E-Coustic Solutions, LLC

NOISE CONTROL ● SOUND MEASUREMENT ● CONSULTATION
COMMUNITY ● INDUSTRIAL ● RESIDENTIAL ● OFFICE ● CLASSROOM ● HIPPA ORAL PRIVACY
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March 23, 2022

Fulton Township Planning Commission, and
Denise Rossman, Township Supervisor
3425 W. Cleveland Rd.
Perrinton, MI 48871

Subject: Review of Jan. 31, 2022 Noise Analysis for Heartland Farms Wind Energy Center

Dear Committee Members and Ms. Rossman:

My name is Richard R. James, and I am the Principal Acoustician for E-Coustic Solutions, LLC. I have conducted an initial review of the Hankard Environmental Noise Analysis for the Invenergy Heartland Farms Wind Energy Center (HFWEC). This review was conducted at the request of Kathleen Defever, Esq., and family, Defever Farms, Fulton Township, Michigan.

My qualifications for conducting this review are provided in Attachments 1 and 2. In short, I have 50 years of experience in acoustics, including computer modeling, measurements of background and operational noise, and assessing the impact of new noise sources on people living near new industrial or utility noise sources. I have been qualified in Federal and State courts as an expert in acoustical measurements and the impact of sound on people. This work has been conducted for companies, including General Motors, Ford Motor Company, Goodyear Tire and Rubber Company, Anheuser Busch, and many other companies addressing complaints from neighbors or in anticipation of new facilities. It has also included work for private citizens who have complaints about noise from new or existing facilities. During the past 15 years the primary focus has been on the impact of renewable energy utilities on rural/wilderness communities similar to the community that would host the proposed Heartland Farms Wind Energy Facility (HFWEC).

ISSUES FOUND DURING THE REVIEW

1. Fulton Township Special Land Use Specific Provisions, Article 7, Section 731 Wind Energy Conversion Systems at C13 provides two sound level limits:

> 13. Noise Levels. The noise generated from a commercial WECS measured at a non-participating property line shall not exceed fifty-five (55) d(B)A. The noise generated from a WECS measured at the exterior of a principal structure located on a non-participating property shall not exceed forty-five (45) decibels.

The terms of "shall not exceed fifty-five (55) dBA" at non-participating property lines and "shall not exceed forty-five (45) decibels" at the exterior of a principal structure on non-participating property are not to exceed sound levels, **not** the average sound level from a computer model that the Noise Analysis offers as "proof" that the HFWEC meets the township sound limits.

There are two points that make the Noise Analysis deficient. First, the stated sound limits are for measured, not modeled sound levels. The model outputs predicted average sound levels that cannot be used to assess the not-to-exceed limits of the regulations. The assertion by the developer that those predicted sound levels can be used to claim compliance with the Fulton Township regulation is incorrect. This has already been litigated in the case of Almer Township, Tuscola County, Michigan where the township's limits were stated as not-to-exceed and the developer tried to substitute modeled average sound levels instead of the maximum sound levels required by the regulations. The Almer Planning Committee denied the application in the basis

that once the "average" sound predictions were corrected to reflect the maximum sound levels that would occur at property lines the Project did not meet the township regulations.

This case was litigated in U.S. District Court, Eastern District of Michigan, Northern Division, Case No. 17-cv-10497 Tuscola Wind III, LLC. Vs Almer Charter Township, et. al.. The Township had a regulation limiting wind turbine noise to "not-exceed 45 dBA" similar to the language of Fulton Township's regulations. The Decision of that case (which was also appealed by the developer and the appeal failed) found that:

> "*Against this factual background (and considering the plain language of the statute), the Township Board's conclusion that § 1522(C)(14) imposes an Lmax standard was reasonable. That conclusion was consistent with principles of statutory interpretation and supported by substantial evidence in the record*." And, "*The Township Board reasonably interpreted its Zoning Ordinance and, under that reasonable interpretation, Tuscola was undisputedly in noncompliance with the Zoning Ordinance*."

