STATE OF NEW YORK
SUPREME COURT COUNTY OF CATTARAUGUS

CONCERNED CITIZENS OF CATTARAUGUS COUNTY, INC., and KATHY BOSER,

Petitioners,

AFFIDAVIT OF DAVID HESSLER

For a Judgment Pursuant to Article 78 of the Civil Practice Law and Rules

Index No.: 79455

-against-

THE TOWN OF ALLEGANY PLANNING BOARD, THE TOWN OF ALLEGANY TOWN BOARD, THE TOWN OF ALLEGANY ZONING BOARD OF APPEALS, THE TOWN OF ALLEGANY CODE ENCORCEMENT OFFICER, and ALLEGANY WIND, LLC,

Respondents.

STATE OF NEW YORK)
)ss.:
COUNTY OF NEW YORK)

David M. Hessler, being duly sworn, under penalty of perjury, deposes and says:

1. My name is David M. Hessler and I am a principal with the firm Hessler Associates, Inc., an acoustical engineering company that has specialized in the design and assessment of noise from power generation facilities for over 35 years. I am a licensed professional engineer and a member of the Institute for Noise Control Engineering (INCE). My resume is attached as Exhibit A.

2. I have been working in the field of power industry acoustics for over 20 years and have been the principal noise control designer on over 400 power stations all over the world. I have been involved with the analysis of wind energy projects, since they first started to be proposed roughly 10 years ago and have been very heavily involved since about 2005 - to the extent the that approximately one half to three quarters of my workload is connected with wind farm development and testing. My most common tasks

are to prepare impartial noise impact assessments for proposed projects, to measure the actual sound emissions from operating projects or units and to carry out surveys investigating noise complaints from wind turbines.

3. To date I have been involved in approximately 70 major wind energy developments throughout North America, many, if not most of which, require site visits and field testing either before or after construction. This field experience at a wide variety of sites and discussions with countless people, both happy and unhappy, living near operating projects has given me the rather rare opportunity to get a first-hand overview of and sense for what the actual reaction is to such projects in qualitative and quantitative terms. My experience is based on first-hand field experience rather than literature reviews or the internet.

4. The following outline summarizes and respond to the allegations in the Petition filed by the Concerned Citizens of Cattaraugus County (CCCC) against the Town of Allegany Planning Board, et al., and the Affidavit of Richard R. James attached thereto, that specifically relate to the noise assessment report I prepared for the Allegany Wind Project and to subsequent submittals on technical noise issues that I drafted on behalf of Allegany Wind, LLC. Since a written response to these particular points or assertions exists in the SEQRA and permitting record, I reference the location of the response together with a brief discussion, if warranted.

The Petition

5. There are essentially two fundamental complaints in the Petition concerning the noise assessment:

- That the Town did not "receive any specific study of low frequency and impulsive sound effects of the Project" (Petition p. 4 Line 2b.)
- The Planning Board did not "require the sound studies that it did receive to comply with with [sic] published professional standards and procedures for sound measurement" (Petition p. 4 Line 2c.).

6. In addition, the Petition states: "that low frequency noise impacts are poorly assessed using A-weighted numerical estimates, and should instead be assessed using C-weighted estimates" (Petition p. 13, Line 49).

Low Frequency and Impulsive Noise

7. Low frequency and impulsive noise are discussed in Section 3.6 of the noise assessment report (R1750[1], DEIS, Appendix N) where the points are made that:

- Low frequency noise (LFN) produced by wind turbines has been shown through the work or multiple investigators to be inconsequential in magnitude and usually similar to, or indistinguishable from, the low frequency sound level in the natural environment
- That the widespread but mistaken belief that high or even harmful levels of LFN are produced by wind turbines probably arose from a confusion between the periodic sound (amplitude modulation) that can be produced and actual low frequency sound
- That this belief can also be attributed to wind-induced microphone distortion where high levels of low frequency sound will always be recorded when measuring in windy conditions - whether a turbine is present or not
- Wind turbine noise can and often does have a periodic character but it is not usually considered impulsive. Van den Berg, who is often quoted by James and others, wrote in a paper titled "Do wind turbines produce significant low frequency sound levels?": "Wind turbine sound is not usually considered to be impulsive, as it has a more or less constant level due to the essentially random nature of the sound production mechanisms. Although there are periodic audible swishes, these are not equal to 'real impulses' like hammering or gun shots." (See Van den Berg, G. P., "Do wind turbines produce significant low frequency sound levels?", 11th International Meeting on Low Frequency Noise and Vibration and its Control, Maastricht, The Netherlands, Sept. 2004).

