



January 12, 2018

Mr. Chris Veinot
Mi'kmaq Wind4All Communities LP.
#1205 - 1801 Hollis Street
Halifax, NS B3J 3N4

Dear Mr. Veinot,

**Re: Sound Monitoring Assessment
Amherst Community Wind Farm**

Introduction

The Amherst Community Wind Farm (the Project) is a two-turbine, 6.0 megawatt (MW) project located on lands approximately 5 km east of Amherst, NS, in the Municipality of the County of Cumberland (UTM Zone 20T 410991mE, 5076124mN).

An Environmental Assessment (EA) for the Project was approved by the Minister of Environment in February 17, 2015. As a condition of the EA approval, the Approval Holder must monitor sound levels once the turbines become operational, and at the request of and to the satisfaction of NSE in order to ensure that sound levels do not exceed 40 dBA.

This report details the results of the pre-construction sound monitoring completed in October 2015 and the two post-construction sound monitoring programs completed in April 2017 and October, 2017

Methodology

As per the EA approval condition, sound testing was completed at the start of turbine operations, and one year after the turbines became operational. For comparison purposes, pre-operation sound monitoring was completed in order to provide a measurement of the existing background sound (due to the environment, wind induced sound in surroundings, as well as in the microphone itself). Pre-operation sound monitoring was completed at three selected receptors from October 17 – 22nd, 2015 (at locations 1 and 2) and from October 27 – November 2nd (at location 3) (Drawing 1, attached).

The two turbines were commissioned in November 2016.

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The first round of post-construction monitoring (Post-construction 1) was completed from April 12-20, 2017. The second round of post-construction monitoring (Post-construction 2) was completed from October 16-18 at the same three receptor locations.

Table 1. Sound Monitor Details

Monitoring Location	Monitor Coordinates	Distance to Nearest Turbine	Deployment Dates
Sound Monitor Location #1 (Residential Property)	45°50'39.89"N 64° 9'38.75"W	1580 m SE	October 17 - 22, 2015 April 12 – 20, 2017
Sound Monitor Location #2 (Residential Property)	45°49'24.56"N 64° 8'11.21"W	1190 m NW	October 17 - 22, 2015 April 12 – 20, 2017
Sound Monitor Location #3 (Vacant Land Near Project Site)	45°50'18.60"N 64° 9'3.35"W	580 m ESE	October 27 – November 2, 2015 April 12 – 20, 2017

The methodologies employed were in conformity with the MOE Compliance Protocol for Wind Turbine Sound – Guidelines for Acoustic Assessment and Measurement (MOE 2009) and consisted of the following components.

Instrumentation and Set Up

The assessment was completed using 3M SoundPro Class I sound level meters with data logging capability. At each location, a monitor was kept in a locked weatherproof case, with the microphone supported by a pole at a height of 1 m above the ground. The microphone was mounted inside an acoustically transparent weather resistant filter, designed to minimize the effects of environmental sound interferences such as wind and rain.

Each data logger was configured to collect the following information:

- A-Weighted Frequencies (frequency range);
- Slow (S) Time Weighting (response); and
- Sample frequency of 1 minute (sample frequency).

The frequency range for the data runs was 0-140 dB and each logger was calibrated at 114.0 dB at 1 kHz. The data are representative of the acoustical environment at the receptor locations during the monitoring periods including all natural (e.g. wind and wildlife) and anthropogenic sources of sound (e.g. road traffic).

Sound monitors were deployed when weather conditions were considered normal for the season. No storm events or severe wind storms occurred during the monitoring period, although wind gusts and light rain events were considered to be normal. Although the pre-construction monitoring period occurred during the fall, and the post-construction monitoring event occurred during the spring and fall, the environmental conditions for these three monitoring events were considered comparable. During all three events, there was no snow on the ground events, the trees were not in leaf, and wind / weather conditions were comparable.

Analysis

Analysis on the sound monitor data was performed using 3M Detection Management Software. The data collected was analysed to isolate three important metrics relevant to a comparison between pre- and post-construction sound levels. These metrics were the LAS_{eq} , the LAS_{90} and the LAS_{50} which are defined below:

LAS_{eq} : The average sound level that contains the same amount of sound energy as the actual fluctuating sound level during the sample period. This represents the average sound level over the duration of the sampling period.