For this case, the developer established that the not-to-exceed sound level is 11 dBA higher than the predicted average sound level from the computer model. Applying this correction factor to the predicted sound levels at homes in Table 5-1 Receptors with the Loudest Predicted Noise Levels shows that all of the homes exceed the Fulton Township sound limits at the listed homes. Further, all homes listed in Appendix B-Receptor Locations and Predicted Noise Levels in Fulton Township that are predicted to be 35 dBA or higher will also not comply with the regulations.

On this basis the Fulton Planning Commission should deny the application under the same basis as did the Almer Township Planning Commission.

2. The township sound limits are not a goal to achieve using a computer model, they are the maximum permitted sound levels of an operating system when measured with appropriate sound measurement instruments. There is nothing in the Township regulations that permit a developer to substitute a predicted sound level from a computer model for the specified limits that are enforced by measurements with a proper sound measuring instrument.

   On this basis the Fulton Planning Commission should reject the Noise Analysis.

3. Continuing with the line of argument in Issue 1, the Noise Analysis does not disclose that wind turbines emit sounds that are not steady and cannot be characterized by a computer models that predicts long term average sound levels. Sound emitted by wind turbines can vary as much as 15 to 20 dBA above the mean predicted sound levels from the model. This has been a well established characteristic of wind turbine noise for over 20 years. The Noise Analysis ignores that characteristic in its attempt to make the HFWEC appear to comply with local limits.

   The National Association of Regulatory Utility Commission (NARUC) commissioned a study by David Hessler in 2011 that shows the true nature of wind turbine noise to be one that fluctuates from one time of the day to another and that the model's predicted average sound levels need to be adjusted accordingly. (Ignoring for the moment that when regulations say not-to-exceed XX dBA the limit is the maximum sound level at any time, not an average over long periods of time.)

   Hessler points out that wind turbine noise routinely varies +/-5 dBA around the predicted sound level. Thus, if we add 5 dB to all of the homes that exceed Hankard's 40 dBA limit there will be a number of homes that will not meet the Township Noise Regulations of 45 dBA at the home. From the NARUC document"

   > "Extensive field experience measuring operational projects indicates that sound levels commonly fluctuate by roughly +/- 5 dBA about the mean trend line and that short-lived (10 to 20 minute) spikes on the order of 15 to 20 dBA above the mean are occasionally observed when atmospheric

conditions strongly favor the generation and propagation of noise. " D. Hessler Page 12-13 of NARUC document.

The point is: the author of the Noise Analysis, Mr. Mike Hankard knows, or should know, that wind turbine noise varies as much as 15 to 20 dBA around the predicted level yet he bases his conclusions on the model's trend line prediction without any consideration of this fluctuation. He misrepresented the nature of wind turbine noise because had he considered the wording of the regulations, Michigan law, he would have had to conclude that the project, as currently designed will not meet the townships requirements.

On this basis the Fulton Planning Commission should reject the Noise Analysis.

4. There are additional errors of omission and commission in the Noise Analysis that could mislead the Planning Commission to believe there are no adverse health effects from wind turbines.

   There isn't sufficient time to describe in detail all of these issues. A proper hearing is required to address them so that the Planning Commission can understand the scientific and medical evidence that wind turbines located as close to homes as the HFWEC project proposes will result in adverse health impacts to the public living in the footprint of the project and around its perimeter.

   One of the issues that I will address in brief is that wind turbines produce pressure pulsations at infra-sonic rates due to the blades passing into a low wind region when they pass the tower at the bottom of the rotation path. This is infrasound.

   While the wind energy industry chooses to ignore the impact of pressure pulsations at infrasonic rates on a subset of the people who will live in the footprint of the project. There is substantial literature describing research showing the complaints of people about dizziness, tinnitus, nausea, migraines, and other symptoms can be reproduced in blinded laboratory studies. The denial of infrasound by the developers and their consultants is specious and relies on the Planning Commission not being informed of the current research.

