 2013 8:58 AM
To: Kirk Schmidt
Cc: Tranter, Melanie
Subject: Mulgrave Wind Farm

Good morning Kirk,

I looked up your file. The initial assessment on your file has been started. It appears that we are waiting for 1 internal stakeholder response. Once this is received a letter should arrive shortly afterwards.

Regards,

Steven Coyle

Steven Coyle

NAV CANADA

AIS Land Use

1601 Tom Roberts Ave

Ottawa, ON, K1G R2

(w) 613 248 3960/ toll-free (866) 577-0247

(f) 613 248 4094

(e) coyles@navcanada.ca

From: Kirk Schmidt [mailto:kirk@nortekresources.com]
Sent: November-28-13 4:20 PM
To: Coyle, Steven
Subject: FW: Mulgrave Wind Farm

Hi Steven:

I do not believe I have received any follow-up to this applications. Can you provide me with and update?

Thanks for the help

From: Kirk Schmidt [<mailto:kirk@nortekresources.com>]
Sent: Tuesday, September 24, 2013 4:26 PM
To: 'Land Use'
Subject: RE: Mulgrave Wind Farm

Hi Steven:

Land Use App is attached.

Applications have also been sent off to Transport regarding aeronautical lighting.

Thanks

From: Land Use [<mailto:LandUse@navcanada.ca>]
Sent: Tuesday, September 24, 2013 2:31 PM
To: Kirk Schmidt
Subject: RE: Mulgrave Wind Farm

Good afternoon Kirk,

We have received your email request to open a file for the Mulgrave Wind project. However, we require a **Land Use Form application**. I will add both attachments to your application.

The process for your proposal would be to submit to both Nav Canada and to Transport Canada (TC). Nav Canada and TC are now completely separate entities, and while the submission forms are similar for both, we assess obstacles for very different concerns. Transport Canada's assessment determines the obstacle's marking (painting) and lighting requirements and ensures that the structure will not infringe on any airport zoning requirements. Nav Canada does a much more comprehensive assessment in order to determine if your structure will have any impact on Canada's Air Navigation System (ANS) as a whole.

Below you will find the links to:

- Nav Canada's website for the Land Use program (where you will find the required submission forms and an explanation of our processes);
- Natural Resource Canada's Topographic mapping tool (In the event that you need a tool to generate the required topographic map); and

- Transport Canada's Civil Aviation Regional Offices (You can contact them directly to determine their specific requirements).

Link to Nav Canada:

- <http://www.navcanada.ca/NavCanada.asp?Language=en&Content=ContentDefinitionFiles\Services\LandUseProgram\SubmissionProcedures\default.xml>

Link to Natural Resources Canada's Mapping Tool - The Atlas of Canada (Toporama):

- <http://atlas.nrcan.gc.ca/site/english/toporama/index.html>

Link to Transport Canada's regional offices:

- <http://www.tc.gc.ca/eng/civilaviation/opssvs/regions-139.htm>

Kirk, please feel free to contact me should you have any questions or concerns.

Steven Coyle

Steven Coyle

NAV CANADA

AIS Land Use

1601 Tom Roberts Ave

Ottawa, ON, K1G R2

(w) 613 248 3960/ toll-free (866) 577-0247

(f) 613 248 4094

(e) coyles@navcanada.ca

From: Kirk Schmidt [<mailto:kirk@nortekresources.com>]

Sent: September-24-13 9:29 AM

To: Land Use
Cc: 'Meghan Milloy'
Subject: Mulgrave Wind Farm

To Whom it May Concern:

I am forwarding this message on behalf of Celtic Current LP. which is currently developing the Mulgrave Wind Farm which is located in Guysborough County, Nova Scotia. I have attached the proposed turbine coordinates and pertinent data, as well as a general location map for your perusal. Can I ask you to open a file for this wind farm project and complete your internal review to determine if you anticipate any interference issues with your existing radar systems.

Please let me know if you have any questions or require any additional data.

Regards

Kirk Schmidt, M.Sc.F., RPF

Manager

Nortek Resource Solutions Inc.

Nova Scotia, Canada

Tel: 902.922.3607

Fax: 902.922.3274

Web: nortekresources.com

Email: kirk@nortekresources.com

Air Defence Radars and Communications

-----Original Message-----

From: ADIN.SWITZER@forces.gc.ca [<mailto:ADIN.SWITZER@forces.gc.ca>]

Sent: Wednesday, September 25, 2013 12:42 PM

To: kirk@nortekresources.com

Cc: vinceph@navcanada.ca

Subject: Detailed Analysis Results - Mulgrave Wind Farm - Guysborough County, NS - WTA-3046

Kirk,

Thank you for your patience on this matter and for considering DND radar and airport facilities in your project development process.

We have completed the detailed analysis of your proposed site, Mulgrave Wind Farm, located in Guysborough County, NS (WTA-3046). The results of the detailed analysis and subsequent technical and operational impact assessments have confirmed there is likely to be minimal interference with DND radar and flight operations.

Therefore, as a result of these findings we have no objections with your project as submitted (attached).

If however, the layout were to change/move, please re-submit that proposal for another assessment using the assigned WTA number listed above. The concurrence for this site is valid for 24 months from date of this correspondence. If the project should be cancelled or delayed during this timeframe please advise my point of contact.

It should be noted that each submission is assessed on a case by case basis and as such, concurrence on this submission in no way constitutes a concurrence for similar projects in the same area, nor does it indicate that similar concurrence might be offered in another region. The issuance of this Letter of Non-Objection shall not constitute a waiver or alienation of any existing or future legal rights of the DND/CF nor shall it be construed to create any exemptions, indemnification, approvals, rights, acceptances in favour of Celtic Current LP. The DND/CF expressly reserves its rights to take legal action or seek remedy for any and all liability, loss, harm, degradation of services or equipment, mitigation costs, damages, judgements or expenses that arise from the adverse effects, whether incidental, indirect or causal, of the Celtic Current LP Mulgrave Wind Farm upon the DND/CF radars, equipment and its provision of Air Traffic Services. I trust that you will find this satisfactory. If you have any technical questions or concerns regarding any aspect of this investigation, please contact the ATESS Liaison Officer at (613) 392-2811 extension 4834, or at

+windturbines@forces.gc.ca.