8. The periodic character of wind turbine noise is also discussed in the last paragraph of Section 3.5 of the same report provided in Appendix N of the DEIS (R1750).

9. Concerns about low frequency noise were also addressed further on Pages 9 and 10 of the November 9, 2010 letter (R3462-3463) response to several letters (see James, R., Letter to Mr. Gary Abraham, Esq., dated Feb. 19, 2009 ("James Feb. 19 Letter") and

[1] Citations designated "R__" refer to the Record of Proceedings.

Feb. 22, 2009 ("James Feb. 22 Letter") and a report (James, R., "A Report on Background (Ambient) Sound Levels At Selected Sensitive Recievers, Olean, NY, April 22-24, 2010", dated May 3, 2010)("James May 2010 Report") from E-Coustic Solutions critical of the noise analysis, where the inference that adverse health effects are inevitable is refuted along with several other assertions concerning C-weighted noise limits. The November 9, 2010 letter response is also provided in Appendix K of the FEIS. (R4663)

10. The topic of amplitude modulation was also addressed in response to Written Comment 1FF (this comment and associated response is provided in Section 4.8 of the FEIS)(R4324) from the NYSDEC in the SEQRA review in 2010 where it is pointed out that this phenomenon is either intermittent or may not occur at all and that, rather downplaying or avoiding the subject, it was already openly discussed in the original assessment report provided in Appendix N of the DEIS (R1750, Appendix N at p. 26).

Compliance with Published Standards

11. Mr. James asserts that the sound study should have been carried out in strict accordance with existing ANSI standards for environmental sound measurements. This concern has been raised in the past by James (James Feb. 19 Letter at p. 6; James Feb. 22 Letter at pp. 1-2), if not elsewhere, and already addressed in a letter I drafted to Mr. Ben Brazell (R2458 also provided in Appendix K of the FEIS; R4667).

12. As made clear in these responses, the crux of this issue is that the ANSI standards that are referred to by James, while perfectly applicable to conventional power plants, were not written with the special circumstances of wind turbine noise in mind and limit the wind speed under which measurements can be taken to roughly 7 mph. Such low wind conditions are largely irrelevant to wind turbines since they are either not operating or operating at less than full power and therefore often producing little or no significant noise. While the wind shear gradient can sometimes allow the turbines to operate to some extent when winds are light at the surface, normal operation generally requires windier conditions. Consequently, background measurements taken under calm conditions cannot be used in any meaningful way to characterize the actual background sound level during project operation. Furthermore, because background sound levels under low wind conditions are almost always extremely low in rural areas the assumption

that such levels represent the environmental sound level at all times creates the illusory situation where predicted project sound levels often appear to vastly exceed the background level - thus suggesting a unrealistically severe noise impact.

C-weighted Sound Levels

13. The issue of A-weighting vs. C-weighting has already been raised by Mr. James (James Feb. 19 Letter at p. 5) and responded in the FEIS (provided in Appendix K of the FEIS, at page 9-10)(R4671-4672).

14. It is asserted again in the Petition that C-weighted sound levels should have been used to evaluate low frequency noise. However, C-weighting is completely impractical for wind turbine applications because such levels can only be accurately measured under conditions of extreme calm. C-weighted levels are highly sensitive to wind-induced microphone distortion and will be erroneously and dramatically elevated by the slightest breeze. Thus there is no practical way to make use of C-weighting for background measurements or for measurements of operational wind project noise. In terms of mathematical predictions, on the other hand, project sound levels are automatically modeled and predicted in terms of both A and C-weighted levels by most modeling programs, including the Cadna/A® software used for this project. Although it would have been favorable to the project, the C-weighted results for the Allegany Project were not discussed in the report not only because of the irrelevance of C-weighting to wind turbine work but also because the levels at the nearest residences were so low as to be of no concern whatsoever.