LAS_{90} : The sound level in decibels that is exceeded 90% of the time. This parameter is an objective measurement of the average background sound level measured throughout the sampling period independent of extraneous sound caused by wind or other sources of sound.

LAS_{50} : The sound level in decibels that is exceeded 50% of the time. This parameter is effectively the median sound level measured throughout the sampling period.

Results

Table 2 shows the results of the pre-construction and post-construction sound monitoring assessments at the three locations.

Table 2. Pre-Construction and Post-Construction Sound Assessment Results

Monitoring Location	LAS_{eq}			LAS_{90}			LAS_{50}		
	Pre-Construction (October 2015)	Post-Construction 1 (April 2017)	Post-Construction 2 (October 2017)	Pre-Construction (October 2015)	Post-Construction 1 (April 2017)	Post-Construction 2 (October 2017)	Pre-Construction (October 2015)	Post-Construction 1 (April 2017)	Post-Construction 2 (October 2017)
Sound Monitor Location #1	57.3	48.7	54.6	27.7	24.3	44.5	44.2	42.1	44.2
Sound Monitor Location #2	51.7	44.3	68.3	24.2	24.4	48.5	33.3	30.2	52.8
Sound Monitor Location #3	45.2	44.1	45.6	24.0	24.7	45.2	33.7	33.5	45.2

At all locations in the Post-construction 1 assessment, the LAS_{eq} level was lower than that recorded during Pre-construction. During the Post-construction 2 assessment; at locations 2 and 3 exceeded the Pre-construction levels, albeit only marginally in the case of location 3. The LAS_{eq} of 68.3 dBA recorded at Location # 2 was higher than the Pre-construction levels, as well as higher than at the other two locations during the Post-construction 2 assessment. Furthermore, the LAS_{50} , or median sound level, that was recorded at Location 2 (52.8 dBA) during the Post-construction 2 assessment

was marginally higher, but still comparable to the LAS_{50} recorded at the other two locations during the Post-construction 2 assessment. It was likely that a few isolated loud noise events skewed the LAS_{eq} recorded at location 2 during the Post-construction 2 assessment. As decibels (dB) are a logarithmic scale, isolated instances of very high sound levels (e.g. 85 dBA or higher), can significantly skew the LAS_{eq} of a monitoring session, but the LAS_{50} is influenced less by this effect. The LAS_{50} levels recorded during the Post-construction 2 assessment did not appear to vary as a function of the individual monitoring location's proximity to the turbine. This indicates that the turbines were likely not a significant contributor to the overall sound levels of the general Project site area (e.g. within 2 km of the Project site).

The LAS_{90} recorded at all three locations during the Post-construction 2 assessment were much higher than those recorded during the Pre-construction and Post-construction 1 assessments. This indicates that the overall background sound levels were higher in the area during the Post-construction 2 assessment. Again, the LAS_{90} recorded during the Post-construction 2 assessment at all three locations was comparable, despite each location's proximity to the operating turbines. The LAS_{90} did not vary to a significant extent in relation to the proximity to the turbines, which serves as more evidence that the turbines are not the most substantial contributor to background sound levels in the area.

Location # 3 was located on the Project site itself, and was only 580 m from the closest turbine. As the LAS_{eq} recorded at this location during the two post-construction monitoring events were low (44.1 and 45.6 dBA), despite the location's proximity to the turbines, it is highly unlikely that the operating turbines are exposing receptors, which are much farther from the turbines, to sound levels that are in excess of the regulatory threshold of 40 dBA.

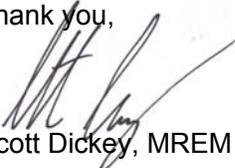
As such we can conclude that the Amherst Community Wind Farm is likely in compliance with the conditions of its regulatory approvals as pertain to the Project's noise levels, and the turbines are not a significant contributor to the sound levels in the general area.