A hard-copy of this response will be mailed separately.

<<Mulgrave Wind Farm Coordinates Aug21.xls>> Sincerely,

Adin Switzer

Capt

AEC Liaison Officer

CCISF/ESICC

ATESS/ESTTMA

Défense nationale | National Defence

8 Wing Trenton, Astra, ON K0K 3W0

TEL: 613 392-2811 Ext4834 (CSN: 827-4834)

FAX: 613 965-3200

Gouvernement du Canada | Government of Canada ü Please consider the environment before printing this email | S'il vous plaît pensez à l'environnement a

Public Safety Agencies

From: Cook, Norman [mailto:COOKNB@gov.ns.ca]

Sent: Tuesday, September 24, 2013 10:19 AM

To: 'Kirk Schmidt'

Cc: 'Meghan Milloy'; Brown, Todd A

Subject: RE: Mulgrave Wind Farm

Hi, Kirk,

I do not anticipate any interference from the Subject Wind Farm.

Regards,

Norm Cook, P.Eng.

From: Kirk Schmidt [<mailto:kirk@nortekresources.com>]
Sent: Tuesday, September 24, 2013 10:01 AM
To: Cook, Norman
Cc: 'Meghan Milloy'
Subject: Mulgrave Wind Farm

Hi Norm:

I am forwarding this message on behalf of Celtic Current LP. which is currently developing the Mulgrave Wind Farm which is located in Guysborough County, Nova Scotia. I have attached the proposed turbine coordinates and pertinent data, as well as a general location map for your perusal. Can I ask you to open a file for this wind farm project and complete your internal review to determine if you anticipate any interference issues with your existing communication systems.

Please let me know if you have any questions or require any additional data.

Regards

Kirk Schmidt, M.Sc.F., RPF

Manager

Nortek Resource Solutions Inc.

Nova Scotia, Canada

Tel: 902.922.3607

Fax: 902.922.3274

Web: nortekresources.com

Email: kirk@nortekresources.com

Vessel Traffic Radars

From: Grégoire, Martin [<mailto:Martin.Gregoire@dfo-mpo.gc.ca>]
Sent: Tuesday, September 24, 2013 4:49 PM
To: Kirk Schmidt
Subject: RE: Mulgrave Wind Farm

Hello,

The proposed wind farm (Mulgrave) is located 18 km away from the Eddy Point (Chedabucto Bay) radar site. Even though it is located within the 60 km consultation zone, it is located beyond the area covered by the radar. Therefore no interference issues are anticipated.

Regards,

Martin Grégoire, P. Eng

Canadian Coast Guard

From: Kirk Schmidt [<mailto:kirk@nortekresources.com>]
Sent: September 24, 2013 9:06 AM
To: XNCR, Windfarm Coordinator
Cc: 'Meghan Milloy'
Subject: Mulgrave Wind Farm

To Whom it May Concern:

I am forwarding this message on behalf of Celtic Current LP. which is currently developing the Mulgrave Wind Farm which is located in Guysborough County, Nova Scotia. I have attached the proposed turbine coordinates and pertinent data, as well as a general location map for your perusal. Can I ask you to open a file for this wind farm project and complete your internal review to determine if you anticipate any interference issues with your existing communication systems.

Please let me know if you have any questions or require any additional data.

Regards

Kirk Schmidt, M.Sc.F., RPF

Manager

Nortek Resource Solutions Inc.

Nova Scotia, Canada

Tel: 902.922.3607

Fax: 902.922.3274

Web: nortekresources.com

Email: kirk@nortekresources.com

Weather Radars

From: Weather Radars Contact,National Radar Program [Ontario]
[mailto:weatherradars@ec.gc.ca]
Sent: Thursday, September 26, 2013 12:04 PM
To: Kirk Schmidt; Weather Radars Contact,National Radar Program [Ontario]
Subject: RE: Mulgrave Wind Farm

Dear Mr. Kirk Schmidt,

Thank you for contacting the Meteorological Service of Canada, a branch of Environment Canada, regarding your wind energy intentions.

Our preliminary assessment of the information provided to us via e-mail on September 24, 2013 indicates that any potential interference that may be created by the Mulgrave Wind Farm in Guysborough County, NS will not be severe. Although we would prefer our radar view to be interference free, this is not always reasonable. As a consequence, we do not have strong objections to the current proposal.

If your plans are modified in any manner (e.g. number of turbines, height, placement or materials) this analysis would no longer be valid. An updated analysis must be conducted.

Please contact us at: weatherradars@ec.gc.ca.

Thank you for your ongoing cooperation and we wish you success.

Best Regards,

Carolyn Wilson

Carolyn Wilson (*Rennie*)
National Radar Program
Meteorological Service of Canada
Environment Canada
4905 Dufferin Street
Toronto, Ontario M3H 5T4
Office : 3N-WS12
NEW Carolyn.Wilson@ec.gc.ca
Phone : 416-739-4931

Carolyn Wilson (*Rennie*)
Le Programme Nationale de Radar
Service météorologique du Canada
Environnement Canada
4905, rue Dufferin
Toronto, Ontario M3H 5T4
Bureau : 3N-WS12
NOUVEAU Carolyn.Wilson@ec.gc.ca
Téléphone : 416-739-4931

From: Kirk Schmidt [<mailto:kirk@nortekresources.com>]
Sent: Tuesday, September 24, 2013 9:05 AM
To: Weather Radars Contact,National Radar Program [Ontario]
Subject: Mulgrave Wind Farm

To Whom it May Concern:

I am forwarding this message on behalf of Celtic Current LP. which is currently developing the Mulgrave Wind Farm which is located in Guysborough County, Nova Scotia. I have attached the proposed turbine coordinates and pertinent data, as well as a general location map for your perusal. Can I ask you to open a file for this wind farm project and complete your internal review to determine if you anticipate any interference issues with your existing radar systems.