5. The sound level limits set in the Fulton Township Regulations exceed the limits that are safe for the host community. The World Health Organization (WHO) has set a limit that translates to approximately 38 dBA Leq (average) for wind turbine noise. This limit is supported by the Standards to protect public health from noise set by the American National Standards Institute (ANSI), the International Standards Organization (ISO) and Acoustical Society of America (ASA). These standards set the limit at between 36 and 38 dBA Leq.

CONCLUSION

The issues described above should be considered sufficient to deny the request for a permit by HFWEC. At a minimum, a full and open public hearing that provides time for experts to advise the Committee is required.

Sincerely,
E-Coustic Solutions LLC

Richard R. James

Attachments-Biographical material

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE	BIRTHDATE
Richard R. James	Principal Consultant, E-Coustic Solutions, LLC (2006-)	3/3/48

ACADEMIC CREDENTIALS

INSTITUTION	DEGREE/POSITION	YEAR	FIELD
General Motors Institute, Flint, MI	B. Mech. Eng.	1966-1971	Noise Control Engineering
Michigan State University, East Lansing, MI	Adjunct Instructor	1985-2013	Acoustics and Effects of Noise on People
Central Michigan University, Mount Pleasant, MI	Adjunct Professor	2012-2017	Wind Turbine Noise and its Impact on People

RESEARCH AND PROFESSIONAL EXPERIENCE:

Richard R. James has been actively involved in the field of noise control since 1969, participating in and supervising research and engineering projects related to control of occupational and community noise in industry. In addition to his technical responsibilities as principal consultant, he has developed noise control engineering and management programs for the automotive, tire manufacturing, and appliance industries. Has performed extensive acoustical testing and development work in a variety of complex environmental noise problems utilizing both classical and computer simulation techniques. In 1975 he co-directed (with Robert R. Anderson) the development of SOUND™, an interactive acoustical modeling computer software package based on the methods that would be later codified in ISO 9613-2 for pre and post-build noise control design and engineering studies of in-plant and community noise. The software was used on projects with General Motors, Ford Motor Company, The Goodyear Tire & Rubber Co., and a number of other companies for noise control engineering decision making during pre-build design of new facilities and complaint resolution at existing facilities. The SOUND™ computer model was used by Mr. James in numerous community noise projects involving new and existing manufacturing facilities to address questions of land-use compatibility and the effect of noise controls on industrial facility noise emissions. He is also the developer of ONE*dB(tm) software. He was also a co-developer (along with James H. Pyne, Staff Engineer GM AES) of the Organization Structured Sampling method and the Job Function Sound Exposure Profiling Procedure which in combination form the basis for a comprehensive employee risk assessment and sound exposure monitoring process suitable for use by employers regulated by OSHA and other governmental standards for occupational sound exposure. Principal in charge of JAA's partnership with UAW, NIOSH, Ford, and Hawkwa on the HearSaf 2000tm software development CRADA partnership for world-class hearing loss prevention tools.

1966-1970	Co-operative student: General Motors Institute and Chevrolet Flint Metal Fabricating Plant.
1970-1971	GMI thesis titled: "Sound Power Level Analysis, Procedure and Applications". This thesis presented a method for modeling the effects of noise controls in a stamping plant. This method was the basis for SOUNDTM.
1970-1972	Noise Control Engineer-Chevrolet Flint Metal Fabricating Plant. Responsible for developing and implementing a Noise Control and Hearing Conservation Program for the Flint Metal Fabricating Plant. Member of the GM Flint Noise Control Committee which drafted the first standards for community noise, GM's Uniform Sound Survey Procedure, "Buy Quiet" purchasing specification, and guidelines for implementing a Hearing Conservation Program.
1972-1983	Principal Consultant, Total Environmental Systems, Inc.; Lansing, MI. Together with Robert R. Anderson formed a consulting firm specializing in community and industrial noise control.
1973-1974	Consultant to the American Metal Stamping Association and member firms for in-plant and community noise.