The Affidavit of Richard R. James

15. The Affidavit of Richard R. James that is attached to the Petition contains a number of complaints beyond those delineated in the Petition. These additional allegations are outlined below.

16. It is asserted that in rural areas, such as the area around the Allegany Project, the typical background sound level is about 25 dBA and that similar levels were, in fact, measured by Mr. James at the site and that the consultant retained by the Allegany Planning Board, Conestoga-Rovers & Associates (CRA), also measured sound levels

ranging from "18.3 to 29 dBA" during their survey of background sound levels at the site. By implication it is alleged that the design background level of 35 dBA for sheltered valley locations developed during our field survey deliberately over-estimates the background level.

17. This concern has been addressed on pp. 3 – 5 of Appendix K in the FEIS (R4665-4667), where it is pointed out that:

- Such low levels in the 20's dBA were also measured during our survey but are associated with low wind conditions that are generally irrelevant to wind turbine operation, as mentioned above.
- In their September 27, 2010 memorandum (provided in Appendix K of the FEIS)(R4650) CRA reported levels as low as 18.3 dBA for calm conditions; however, their actual conclusion was that the background level was in the "33 to 35 dBA range during the wind conditions of interest, which are similar to Hessler's previous background study that established the overall L90 background levels as a function of the 7 m/s wind speed design value".

18. It is alleged "Everpower's sound study for the Allegany Wind Project utilizes an average measure [L_{eq}] for the background sound level" rather than the L_{90} statistical measure.

19. This assertion is totally erroneous as has already been explained on p. 2 of my Nov. 9, 2010 letter to Mr. Ben Brazell (provided in Appendix K of the FEIS)(R4664). Our design background level of 35 dBA for sheltered valley locations is based on measurements of the L_{90} correlated with wind speed. It should also be noted that this sound level was derived by correlating the wind speed measured high above the ridge top by the met tower with simultaneous sound measurements in sheltered valleys where the local wind speed may well have been negligible. Thus the wind speed associated with turbine operation is related to the sound level measured near ground level adjacent to residences in hollows surrounding the project.

20. It is alleged that the NYSDEC's "noise assessment procedure calls for the addition of a 'penalty' of 10 dBA added [sic] to modeled project sound levels for noise operating at night" and that such a penalty was not applied in our assessment.

21. As explained in our response to comments from the NYSDEC in August of 2010 (Written Comments 1EE, 1FF and 1GG included in Section 4.8 of the FEIS)(R4323-4327), the 10 dBA nighttime factor is specifically associated with the Day-Night Average Level, or Ldn assessment methodology, which is a 24 hour averaging formula that is fundamentally based on hourly average (L_{eq}) sound levels. The 10 dBA nighttime weighting factor is only one input into a fairly complex algorithm that summarizes an entire 24 hour period in a single number. L_{eq} sound levels, particularly measured over a one hour time frame, are completely unsuitable for wind turbine surveys because they will be dominated by sporadic, contaminating noises rather than the actual "background" level occurring between these events, which is much more conservatively quantified by the L_{90} measure that we used. Ironically, the previous allegation criticizes us (mistakenly) for basing our assessment on L_{eq} measurements instead of L_{90} data and this allegation essentially criticizes us for not using the Ldn weighted average formula mentioned in the NYSDEC guidelines, which is fundamentally based on L_{eq} values. In general, the use of the Ldn metric, which is primarily suited to highway and aircraft noise, to evaluate wind projects would likely result in the fallacious conclusion that the project would have no impact whatsoever because the baseline background level would probably be quite high relative to the modeled project sound level.

22. It is further alleged the NYSDEC procedure "calls for evaluating impulsive noise like wind turbine noise by adding additional decibels".

23. This concern was originally voiced by the NYSDEC and was responded to in Written Comment 1FF provided in Section 4.8 of the FEIS. (R4324).

24. It is alleged that the 40 dBA noise limit on Project noise was based on "standards provided by the wind industry trade associations, in the American Wind Energy Association and the Canadian Wind Energy Association, or by political organizations".

25. While some of these organizations may recommend similar limits, the 40 dBA limit that was proposed to the Planning Board was based on field experience and the observed reaction to newly operational wind projects including the United States as detailed in a peer-reviewed article published in the *Noise Control Engineering*

Journal[2]. It did not derive from any trade group and certainly did not derive from any "political organizations", whatever that phrase is referring to.