Please let me know if you have any questions or require any additional data.

Regards

Appendix X. PROJECT TEAM MEMBERS' CVs

Years in Practice

13

Certifications

Nova Scotia Advanced Wetlands Delineator and Evaluator

Memberships

Nova Scotia Wetlands Delineation, Maritime College of Forest Technology

Education

- Master in Environmental Studies (MES), York University, Toronto, Ontario, 1997-1999
- BSc. (Biology), Dalhousie University, 1992-1997
- BA (Political Science), Honours, Dalhousie University, 1992-1997

Training

- Urban Wetland Restoration: A Watershed Approach, 2012
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course, 2009;
- Water Management and Wetland Restoration Training Course, 2009;
- Identifying and Delineating Wetlands for Nova Scotia, 2008
- Saint John Ambulance Standard First Aid, AED, CPR(C). 2013

Summary

Ms. Milloy oversees, manages, and executes environmental projects. She completes wetland delineations and characterizations, and guides clients through the environmental and permitting stages of development projects. Ms. Milloy also guides clients through provincial and federal environmental assessment requirements. Ms. Milloy has submitted multiple applications for Transport Canada, under the Navigable Waters Protection Program, has submitted numerous Department of Fisheries and Oceans HADD applications (freshwater and marine) and has developed HADD compensation programs. Ms. Milloy regularly completes applications for wetland alteration and development across Atlantic Canada, and has developed and implemented wetland compensation programs. Ms. Milloy is a trained wetland restoration professional. Ms. Milloy is also knowledgeable in preparing Environmental Management Plans and Emergency Preparedness Plans for development projects.

Ms. Milloy is also involved with programs including the remediation of contaminated commercial and residential sites, and the execution of Phased Site Assessments in accordance with the Nova Scotia Management of Contaminated Sites Guidelines and CSA. Ms. Milloy is knowledgeable in risk assessment processes, and completes both qualitative and quantitative risk assessments for commercial and residential properties. Ms. Milloy has extensive experience working with the Atlantic Risk Based Corrective Action (RBCA) risk assessment process for hydrocarbon-impacted sites, and is proficient in plume characterization and exposure assessment.

Selected Project Experience

- Completed watershed planning for the Sackville River Secondary watershed to evaluate wetland restoration potential and to aid in better land use planning, source water protection and management of water resources.
- Completion of 35-45 projects involving watershed evaluation, land use classification, wetland delineation and alteration and infill, and compensation planning for numerous residential and commercial large-scale developments across Nova Scotia and New Brunswick.
- Completion of a wetland alteration application and associated compensation for 24 individual wetlands associated with road development in support of a planned residential development in Sackville Nova Scotia.
- Completed the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Project Management of regulatory permitting and environmental assessments for a 50 MW Wind Power Project in Nova Scotia for Sprott Power Corp.
- Completion of wetland delineation and watercourse identification for two large scale developments (200 ha and 400 ha) in 2012.
- Completion of provincial permitting requirements including wetland alteration and compensation planning, and watercourse alteration for a proposed marine terminal and associated 20 km rail and transmission line in Nova Scotia.
- Developed and implemented wetland restoration and creation projects as

compensation for wetland losses for numerous development clients.

- Completion of more than 50 phased site assessment and remediation projects - Phase I, II, III and risk assessment for commercial property transfers.

Experience

McCallum Environmental Ltd., Nova Scotia, 2010-Present

Vice President/Senior Project Manager - Provides project management expertise for site and/or route selection, constraints mapping, regulatory consultation, environmental assessments, wetland alteration and restoration planning, environmental protection plan development, regulatory applications, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Strum Environmental Services Ltd., Nova Scotia 2000-2010

Project Manager- From 2000- 2010, provided project management expertise for development clients across Atlantic Canada. Projects included environmental assessment, large scale commercial and residential developments, wetland alteration projects, wetland compensation planning and implementation, wetland restoration and creation projects, phased site assessments, and risk assessment and management.

Environmental Sciences Group, Kingston, ON 1998

Environmental Scientist- in 1998, provided contaminant and project management expertise to Department of National Defense in the Canadian Arctic in support of remediation of several remote military sites. Identified areas required for remediation and completed associated boundary soil and sediment confirmatory sampling and analysis.

Years in Practice

16

Memberships

Alberta Society of Professional Biologists (ASPB), 2001
AB# 875

Certifications

Watercourse Alteration Certification, Nova Scotia.
#10044385

Education

Bachelor of Science, Biology/ Environmental Studies, University of Victoria, BC

Recent Training

- ◆ Project Management Fundamentals, 2010
- ◆ ISO 14064-1 Essentials: Greenhouse Gas Inventories
- ◆ ISO 14064-2 Expert – Greenhouse Gas Projects (Carbon Emissions Reduction Expert Course)
- ◆ Standard First Aid w/ CPR Level C
- ◆ H2S Alive

Recent Clients

- ◆ Altagas Ltd.
- ◆ Sprott Power Corp.
- ◆ Goldworx
- ◆ BluEarth Renewables
- ◆ Joss Wind Inc.
- ◆ Alva Construction
- ◆ Shear Wind Inc.

Skills

Extensive project management experience in an owner and consulting environment.

Extensive experience in project planning, environmental assessments, regulatory compliance, construction planning and project execution.

Understand appropriate environmental assessment methodologies and project management to successfully permit both large and small scale projects.

Understand and can articulate environmental and regulatory requirements and constraints, technical, business and project management functions associated with project development and execution.