1973	Published: "Computer Analysis and Graphic Display of Sound Pressure Level Data For Large Scale Industrial Noise Studies", Proceedings of Noise-Con '73, Washington, D.C.. This was the first paper on use of sound level contour 'maps' to represent sound levels from computer predictions and noise studies.
Nov. 1973	Published: "Isograms Show Sound Level Distribution in Industrial Noise Studies", Sound & Vibration Magazine
1975	Published: "Computer Assisted Acoustical Engineering Techniques", Noise-Expo 1975, Atlanta, GA which advanced the use of computer models and other computer-based tools for acoustical engineers.
1976	Expert Witness for GMC at OSHA Hearings in Washington D.C. regarding changes to the "feasible control" and cost-benefit elements of the OSHA Noise Standard. Feasibility of controls and cost-benefit were studied for the GMC, Fisher Body Stamping Plant, Kalamazoo MI.
1977-1980	Principal Consultant to GMC for the use of SOUND(tm) computer simulation techniques for analysis of design,layout, and acoustical treatment options for interior and exterior noise from a new generation of assembly plants. This study started with the GMAD Oklahoma City Assembly Plant. Results of the study were used to refine noise control design options for the Shreveport, Lake Orion, Bowling Green plants and many others.
1979-1983	Conducted an audit and follow-up for all Goodyear Tire & Rubber Company's European and U.K. facilities for community and in-plant noise.
1981-1985	Section Coordinator/Speaker, Michigan Department Of Public Health, "Health in the Work Place" Conference.
1981	Published: "A Practical Method for Cost-Benefit Analysis of Power Press Noise Control Options", Noise-Expo 1981, Chicago, Illinois
1981	Principal Investigator: Phase III of Organization Resources Counselors (ORC), Washington D.C., Power Press Task Force Study of Mechanical Press Working Operations. Resulted in publishing: "User's Guide for Noise Emission Event Analysis and Control", August 1981
1981-1991	Consultant to General Motors Corporation and Central Foundry Division, Danville Illinois in community noise citation initiated by Illinois EPA for cupola noise emissions. Resulted in a petition to the IEPA to change state-wide community noise standards to account for community response to noise by determining compliance using a one hour L_{eq} instead of a single not-to-exceed limit.
1983	Published: "Noise Emission Event Analysis-An Overview", Noise-Con 1983, Cambridge, MA
1983-2006	Principal Consultant, James, Anderson & Associates, Inc.; Lansing, MI. (JAA), Together with Robert R. Anderson formed a consulting firm specializing in Hearing Conservation, Noise Control Engineering, and Program Management.
1983-2006	Retained by GM Advanced Engineering Staff to assist in the design and management of GM's on-going community noise and in-plant noise programs.
1984-1985	Co-developed the 1985 GM Uniform Plant Sound Survey Procedure and Guidelines with James H. Pyne, Staff Engineer, GM AES.
1985-2013	Adjunct instructor in Michigan State University's Department of Communicative Sciences and Disorders from 1985-2013
1986-1987	Principal Consultant to Chrysler Motors Corporation, Plant Engineering and Environmental Planning Staff. Conducted Noise Control Engineering Audits of all manufacturing and research facilities to identify feasible engineering controls and development of a formal Noise Control Program.
1988-2006	Co-Instructor, General Motors Corporation Sound Survey Procedure (Course 0369)
1990	Developed One*dB(tm), JAA's Occupational Noise Exposure Database manager to support Organizational structured sampling strategy and Job Function Profile (work-task) approach for sound exposure assessment.
1990-1991	Co-developed the 1991 GM Uniform Plant Sound Survey Procedure and Guidelines with James H. Pyne, Staff Engineer, GM AES. Customized One*dB(tm) software to support GM's program.
1990-2006	Principal Consultant to Ford Motor Company to investigate and design documentation and computer data management systems for Hearing Conservation and Noise Control Engineering Programs. This included bi-annual audits of all facilities.

