

# **E-Coustic Solutions** LLC

NOISE CONTROL • SOUND MEASUREMENT • CONSULTATION  
COMMUNITY • INDUSTRIAL • RESIDENTIAL • OFFICE • CLASSROOM • HIPPA ORAL PRIVACY  
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## **PRELIMINARY SOUND TEST PROTOCOLS NOVEMBER 13, 2017**

### **INTRODUCTION**

This document is intended to provide the concepts and goals of sound measurements to document immission levels at representative homes in and near the Des Moines Wind facility. It provides guidance as to what should be measured, what types of measurements are required, and the conditions to be measured. These are subject to change as more information is acquired.

### **MEASUREMENT INSTRUMENTS AND CONCEPTUAL TEST PROTOCOLS**

One primary purpose of the sound tests is to establish the sound pressure levels inside and outside homes over the frequency range from 0.125 Hz through to at minimum 8000 Hz with the same degree of sufficiency and accuracy as what was proposed for Mr. Metelka. Attached to this document is a paper by Mr. Metelka, "**Measurement Techniques for determining Wind Turbine Infrasonic Penetration into Homes**" that describes the protocols he would have applied for test instruments, reports, etc.. The same class of instruments or their functional equivalents shall be used, and data collected shall be of a similar nature and detail except that the frequency range shall address both audible and inaudible sound energy inside and outside test homes. Data shall include calibrated audio files, 1/3<sup>rd</sup> octave band sound pressure levels (taken with 0.125 second sampling frequency for raw data but reported in aggregate graphs showing typical 5 or 10 minute periods with L90, L50, L10, plus minimum, maximum and Leq values for the 1/3<sup>rd</sup> octave band sound pressure levels plus overall dBA, dBC and dBZ(0.125 Hz to 8k), weather conditions, and SCADA data summarized in tables and with corresponding spreadsheets. Raw data and software necessary to access it for review shall also be provided.

### **MEASUREMENT LOCATIONS**

A minimum of three but ideally four homes shall be selected for testing based on proximity to wind turbines with the all but one of the test homes being those located closest to clusters of wind turbines and where it can be assumed that wind directions will place them downwind during the test period. These will be selected to represent the most impacted sites. One test site shall be a home 1 km (approximately) from a large bank of wind turbines, also in the downwind direction. It will be selected to represent moderate impact sites. Specific test homes will be selected later.

### **MEASUREMENT CONDITIONS TO BE DOCUMENTED**

Two types of measurements are desired.

First, an On/Off test conducted per the protocols of American National Standard, ANSI-ASA S12.9 Part 3 (See 7.3.2 for guidance) and ANSI-ASA S12.100. These standards are attached. Test time shall be selected to minimize interference from other community sounds so as to represent nighttime sound levels.

The On/Off test will require cooperation of the project operator for information needed to confirm wind turbines are at full power (SCADA data) and to turn the project's turbines On and Off for the sound tests. All wind turbines within 2 km of any test site will need to be off.

S12.9 provides the protocols for conduction this type of test to determine compliance with regulations. S12.100 provides additional protocols to correct any background sound measurements taken in quiet rural or wilderness communities.

Representatives of the Complainant shall be present during the On/Off test and shall confirm that the sounds they hear during the On condition represent the sounds that form the basis for their

complaints. The goal of the On/Off test is to have low surface wind speeds (under 2km per hour) to minimize leaf rustle and pseudo-noise from wind pressure on the microphones while the hub level winds are sufficient to power the wind turbines at 90% of full name plate power and as close as possible to 100% of theoretical power for hub level winds. These conditions are common during night time periods.

The specifics of this test will be developed later.

Second, at each of the test homes an extended measurement of one week duration to document normal wind turbine operation sound levels inside and outside homes following the protocols of Mr. Metelka. Weather conditions at the test site and SCADA data for power output, blade rpm and angle, nacelle yaw, hub level wind speed and direction, and theoretical power output for those wind conditions shall be correlated to measurements. Periods with wind turbine sounds audible with low surface wind conditions shall be identified as examples of worst case conditions. Periods with no wind turbine activity shall also be identified as examples of pre-existing conditions.

The two sets of measurements shall be reviewed and periods that represent specific types of conditions identified.

A copy of software that may be needed to review the recordings and data from these measurements shall be made available for use by the Complainants experts in review and analysis. All audio files shall include a calibration tone and be 24 bit resolution.

Sincerely,  
E-Cooustic Solutions LLC

  
Richard R. James