Understand construction practices, requirements and deliverables associated with project stages.

Understand typical owner company project sanctioning / funding cycles and business drivers.

Demonstrated dedication to safe project execution and a safe workplace in support of zero incident targets.

Selected Project Experience

MINING & CONSTRUCTION

- Completion of environmental baseline surveys for Nova Scotian provincial environmental assessment process for Goldworx for a proposed re-development of a gold mine in eastern Nova Scotia.
- Completion of environmental baseline surveys for Quebec based company for a proposed gold mine expansion in eastern Nova Scotia.
- Completion of environmental baseline surveys for three Nova Scotian quarry expansion projects in 2012-2013.

OIL & GAS

- Project manager for environmental approvals and compliance for 68 kilometres of pipeline development in Alberta. Project components included pipeline route selection, first nation/public consultation, regulatory consultation, environmental assessments, survey supervision, regulatory applications for licenses/permits, construction monitoring, and reclamation of the right-of-ways.
- Completion of environmental assessments for 53 oil and gas developments on the Hay Lake I.R. #209, Alberta, since 2001. Conducted construction compliance monitoring, reclamation, and completed regulatory compliance audits for ongoing activities.
- Working as part of the Nexen Abandonment and Reclamation team, completed the AENV facility amendment application, and the Decommissioning, Remediation and Land Reclamation Plan for the Balzac

- ◆ Nexen Inc.
- ◆ Husky Energy
- ◆ Bonavista Energy
- ◆ Canadian Natural Resources
- ◆ Enhance Energy
- ◆ Nuvista Energy
- ◆ Advantage Energy
- ◆ Cenovus Energy
- ◆ Eiger Energy
- ◆ Devon Canada
- ◆ Penn West Petroleum
- ◆ Shell Canada
- ◆ Talisman Energy
- ◆ Taqa North
- ◆ Hatch Mott MacDonald
- ◆ AllNorth Consultants
- ◆ Armco Capital
- ◆ Ramar Development

References

(contact info available upon request)

- ◆ Greg Denham – A&R Coordinator, Nexen Inc.
- ◆ Louise Clarke – V.P. Sprott Power Corp.
- ◆ Don Bartlett, COO – Sprott Power Corp.
- ◆ Colin Fisher – Division Manager, Allnorth
- ◆ Tim Benko, Project Manager-Facilities, Enhance Energy

Gas Plant for Nexen Inc.

- Completed the Cumulative Effects Assessment and Environmental Protection Plan for a 107 shallow gas well program on federally regulated lands in Saskatchewan for submission to the Canadian Wildlife Service and Environment Canada.
- Environmental Coordinator for Baytex Energy Ltd. from 2004-2006. Responsible for regulatory approvals and compliance for all business operations in Alberta, Saskatchewan, and British Columbia.
- Completion of hundreds of regulatory compliance audits for oil and gas clients in Alberta.
- Completed hundreds of watercourse crossing applications for upstream oil and gas development in Alberta.
- Completion of site selection, CEAA screening documents, first nation consultation, regulatory consultation, and surface land applications for 10 wellsites, access road, and pipelines for Maverick Oil & Gas Ltd on the Louis Bull First Nation since 2006.

ALTERNATIVE ENERGY

- Construction monitoring for EPP compliance, and reclamation management, for Kettle Hills Wind Power Project, Alberta.
- Completed Environmental Protection Plan, Erosion & Sedimentation Control Plan, acting as Environmental Monitor and regulatory specialist, and completion of the Federal Cumulative Effects Assessment for the Glen Dhu Wind Power Project in Nova Scotia for Shear Wind Inc.
- Coordination and completion of the 10 year Alberta Environment renewal application for the 105 MW Balzac Thermal Power generating station for Nexen Inc. This application encompasses the same requirements as a new facility application.
- Completed winter wildlife and fall migration survey of the Glenridge Wind Power Project, Alberta for Altagas Ltd.
- Completed environmental assessment and Alberta Utility Commission (AUC) Application for the 79 MW HandHills Wind Power Project in Central Alberta, for Nexen Inc/Joss Wind Power Inc.
- Coordination of the environmental assessment and Alberta Utility Commission (AUC) Application for the 100 MW Willowridge Wind Power Project in Southern Alberta for Shear Wind Inc.
- Completed initial site assessment of turbine locations for constructability, access and environmental constraints for an 80 MW Wind Power Project in North East British Columbia, for Sprott Power Corp. This Project was recently cancelled.
- Completed the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Completed the Provincial Environmental Assessment for the 25.2 MW Hampton Mountain Wind Power Project, Bridgetown, Nova Scotia. The

Project received Ministerial approval on January 10, 2011.

- Completed Environmental Assessment amendment application for a 32 MW Amherst Wind Power Project, Nova Scotia, for Sprott Power Corp. This Project was acquired from Acciona.
- Project Management of regulatory permitting and environmental assessments for the 50 MW Canaan Mountain Wind Power Project in Nova Scotia for Shear Wind Inc.
- Completed constraints and regulatory analysis for 2 different wind power projects in Saskatchewan for Joss Wind Power Inc. for the 2011/12 RFP.
- Completed constraints and regulatory analysis, and Fall and Winter wildlife surveys for the 80 MW Burstall Wind Power Project in Saskatchewan for Shear Wind Inc. for the 2011/12 RFP.
- Project Management of regulatory permitting and environmental assessments for a 65 – 100 MW Wind Power Project in New Brunswick for Shear Wind Inc.