1993-2006	GM and Ford retain James and JAA as First-Tier Partners for all non-product related noise control services.
1993	Invited paper: "An Organization Structured Sound Exposure Risk Assessment Sampling Strategy" at the 1993 AIHCE
1993	Invited paper: “An Organization Structured Sound Exposure Risk Assessment Database” at the Conference on Occupational Exposure Databases, McLean, VA sponsored by ACGIH
1994-2001	Instructor for AIHA Professional Development Course, “Occupational Noise Exposure Assessment”
1996	Task Based Survey Procedure (used in One*dB(tm)) codified as part of ANSI S12.19 Occ. Noise Measurement
1995-2001	Coordinate JAA’s role in HearSaf 2000tm CRADA with NIOSH, UAW, Ford, and HAWKWA
1997-2007	Board Member, Applied Physics Advisory Board, Kettering Institute, Flint, Michigan
2000	Use of structured, interactive interviews in retrospective noise exposure assessment in an occupational epidemiologic study, Prince, Waters, Anderson, and James, JASA,, April 2000
2002-2006	Member American National Standards Institute (ANSI) Accredited Standards Committee S12, Noise
2006	Closed James, Anderson and Associates, Inc. (JAA) and founded E-Coustic Solutions (E-CS)
2006-Present	Consultant to local communities and citizen’s groups on proper siting of Industrial Wind Turbines. This includes presentations to local governmental bodies, assistance in writing noise standards, and formal testimony at zoning board hearings and litigation.
2008	Paper on “Simple guidelines for siting wind turbines to prevent health risks” for INCE Noise-Con 2008, co-authored with George Kamperman, INCE Bd. Cert. Emeritus, Kamperman Associates.
2008	Expanded manuscript supporting Noise-Con 2008 paper titled: “The “How To” Guide To Siting Wind Turbines To Prevent Health Risks From Sound”
2009	"Guidelines for Selecting Wind Turbine Sites," Kamperman and James, Published in the September 2009 issue of Sound and Vibration.
2010	Punch, J., James, R., Pabst, D., "Wind Turbine Noise, What Audiologists should know," Audiology Today, July-August 2010
2011	Jerry L. Punch, Jill L. Elfenbein, and Richard R. James, "Targeting Hearing Health Messages for Users of Personal Listening Devices," Am J Audiol 0: 1059-0889_2011_10-0039v1
2011	Bray, W., HEAD Acoustics, James, R., "Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception," invited paper for Noise-Con 2011, Portland OR
2012	James, R., "Wind Turbine Infra and Low Frequency Sound: Warning Signs that were not Heard," April 2012, Bulletin of Science, Technology and Society
2012	Appointed to position as Adjunct Professor in the Department of Communication Disorders at Central Michigan University.
2014	Negative Health Effects of Noise from Industrial Wind Turbines-Parts 1-3, Punch, J, James, R., Hearing Health Technology Matters, http://hearinghealthmatters.org/hearingviews/2014/wind-turbine-noise-evidence-health-problems/
2016	Punch, J. L., James, R.R., “Wind turbine noise and human health: a four-decade history of evidence that wind turbines pose risks,” Journal of Hearing Health and Technology Matters, October 4, 2016, http://hearinghealthmatters.org/journalresearchposters/files/2016/09/Final-Final-16-09-30-Wind-Turbine-Noise-Final-Manuscript-HHTM-Punch-James.pdf.
2018	Krogh, C.M., Dumbrille, A., McMurtry, R.Y., James, R., Rand, R.W., Nissenbaum, M.A., Aramini, J.J. and Ambrose, S.E. (2018) "Health Canada’s Wind Turbine Noise and Health Study—A Review Exploring Research Challenges, Methods, Limitations and Uncertainties of Some of the Findings." Open Access Library Journal, 5: e5046. https://doi.org/10.4236/oalib.1105046

2020	Krogh, C.M, McMurtry, R.Y., Johnson, W.B., Dumbrille, A., Alves-Pereira, M., Punch, J.L., Hughes, D., Rogers, L., Rand, R.W., James, R.R., Ambrose, S.E., Gillis, L. (2020) "Wind Turbines: Why Some Families Living in Proximity to Wind Energy Facilities Contemplate Vacating Their Homes: An Overview of Findings." Open Access Library Journal 7: e6443

