

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

Dan Lipschultz
Matthew Schuerger
Katie J. Sieben
John A. Tuma

Commissioner
Commissioner
Commissioner
Commissioner

In the Matter of the Application of Freeborn
Wind Energy LLC for a Route Permit for the
Freeborn Wind Transmission Line in
Freeborn County

PUC Docket No. IP-6946/TL-17-410

LATE FILED

**ASSOCIATION OF FREEBORN COUNTY LANDOWNERS
MOTION FOR REMAND TO ADMINISTRATIVE LAW JUDGE**

Association of Freeborn County Landowners (AFCL), intervenor in this above-captioned wind siting docket and participant in the related and concurrent transmission docket (IP6946/WS-17-410), bring this LATE FILED Motion¹ for Remand to Administrative Law Judge for additional hearing to inform the record. This Motion is late filed because the information attached in Exhibits A-K was just received from MPCA yesterday, in response to AFCL Data Practices Act Request. There is good cause not to exclude this filing, as it exposes addresses the private contortions and machinations in private of agency staff to improperly lead the Commission to give Freeborn Wind its wishes and permit the project

A prior Freeborn Wind pleading disclosed an agreement made between Applicant, Dept. of

¹ Any opposition to the motion must be filed and served on the same list of persons within 14 days of service of the motion filing. Minn. R. 7829.0410.

Commerce, and the Pollution Control Agency. AFCL followed up with Data Practices Requests to the MPCA and Commerce, and the MPCA response was received yesterday, attached. Commerce has yet to provide documents requested.

The responses to the Data Practices Act Request provide documentation that on Freeborn Wind initiative, beginning with a request on May 30, 2018, roughly two weeks after the ALJ Recommendation of denial of the permit was filed in this docket, there were multiple back and forth emails and at least one meeting between Freeborn Wind and Commerce's John Wachtler and MPCA's Frank Kohlasch. There was a flurry of emails also initiated by Litchfield/Freeborn Wind beginning Friday, September 14, at 5:42 PM and continuing through the weekend until the last email provided, on Monday September 17. These agency representatives, in private discussions, absent notice to or participation of AFCL, a full party in this proceeding, reworked and rewrote "conditions" to the permit to allow this project to move forward knowing it could not comply with the state's noise standard.

Suddenly, to those not informed or participating in private discussions, on September 19, 2018, Freeborn Wind filed a proposed "condition." This "condition" included a change in the ground factor assumption from 0.0, the ground factor repeatedly discussed in the hearing record, to 0.5, not discussed in the record, and which increases noise by 3 dB(A). In addition, an additional increase of 3 dB(A) was added as "tolerance." Again, 3 dB(A) is a doubling of noise, and 3 dB(A) plus 3 dB(A) is a four-fold increase in noise. Is the Commission aware of the meaning of this increase in this change in ground factor input and the increase in "tolerance" of the condition?

For Freeborn to be meeting privately with agency staff, rearguing their case to these regulators, inserting conditions with no vetting, inserting conditions allowing noise exceedences after admission that it could not comply with noise rules, all topped with an orchestrated presentation to the Commission and the Commission's blithe acceptance of this behavior and terms that are not supported by the record, how is this anything but blatant ex parte contact and improper

conduct on the part of the Commission? This is flagrant abuse of process.

There is no basis in the record for either the 0.0 to 0.5 ground factor change; there is no basis in the record for an additional 3 dB(A) “tolerance.” There is no basis in the record for this “condition.” There is no basis in the record for allowing four-fold increase in noise modeling and/or noise. This must be remanded to the ALJ for additional proceedings to inform the record in public, with opportunity for review, cross-examination, briefing, argument, and due consideration.

I. FREEBORN ADMITS IT CANNOT DEMONSTRATE IT CAN COMPLY “USING PRUDENT MEASURING PRACTICES” AND PROCEEDS TO USE IMPRUDENT AND DECPTIVE PRACTICES

The ALJ’s Conclusions and Recommendation were clear, that Freeborn Wind had not demonstrated that it could comply with the noise standard:

5. The Applicant failed to demonstrate, by a preponderance of the evidence, that the Project complies with Minn. R. 7030.0040. Therefore, the Project does not comply with criteria set forth in chapter 216F and section 216E.03, subdivision 7 of the Minnesota Statutes and chapter 7854 of the Minnesota Rules.

...

9. Should the Applicant demonstrate that it can meet the requirements of Minn. R. 7030.0040, the Project, with the Draft Site Permit conditions and the amended and additional Permit Conditions and Special Conditions to sections 4.2, 5.2, 5.2.25, 7.2, 7.4, and 11.1, as described at paragraphs 543 through 550 of this Report, would satisfy the site permit criteria for an LWECS in Minn. Stat. § 216F.03 and meet all other applicable legal requirements.

RECOMMENDATION

Based upon these Conclusions of Law, the Administrative Law Judge respectfully recommends that the Commission deny the site permit to Freeborn Wind Energy, LLC to construct and operate the up to 84 MW portion of the Freeborn Wind Farm in Freeborn County, Minnesota. In the alternative, the Administrative Law Judge respectfully recommends that the Commission provide Freeborn Energy, LLC with a period of time to submit a plan demonstrating how it will comply with Minnesota’s Noise Standards at all times throughout the footprint of the Freeborn Wind Project.