OTHER PROJECTS

- Completing an Evaluation of Wetland Restoration Potential (EWRP) within the Sackville Watershed, Halifax, N.S. to identify priority wetland restoration sites. The goal is to reduce overland water flow within developed areas to reduce municipal liabilities.
- Completed fisheries assessments and applications for numerous bridge crossings in Nova Scotia.
- Assistance with project management and regulatory permitting for the 2010 Heritage Gas pipeline expansion within the Halifax Regional Municipality, Halifax, N.S.
- Completion of the CEAA screening document and NAV Canada application for the Deer Lake Regional Airport Authority (Newfoundland) Runway expansion, access road relocation, and transmission line relocation, including DFO and NAV Waters application.

Experience

McCallum Environmental Ltd.,

President - Since 2001, has provided project management expertise for site and/or route selection, constraints mapping, land acquisition, first nation/public consultation, regulatory consultation, environmental assessments, environmental protection plan development, survey supervision, regulatory applications, license and permit acquisitions, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Indian Oil & Gas Canada, Department of Indian & Northern Affairs, AB

Environmental & Surface Land Analyst (Responsible Authority under CEAA) - applied federal environmental legislation (CEAA, CEPA, Fisheries Act, and Indian Oil & Gas regulations (1995), which incorporate provincial legislation, on oil and gas producing Indian reserves in Canada. Analyzed

Robert McCallum, P.Biol

robert@mccallumenvironmental.com

902-292-0514

environmental assessments for proposed projects and conducted site inspections where required (acting as the Responsible Authority under CEAA). Audited projects to ensure compliance with federal and provincial legislation. Negotiated and resolved environmental issues while maintaining an effective working relationship with First Nations, industry, IOGC and other federal and provincial regulators. Conducted reclamation inquiries to ensure compliance with reclamation criteria.

Stantec Consulting Ltd., AB

Project Manager - responsibilities included marketing, budget management, report preparation and client service. Project experience related to reclamation and environmental monitoring of construction projects. Completed federal and provincial environmental assessments, conservation and reclamation plans, designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments and dig & dump supervision and closure sampling.

Pioneer Land Services Ltd., Calgary, AB

Assistant Environmental Manager - responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Completed environmental assessments as per provincial and federal requirements, designed and monitored environmental protection plans for developments in environmentally sensitive areas, Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Pioneer Land Services Ltd., Grande Prairie, AB

Environmental Division Manager - responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Great White North Environmental Services Ltd., AB

Senior Environmental Scientist - responsible for the preparation and implementation of Phase I and Phase II Contamination Assessments and Risk Assessments. Conducted Waste Auditing, Soil Vapor Surveys, and site remediation.

Years in Practice

8

Education

Masters of Resource and Environmental Management, Dalhousie University, 2009-2011

B.Sc. Advanced Major in Biology & Interdisciplinary Studies in Aquatic Resources, St. Francis Xavier University, 2001-2005

Training

- ◆ Wetland Delineation Certification, 2013
- ◆ Saint John Ambulance Standard First Aid, AED, CPR(C), 2013
- ◆ Health Safety and Environmental Leadership training and Advanced Safety Audit training, 2009
- ◆ Emergency Operations Centre crisis management training, 2006-2008
- ◆ Introduction to the Fisheries Act and Navigable Waters Protection Act course – ESAA
- ◆ Bear Awareness training and ATV training – Alberta Safety Council, 2006
- ◆ Site Supervisor Safety Training, Construction Safety Training System and W.H.M.I.S., 2005

Summary

Ms. MacDonald has been in the environmental consulting profession since 2005. She has worked on both project related and research related field assessments in Nova Scotia, Prince Edward Island, and Alberta.

Ms. MacDonald's academic credentials include a Bachelor's degree in Biology and Interdisciplinary Studies in Aquatic Resources, and a Masters' degree in Resource and Environmental Management. Melanie has been able to apply the lessons from these inter-disciplinary programs through a variety of projects throughout her professional career. Most recently, Ms. MacDonald has been responsible for completing biophysical assessments, including flora and fauna surveys, avian surveys, and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Ms. MacDonald coordinates all field staff required to complete all environmental baseline programs for Provincial Environmental Assessment registration. Ms. MacDonald has been responsible for the implementation of six environmental baseline programs for mining, quarry development and energy sector development projects in Nova Scotia in advance of environmental assessment registration.

Ms. MacDonald is specialized in wetland and watercourse delineations and functional assessments and fish habitat surveys, having delineated approximately 300 wetlands and their associated watercourses within the past 2 years. Ms. MacDonald brings considerable experience in fisheries monitoring projects in both marine and freshwater environments. As a certified electrofishing crew leader, Melanie has logged hundreds of hours performing electrofishing surveys for various DFO HADD monitoring programs and associated compensation projects. Specifically, Ms. MacDonald was pivotal in planning and completion of a watercourse alteration, fish salvage and diversion of 38km of the Tar River, and in the construction of a 77 hectare lake for fish habitat compensation. Ms. MacDonald is experienced in watercourse habitat assessments, various types of fisheries assessments, and has overseen multiple watercourse (both road and pipeline) crossings in Alberta and Nova Scotia. Throughout her career, Ms. MacDonald has gained experience in regulatory compliance and permitting, including DFO HADD and NWPA permits.

Selected Project Experience

- Completion of environmental baseline surveys for the provincial environmental assessment process for Goldworx for a proposed re-development of a gold mine in eastern Nova Scotia.
- Completion of environmental baseline surveys for Quebec based company for a proposed gold mine expansion in eastern Nova Scotia.
- Completion of environmental baseline surveys for three Nova Scotian quarry expansion projects in 2012-2013.

- Completed watershed planning for the Sackville River Secondary watershed to evaluation wetland restoration potential and to aid in better land use planning, source water protection and management of water resources.
- Completion of field work associated with a wetland alteration application and associated compensation for 24 individual wetlands associated with road development in support of a planned residential development in Sackville Nova Scotia.
- Completed field programs and reporting associated with the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Completion of wetland delineation and watercourse identification for four large scale developments (2 - 200 ha, 400 ha, and 450 ha) in 2012 and 2013.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Biologist and Environmental Specialist/Coordinator:

May-Aug 2011, Jan 2012-Present

Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating migratory bird and bat monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications.