26. It is alleged that project noise will be "very noticeable to intolerable" because 40 dBA is more than 20 dBA above the minimum background level of 18 dBA measured in the CRA survey.

27. As previously explained, a background sound level of 18 dBA does not apply during the windy conditions necessary for the project to operate and produce noise. Additionally, as mentioned above, CRA did not conclude in their September 27, 2010 memorandum that the background level was 18 dBA but agreed with our conclusion that the operational background level was about 33 to 35 dBA. They state on p. 7 of the report that: "The significant range in sound level data shows that it is not appropriate to simply select the absolute minimum or maximum L_{eq} or L_{90} value as representative of the typical background measured for the monitoring period." CRA's September 27, 2010 memorandum is provided in Appendix K of the FEIS (R4656)

28. It is alleged that the ground absorption loss calculated by ISO 9613-2 will not be accurate for sources located more than 30 m in the air. "The standard states that application [sic] of a ground absorption factor will not generate accurate results for noise sources elevated 30 m or more."

29. The fact of the matter is that the 30 m height "limitation" is not specifically associated with the ground absorption calculation but rather refers to the overall accuracy of the standard. Specific uncertainty ranges are given for source heights of up to 30 m but not beyond that. It is not that the standard is invalid for higher sources (such as turbines at 80 m) it is just that a specific uncertainty figure is not provided in the standard for such sources. This point is closely related to the question of modeling accuracy in general and has been discussed before. (R4668-4670 at Appendix K, pp 6-8).

30. It is further alleged that the application of "a discount for ground absorption" is solely responsible for under-predictions of "8 to 11 dBA".

31. Since ground effects only change the predicted sound level by 1 or 2 dBA at the distances of relevance here, the omission of ground effects (i.e. the assumption of

[2] Hessler, D.M., Hessler, G.F., "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", *Noise Control Engineering Journal*, J.59(1), January-February 2011.

perfectly reflective ground, like a frozen lake, at all locations at all times) would only slightly raise the predicted levels. However, as illustrated by the discussion on pp. 6 – 8 of Appendix K of the FEIS (R4668-4670), comparisons between measured and predicted levels, assuming a mid-range ground absorption coefficient of 0.5, show good agreement. The unrealistic assumption of completely reflective ground surfaces for the wooded ridges comprising the Allegany site would simply overstate the potential impact of the Project.

32. It is alleged that sleep disturbance and other adverse health effects will result from the Project according to the 1999 WHO *Guidelines for Community Noise*.

33. This issue has already been addressed. (See R4671 Appendix K at p. 9). It is noted that the more recent (2009) WHO guidelines essentially say that an outdoor sound level of no more than 40 dBA is sufficient to largely avoid sleep disturbance issues.

34. It is alleged that the wind turbine sound power level test standard, IEC 61400-11[3], "acknowledges that industrial wind turbines emit a strong low frequency component".

35. This standard expresses no opinion whatsoever on low frequency noise and simply describes in meticulous technical terms how to accurately measure the sound emissions from wind turbines.

36. It is alleged that Project noise will be louder at night due to wind shear.

37. The potential for wind shear to result in sound levels that are higher than predicted is stated in the conclusions of the original assessment report (R1754 at Appendix N, Section 4.0, p. 30. In addition, this topic is discussed in R4324 in response to Written Comment 1FF provided in Section 4.8). Moreover, as described in the response to Written Comment 1FF, compression of the air flow over a ridge tends to flatten the shear gradient thereby lowering the potential amplitude modulation effects. In fact, a subsequent analysis of the met tower wind speed data at various heights shows that the shear gradient at the proposed turbine locations on the ridge top was relatively low throughout the entire two week field survey in February of 2008 and was nearly the same at night as it was during the day.

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[3] IEC 61400-11 Ed. 2.1, *Wind turbine generator systems – Part 11: Acoustic noise measurement techniques*, International Electrotechnical Commission, Geneva, Switzerland, 2006.

38. Finally, it is alleged that a sound level of 40 dBA is too high and that "a number of families … have abandoned their homes as a result" of this sound level at an unspecified project where such a level was permitted.