Professional Affiliations/Memberships/Appointments

Research Fellow - Metrosonics, Inc.	American Industrial Hygiene Association (through 2006)
National Hearing Conservation Association (through 2006)	Institute of Noise Control Engineers (Member through 2017)
American National Standards Institute (ANSI) S12 Working Group (through 2006)	Founder and Board Member of the Society for Wind Vigilance, Inc.
Adjunct Professor, CMU 2012-2017	Adjunct Instructor, MSU 1985-2013
Acoustical Society of America (ASA) 2017-Present	

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List of Recent Publications

Jan. 26, 2021

2000 JASA, April 2000, Prince, Waters, Anderson, and James, Use of structured, interactive interviews in retrospective noise exposure assessment in an occupational epidemiologic study

2008 Paper on guidelines for siting wind turbines to prevent health risks for INCE Noise-Con 2008, co-authored with George Kamperman, Kamperman Associates.

2008 Expanded manuscript supporting Noise-Con 2008 paper titled: "The 'How To' Guide To Siting Wind Turbines To Prevent Health Risks From Sound"

2009 "Guidelines for Selecting Wind Turbine Sites," Kamperman and James, Published in the September 2009 issue of Sound and Vibration.

2010 Punch, J., James, R., Pabst, D., "Wind Turbine Noise, What Audiologists should know," Audiology Today, July-August 2010

2011 Jerry L. Punch, Jill L. Elfenbein, and Richard R. James , "Targeting Hearing Health Messages for Users of Personal Listening Devices," Am J Audiol 0: 1059-0889_2011_10-0039v1

2011 Bray, W., HEAD Acoustics, James, R., "Dynamic measurements of wind turbine acoustic signals, employing sound quality engineering methods considering the time and frequency sensitivities of human perception," invited paper for Noise-Con 2011, Portland OR

2012 James, R., "Wind Turbine Infra and Low Frequency Sound: Warning Signs that were not Heard," April 2012, Bulletin of Science, Technology and Society, http://bsts.sagepub.com, DOI:10.1177/0270467611421845

2014 Negative Health Effects of Noise from Industrial Wind Turbines-Parta 1-3, Punch, J, James, R., Hearing Health Technology Matters, http://hearinghealthmatters.org/hearingviews/2014/wind-turbine-noise-evidence-health-problems/

2016 Punch, J. L., James, R.R., "Wind turbine noise and human health: a four-decade history of evidence that wind turbines pose risks," Journal of Hearing Health and Technology Matters, October 4, 2016, http://hearinghealthmatters.org/journalresearchposters/files/2016/09/16-10-21-Wind-Turbine-Noise-Post-Publication-Manuscript-HHTM-Punch-James.pdf.

2018 Krogh, C.M., Dumbrille, A., McMurtry, R.Y., James, R., Rand, R.W., Nissenbaum, M.A., Aramini, J.J. and Ambrose, S.E. (2018) "Health Canada's Wind Turbine Noise and Health Study—A Review Exploring Research Challenges, Methods, Limitations and Uncertainties of Some of the Findings." Open Access Library Journal, 5: e5046. https://doi.org/10.4236/oalib.1105046

2020 Krogh, C.M, McMurtry, R.Y., Johnson, W.B., Dumbrille, A., Alves-Pereira, M., Punch, J.L., Hughes, D., Rogers, L., Rand, R.W., James, R.R., Ambrose, S.E., Gillis, L. (2020) "Wind Turbines: Why Some Families Living in Proximity to Wind Energy Facilities Contemplate Vacating Their Homes: An Overview of Findings." Open Access Library Journal 7: e6443

2021 Krogh, C.M, McMurtry, R.Y., Johnson, W.B., Dumbrille, A., Alves-Pereira, M., Punch, J.L., Hughes, D., Rogers, L., Rand, R.W., James, R.R., Ambrose, S.E., Gillis, L. (2021), "Grounded Theory as an analytical tool for exploring housing decisions related to living in the vicinity of industrial wind turbines," To be Published