Amec Colt, Shell/Albian Sands Expansion 1 - Fort McMurray, Alberta.

Environmental Specialist and Area Environmental Lead

July 2008 – October 2009.

Proactively monitored construction activities via inspections, audits and Environmental Work Permits & Protection Plans to ensure compliance with regulatory approvals, the projects' Environmental Control Plan, and best management practices. Investigated and reported incidents, and liaised between contractors and project owners. Implemented Environmental Awareness and communicated issues via weekly newsletters. Developed a greater business sense, working as an independent contractor to Amec Colt.

Canadian Natural Resources Ltd. - Fort McMurray, Alberta

Regulatory and Environmental Specialist

October 2005 – July 2008

Conducted extensive field work in various fish and wildlife programs. Communicated issues with government agencies, contractors and external stakeholders. Performed on-call duties, spill response, and non-compliance reporting and response. Expanded upon site wide procedures for protection of water, wildlife and waterbirds. Played a pivotal role in planning & completion of a fish salvage of 38 km of the Tar River, and in construction of a 77 hectare fish habitat compensation lake (Horizon Lake). Horizon Lake earned CAPP Steward of Excellence Award for Environmental Performance. Hired, trained, and supervised teams of up to four summer interns. Chaired the regional 'Oil Sands Bird and Wildlife Protection Committee'.



DAP-PL-3770.00

Akkreditiert nach
DIN EN ISO/IEC 17025:2005



Zertifiziert nach
ISO 9001: 2000

AL-PRO Wind Energy Consulting Canada Inc.

AL-PRO Wind Energy Consulting Canada Inc. is a Canadian subsidiary of AL-PRO GmbH & CO. KG, a German, independent, internationally active and DAP accredited consulting firm that specializes in wind energy modeling and assessment. Our main focus is site specific wind and yield analysis for wind farm developments. We use industry standard software that include models like WAsP for relatively simple terrain conditions and Meteodyn WT for complex nonlinear three-dimensional flow models to determine the wind fields for sites with complex or rough terrain.

AL-PRO's founder, Mr. Carsten Albrecht is a member of the wind consultancy advisory board of the Federal Association for Wind Energy e. V. - a forum of wind consultants as well as specialists and experts from institutes and research establishments. Mr. Albrecht held the position of chairman of the advisory board in 2005. AL-PRO is committed to maintaining the current standards for the preparation of wind reports as well as the restrictions of the latest "Technical Guideline for Wind Turbines" part 6, revision 7, for the preparation and documentation of wind reports. An overview of the regulations for the preparation of wind reports as well as additional information of the BWE is available on the following website: www.wind-energie.de .

Our core services are certified by the Germanischer Lloyd to DIN ISO 9001. In our third year of operation, we became the first wind energy consulting firm to be accredited in the world to the DIN EN ISO 17025 standard. Our accreditation includes the determination of wind potential and energy yields, shadow and noise calculations, the reference yield determination due to the EEG and the development of 60% certificates, which have been required since 2005 for the promotion of wind energy farms.

AL-PRO specializes in the use of three-dimensional flow models for the determination of wind conditions in complex terrain and has extensive experience using this approach. The application of three-dimensional flow models includes traditional tasks such as the determination of wind potential and energy yields and more sophisticated analyses which include load studies that consider turbulence, incident flow values, vertical wind shear, etc. All wind energy modeling meets or exceeds the existing technical guidelines TR5 (1) and TR6 (2).

AL-PRO also offers additional services which include wind farm optimization and configuration, turbulence determination, three-dimensional flow modeling, visualisations and visibility studies as well as long-term risk and performance analysis of existing wind farms.

Tel (902) 692-3606

AL-PRO Wind Energy Consulting Canada Inc.

390 Marsh St, New Glasgow, NS

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Geschäftsführer:
Dipl. Inf. Carsten Albrecht

e-mail: info@al-pro.de
Internet: www.al-pro.de



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Our typical customers are project developers, turbine manufacturers, banks and wind farm operators located within Europe, South America and Canada.

Our staff consists of 7 full time and three part time individuals with a broad range of expertise and experience. Our managing directors are Mr. Carsten Albrecht, M.Sc.

Mr. Carsten Albrecht, M.Sc. has been active in the field of wind energy for over a decade and is responsible for the technical and scientific support. Dr. Raimund Pauen is responsible for project management and oversees the computations and the modeling of wind resources.

Our headquarters are located in Großheide, Germany and the majority of the analysis work is completed at our main office, however we operate AL-PRO Wind Energy Consulting Canada Inc. which provides support for the Canadian and American Markets. The staff at AL-PRO travel extensively to complete site inspections for a variety of global clients.

Recently, AL-PRO added to the range of services it provides by developing and marketing the Global Windmapping Service (GWS). The Global Windmapping Service includes a variety of products that provide strategic and site specific wind resource mapping products. For further information please visit our web shop at: www.gws-alpro.com.

Since 2001, AL-PRO has completed in excess of 700 projects of which the majority have been located in Germany, although in recent years, we have pursued an increasing number of international projects (*Europe: France, Poland, Italy, Austria, Greece, Bulgaria, Switzerland and Hungary, Argentina, Brazil, USA and Canada*).

For our customers there is always the possibility of getting information about us and our services. Close contact to our customer as well as their feedback is very important for us. Detailed information can be found on our website: www.al-pro.de

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Technical guidelines:

- (1) Technische Richtlinien für Windenergieanlagen, Teil 6: Bestimmung von Windpotenzial und Energieerträgen (*Technical Guidelines for Wind Turbines, Part 6: Determination of Wind Potential and Energy Yields*), Revision 7, 10.09.2007; Fördergesellschaft Windenergie e.V.
- (2) Technische Richtlinien für Windenergieanlagen, Teil 5: Bestimmung und Anwendung des Referenzertrages (*Technical Guidelines for Wind Turbines, Part 5: Determination and Application of the Reference Yield*), Revision 4, 01.06.2008; Fördergesellschaft Windenergie e.V.