39. Such an extreme reaction to 40 dBA, if true, would be highly unusual and does not mesh at all with my field experience measuring noise from operating projects and interviewing complainants. I am only aware of two cases where serious complaints were filed by residents where mean project sound levels of less than 40 dBA were actually measured. The vast majority of serious complaints occur at substantially higher sound levels.

David M. Hessler

Subscribed and sworn to before me
this 24 day of October, 2011

Notary Public

CHRISTOPHER HENRY DI LUCCA
Notary Public
Commonwealth of Virginia
7372689
My Commission Expires Aug 31, 2014

Exhibits

A. Resume of David M. Hessler

EXHIBIT A

CIRRICULUM VITAE

DAVID M. HESSLER

Title:	Principal Consultant Hessler Associates, Inc.
Professional Affiliations:	Professional Engineer (P.E.), Commonwealth of Virginia Member Institute of Noise Control Engineering (INCE) National Council of Acoustical Consultants (NCAC)
Education:	Bachelor of Science in Mechanical Engineering (B.S.), 1997 *Summa Cum Laude* A. James Clark School of Engineering University of Maryland, College Park, MD Bachelor of Arts (B.A.), 1982 University of Hartford, Hartford, CT
Employer:	Hessler Associates, Inc. 3862 Clifton Manor Place Haymarket, VA 20169 Years in present position: 20
Current Job Description:	Acoustical engineer specializing in the prediction, assessment and mitigation of environmental noise from new and existing power generation and industrial facilities. Typical tasks include: • Field measurement studies of existing ambient sound levels in the vicinity of proposed project sites • Computer noise modeling of new facilities prior to construction • Environmental impact assessments for new projects • Noise mitigation design studies of new facilities • Verification measurements of completed facilities • Diagnostic studies of facilities with existing noise problems • Design and specification of noise mitigation measures • Educational lectures on noise issues for private corporations • Expert witness testimony
General Experience:	As an outside consultant to nearly all the major power industry EPC contractors, developers and OEM's, have been the principal acoustical designer of over 400 power plants and industrial facilities worldwide ranging from large coal plants to numerous combustion turbine combined cycle plants to refineries and wind turbine projects. Typically, the focus of the work on these projects was to anticipate potential noise impacts at sensitive receptors near the project and recommend practical noise abatement measures to avoid them. In addition, extensive verification measurements in and around the completed power plants and wind farms have been performed to confirm that the design recommendations have been successfully executed.
Wind Turbine Experience:	Over the past 10 years have performed noise impact evaluations and siting optimization studies for roughly 70 large wind turbine projects in

the United States and Canada, involving nearly all current makes and models of wind turbines. Have developed test protocols and conducted long-term field measurement surveys of numerous newly completed wind projects to evaluate compliance with applicable permit conditions, to investigate complaints and/or to verify the accuracy of pre-construction noise modeling. Have carried out field tests of wind turbine sound power level in strict accordance with the IEC 61400-11 test methodology. Have carried out field measurement studies of operating wind turbines to evaluate their low frequency sound emissions, nacelle noise sources and radial directivity characteristics. Have performed laboratory wind tunnel testing to quantify the level and frequency content of wind-induced microphone distortion and windscreen effectiveness for wind turbine applications. Have testified as an expert witness at permitting hearings for proposed wind projects. Attended all four bi-annual Wind Turbine Noise conferences held so far: Berlin 2005, Lyon 2007, Aalborg 2009 and Rome 2011.

Recent Papers and Publications:

Wind Turbine Noise, Chapter 6 "Measuring and Analyzing Wind Turbine Sound Levels". Comprehensive book on all aspects of wind turbine noise to be published in the fall of 2011. Each chapter written by a recognized expert in that subject.

"Accounting for Background Noise when Measuring Operational Noise from Wind Turbines", Fourth International Meeting on Wind Turbine Noise, Rome, Italy, Apr. 2011.

"Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", *Noise Control Engineering Journal*, J.59 (1), January-February 2011.

"Wind tunnel testing of microphone windscreen performance applied to field measurements of wind turbines", Third International Meeting on Wind Turbine Noise, Aalborg, Denmark, June 2009.

"Experimental study to determine wind-induced noise and windscreen attenuation effects on microphone response for environmental wind turbine and other applications", *Noise Control Engineering Journal*, J.56, July-August 2008.