Closure

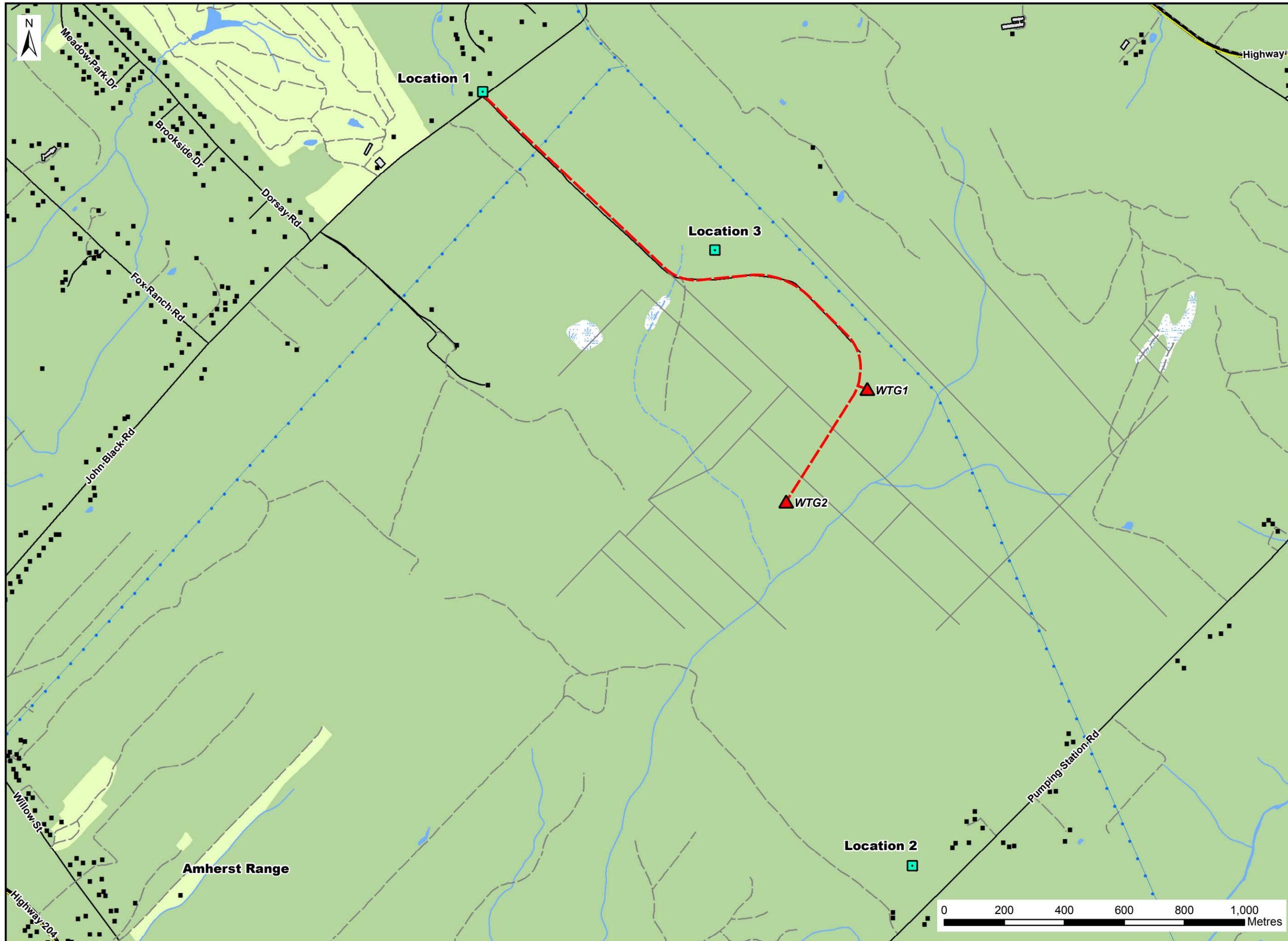
The cumulative results of the sound monitoring program conducted between October 2015 and October 2017 at the Amherst Community Wind Farm suggest that it is highly probable that the Project is compliant with the conditions of its regulatory approvals as it pertains to the Project's noise levels, and the turbines are not a significant contributor to the overall sound levels in the Project site's general area.

Should you have any questions, please do not hesitate to contact us.

Thank you,


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Notes:

1. Reference: Nova Scotia Property Records. Digital Topographic Mapping by Nova Scotia Department of Natural Resources.
2. Projection: NAD83(CSRS), UTM Zone 20 North.
3. GPS Data Collected is Typically to +/-5m Accuracy.

Legend:

- Sound Monitor
- Proposed Turbine
- Proposed Access Road
- Property Line (Approximate)
- Building
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

**Amherst Community
Wind Farm -
Sound Monitor
Locations**



Date: May 2017	Project #: 17-6017
Scale: 1:12,000	Drawing #: 1
Drawn By: H. Serhan	
Checked By: S. Dickey	