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ISO 9001: 2000

Current software:

- (1) WAsP, Wind Atlas Analysis and Application Program, Version 8.1, Build 8.01.0057, Risø National Laboratory, Denmark.
- (2) Meteodyn WT, Version 4.5.2, France
- (3) WindPRO, Version 2.9 207, April 2013, EMD International A/S, Denmark.
- (4) World-Wind-Atlas, Version 01/2005-3.6 Sander + Partner GmbH, Switzerland
- (5) Matlab, The MathWorks, Version 7.5.0.342 (R2007b) 15. August 2007
- (6) AnemoScope, Version 1.5.10, 2007, Canadian Hydraulics Centre/National Research Council, Canada

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Overview of key customers:

- Plambeck Neue Energien AG, Cuxhaven, Germany
- ENERCON GmbH, Germany
- DEWIND Ltd., Lübeck, Germany
- AN Windenergie GmbH, Bremen, Germany
- Unigea Erneuerbaren Energien GmbH, Cuxhaven, Germany
- Deutsche Kreditbank AG, Berlin, Germany
- Eolica-Energia sarl, Italy
- Gamesa Energie Deutschland GmbH, Oldenburg, Germany
- REE Sarl. Régie d`Energie Eolienne, France
- WWU GmbH, Münster, Germany
- RESEC, Liberecký kraj (Tschechien), Czech Republic
- ENOVA Beratungs- und Vermittlungs- GmbH, Germany
- EFI Energy Farming International AG, Germany
- Shear Wind Inc., Nova Scotia, Canada
- Celtic Current GP, Nova Scotia, Canada
- Aeolis Wind Corp., British Columbia, Canada
- Wind Energy Developers, Rhode Island, USA
- Affinity Renewables Inc, Nova Scotia, Canada
- RESL, Nova Scotia, Canada
- BluEarth Renewables, Alberta, Canada
- Renewable Energy Developers, Ontario, Canada

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**DAVID JOHNSTON
BIRDING CV**

- Chemical Engineer, now retired, an active birder for about 40 years.
- Have provided bird population studies for consultants of several potential industrial sites including wind farms in the Strait of Canso area.
- Was the Regional Coordinator for Southwest Cape Breton for the Maritimes Breeding Bird Atlas, a five year survey, 2006 to 2010.
- Currently the coordinator (since 1992) of the Strait of Canso Christmas Bird Count.
- Currently the coordinator for Inverness County, of the Annual Nova Scotia Migration Count.
- Provides bird talks and field trips to interested groups in the Strait of Canso area and actively participates in various field trips in other areas.

ARCHAEOLOGIST / PRINCIPAL INVESTIGATOR

STEPHEN DAVIS, D. PHIL

Phone: (902) 441-9481

E-mail : steve.davis@eastlink.ca

Years of experience: 40+

Years with DM&A (formerly DAC) : 22

ARCHAEOLOGICAL IMPACT ASSESSMENT

ENVIRONMENTAL EFFECTS MONITORING

MITIGATION DESIGN

CULTURAL RESOURCE DATA ANALYSIS

ARCHAEOLOGICAL SENSITIVITY TRAINING

EDUCATION

1987 D.Phil. Prehistory - University of Oxford, England.

1975 Master of Arts, Anthropology – Memorial University of Newfoundland.

1971 Bachelor of Arts, Honours in Anthropology - University of New Brunswick

PROFESSIONAL DEVELOPMENT AND CERTIFICATION

WHMIS: Certified 2008

PROFESSIONAL MEMBERSHIPS AND AFFILIATIONS

Federal Heritage Legislation Committee for the protection of heritage resources on Federal lands.

Atlantic Province consultant for the “Proposed Act respecting the protection of archaeological heritage in Canada”. The Bastion Group Heritage Consultants, Victoria, B. C.; for the Department of Communications, Canada.

Member of the Canadian Archaeological Association

Member of the Council for Northeast Historical Archaeology

RELEVANT PROJECTS AND RESPONSIBILITIES

Stephen Davis is President of Davis MacIntyre & Associates Limited. After teaching archaeology for thirty-seven years he is presently Professor Emeritus of Anthropology at Saint Mary's University, Halifax. He has been granted the President's Award for Excellence in Research (Saint Mary's University) and most recently the 2011 Smith-Wintenburg Award for outstanding contribution to the field of archaeology in Canada (Canadian Archaeological Association).

The principal investigator for archaeology has had field experience in the Canadian High Arctic, the Barrens and Eastern Arctic. This includes field surveys and excavations of sites on Dundas and Devon Islands in Nunavut as well as work in the interior Barrens along the northeastern shore of Dubawnt Lake. His experience in the Eastern Arctic dealt with First Nations sites in southern Labrador, which included a sacred burial site. While employed by the Archaeological Survey of Canada he dealt with the full range of cultural traditions defined in the Arctic from early Independence 1 sites through Dorset and Thule.

Through research and consultancy experience over a forty-year period, Dr. Davis has worked on projects in Spain, Norway, Maine, the British Isles, N.W.T., Ontario and the Canadian Arctic. With a growing public interest in protecting cultural resources of all types, Dr. Davis has become involved with numerous projects involving historic site archaeology. During his professional career he has directed archaeological investigations of prehistoric sites, historic sites and conducted hundreds of cultural resource assessment surveys under the guidelines for a Category C Permit (Nova Scotia Museum). These activities have resulted in over 100 publications in the form of books, book chapters, journal articles and contractual documents.

Representative projects include:

- [Little River Reservoir Project, Saint John NB](#) – Dillon Consulting / City of Saint John: heritage resource impact assessment including refining and field-truthing a predictive model based on changing water levels.
- [Muggah Creek Shipwreck, Sydney NS](#) - Sydney Tar Ponds Agency: archaeological assessment and recording of a beached shipwreck in the Sydney Tar Ponds, also known as Muggah Creek.
- [Route 11 Pokemouche to Janeville, NB](#) - New Brunswick Department of Transportation: CEAA Screening and Provincial EIA. Archaeological background study and reconnaissance of a proposed highway corridor over 50km in length.
- [Deep Panuke Landfall Preparation, Goldboro NS](#) - EnCana Corporation: monitoring and mitigation of the near shore development of the Deep Panuke natural gas project, and heritage sensitivity training.
- [Morell Lagoon Upgrade, PEI](#) – Community of Morell: Monitoring of lagoon upgrades in the vicinity of a known Acadian / Mi'kmaq cemetery.

Davis MacIntyre & Associates Limited

SENIOR ARCHAEOLOGIST

LAURA DE BOER, M.A.

Phone: (902) 209-4004

E-Mail: laura.deboer@eastlink.ca

ARCHAEOLOGICAL IMPACT ASSESSMENT
ENVIRONMENTAL EFFECTS MONITORING
DESKTOP STUDIES
ARCHIVAL RESEARCH
STRUCTURAL RECORDING

EDUCATION

Master of Arts, European Historical Archaeology – University of Sheffield (UK)

Bachelor of Arts, Honours in Anthropology – Saint Mary's University

PROFESSIONAL DEVELOPMENT AND CERTIFICATION

WHMIS: Certified 2008

Emergency First Aid & CPR Level A certified (St. John Ambulance) 2010

PROFESSIONAL MEMBERSHIPS, AWARDS, AND AFFILIATIONS

Board member, Industrial Heritage Nova Scotia

Member, Canadian Archaeological Association

Member, Nova Scotia Archaeology Society

John Harvey Memorial Writing Award, Nova Scotia Archaeology Society

Prince John Loewenstein Anthropology Award (Writing), Saint Mary's University Anthropology Department

AUUHC Conference award – Best Presentation, University of Prince Edward Island

Nelly B. Grey Memorial Scholarship, Saint Mary's University

RELEVANT PROJECTS AND RESPONSIBILITIES

Ms. de Boer is a Senior Archaeologist who has been involved in archaeological field survey and excavations since 2006. She began working in the consulting field in 2008. She is experienced in a range of work pertaining to the historical or post-contact period of Nova Scotia, with a focus on the archaeology of standing buildings and of industrialization. Her projects as a consultant and previously as a student have included cemeteries, populous urban sites, areas reclaimed by wilderness, and industrial sites. She has also been involved in archaeological field surveys in Italy and the United Kingdom. Ms. de Boer has held archaeological research permits in Nova Scotia under the Special Places Protection Act, is qualified to hold permits in PEI, and has conducted archaeological research in New Brunswick.

As a senior and previously as a junior archaeologist, her responsibilities have included conducting field reconnaissance and excavation (test units, forest and mountain field surveys, and large-scale construction site excavation and monitoring, recording and profiling of test units); extensive research in public and private archives; analysis of historical mapping; compiling museum reports under Special Places Protection Act legislation; laboratory processing of artifacts; and the recording and drafting of sites, structures, and shipwrecks. Ms. de Boer's academic experience prior to her consulting work has included the use of basic AutoCAD programming, Leica Total Station survey, vector-based graphics work, and geophysical surveying.

Representative projects include:

- [Wilkes Subdivision, Rusagonis NB](#) – Dillon Consulting: Archaeological background study and survey to ground-truth predictive modelling.
- [Route 11 Pokemouche to Janeville, NB](#) - New Brunswick Department of Transportation: CEEA Screening and Provincial EIA. Archaeological background study and reconnaissance of a proposed highway corridor over 50km in length.
- [Muggah Creek Shipwreck Recording, Sydney NS](#) - Sydney Tar Ponds Agency: archaeological recording and drafting of a beached shipwreck prior to its removal during the Tar Ponds Clean-up.
- [Melford International Terminal, Melford NS](#) - AMEC Earth & Environmental: archaeological resource impact assessment including recording and mitigation of archaeological and built heritage resources.
- [Point Pleasant Park Archaeological Research, Halifax NS](#) - Halifax Regional Municipality: Design and execution of archaeological research program for management and rehabilitation of historic roadways
- [Digby Wastewater Treatment Project](#) – Town of Digby: Archaeological testing and recording following an impact assessment also conducted by DM&A.
- [Bailey's Cemetery](#) – Xstrata Coal: Archaeological excavation to identify fourteen grave shafts at Bailey's Cemetery, Donkin, Cape Breton.

Davis MacIntyre & Associates Limited

Jody R. Hamper

2796 Laggan Rd., Barney's River, NS, B0K 1A0

902-759-3412

Experience

E & R Langille Contracting, New Glasgow, NS, (2007-present)

Logging Crew Supervisor

- Cut block lay-out
- Supervising work crews
- Coordinating transportation, floating schedules
- Collecting and monitoring time cards for payroll
- Timber Cruising

M & R Ross, New Glasgow, NS, (2006-2007)

Harvest Block Layout

- Laying out the harvest blocks for harvesting crew
- Supervising work crews

Education

1999 **Maritime Forest Ranger School, Fredericton, NB**
Forest Technician, Certified (Graduated with Honours)

1996-1998 **Holland College, Charlottetown, PEI**
Diploma in Renewable Resource Management

Skills

Emergency First Aid, comfortable with Microsoft Office, experience using GPS and GIS, work well on my own or with a team, detailed oriented

Additional Information & Interests

Volunteer Fire Fighter with Barney's River Volunteer Fire Department
Member of Masonic Lodge, Pictou County Shrine Club
Interests include hiking, rafting, playing hockey and travelling.