ALJ Recommendation, pps. 118-119.

In a September 16, 2018 email, Dan Litchfield, Freeborn Wind, admits that Freeborn cannot comply with the noise standard:

3. Finally, we think that demonstrating compliance with the final paragraph (showing we're at 45 dBA or less when wind is at 50 dBA) is technically impossible, per ANSI standards and MPCA guidance. My concern is that this isn't an "innocent until proven guilty" scenario – as I understand it, we have to demonstrate innocence, or compliance. And we will not be able to do that using prudent measuring practices...

We are drafting some proposed alternate language that could go in section 6.0: Special Conditions and would like to review that with you. Also, we'd like to propose an amendment to paragraph 2 of 7.4.1 so that the tolerance is 5 dBA, which is supported by our record "A Guide to Noise Control in Minnesota • November 2015," section 2.3: "The human ear can usually tell the difference when sound changes by 3 dBA and a 5 dBA change is clearly noticeable."

Litchfield, Exhibit A, p. 3, in "basic details," para. 3; conclusion, p. 4.

As AFCL argued in its brief, the record reflects the distinction between black letter dB(A) modeling and measurements and perception of noise, and that 3 dB(A) is a doubling of noise. Hankard, Tr. Vol. 1B, p. 65, 114, 116. Doubling of sound energy, or sound pressure level, is 3 dB. Id. "They do not perceive it as a doubling of loudness, until the – until the increase in the decibels is 10. Tr., Vol. 1B, p. 115. Doubling of sound energy doesn't mean a perception of doubling of sound. But the numbers are what matters, not perception. In this case what matters is the 50 dB(A) of the MPCA 7030 rule.

Freeborn Wind went to the MPCA and Commerce, and the emails reveal Freeborn Wind's belief that it could not meet the noise standards. Reborn Wind reargued its post-hearing brief, its reply brief, and its proposed Findings of Fact. Exhibits D-K, attached. Intervenors had no such opportunity.

Hankard's post hearing modeling, brought before the MPCA and Commerce in May, 2018, shows many instances of 50 dB(A) or higher levels in the "Ambient 50 dBA Plus Turbine Noise Level (dBA)" and many in the "Ambient 45 dBA Plus Turbine Noise Level (dBA)" column. The hearing record reflects that Hankard testified that there was a +/- 3 dB(A) "margin of error built

into the modeling. See Hankard, Tr., Vol. 1B, p. 64, 113. Over and over, the record reflects the reasons and importance of using the 0.0 ground factor.

Another recent statement by Hankard, in another docket, in another state, also shows that a ground factor of 0.5 is not typically used for wind:

The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably – well, with the exception perhaps of wind turbine projects which are different because the source is elevated. Bot for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90-99 percent of the studies use 0.5.

Exhibit G, Tr. p. 122, l. 7-14.

Enough of the machinations and private meetings and development of “conditions” that have no basis in the record. This matter must be opened to the light of day.

II. THE COMMISSION ACTIONS ARE IMPROPER.

Given Applicant’s “Request for Clarification” pleading, admitting an “agreement” with MPCA and Commerce, the Commission cannot now plausibly claim that it did not know of Freeborn’s behind the scenes actions with MPCA and Commerce staff. Those actions, meetings, agreements, should have been made public, parties included in all discussions, all parties allowed to reargue their case as done by Freeborn Wind. Better yet, those meetings should have never occurred, should have stopped, staff should be disciplined for these ethical violations, and the hearing reopened immediately to address these issues. That didn’t happen, and the Commission, as the decider, is responsible.

Commission ethics and integrity rules speak for themselves:

7845.0400 CONFLICT OF INTEREST; IMPROPRIETY.

Subpart 1. General behavior.

A commissioner or employee shall respect and comply with the law and shall behave in a manner that **promotes public confidence in the integrity and impartiality of the commission's decision making process.**

Subp. 2. Actions prohibited.

Commissioners and employees shall avoid any action that might result in or create a conflict of interest or the appearance of impropriety, including:

- A. using public office for private gain;
- B. giving preferential treatment to an interested person or entity;**
- C. impeding the efficiency or economy of commission decision making;
- D. losing independence or impartiality of action;**
- E. making a commission decision outside official channels; and**
- F. affecting adversely the confidence of the public in the integrity of the commission.**

Minn. R. 7845.0400 (emphasis added).

A look at the process and Commission treatment of Freeborn Wind, there are known examples of giving preferential treatment to an interested entity. The Commission has lost independence and impartiality of action. The decision has been made, for all intents and purposes, outside official channels, in private between Freeborn Wind, Commerce, and MPCA, arguably and generously assuming Commission knew nothing about these discussions and agreement. This process failure absolutely adversely affects the confidence of the public in the integrity of the Commission.

III. THE FREEBORN WIND DOCKET MUST BE REMANDED TO THE ALJ FOR FURTHER PROCEEDINGS TO BUILD THE RECORD.

This docket, this permit, must not proceed as it is, with the improper, behind the scenes, deal-making, based on information not in the record, and inaccurate information. The Commission must be reconsidered, and remanded. There is no basis in the record for either the 0.0 to 0.5

ground factor change or the notion of adding an additional 3 dB(A) “tolerance.” There is no basis in the record for this “condition.” There is no basis in the record for allowing four-fold increase in noise modeling and/or noise. This must be remanded to the ALJ for additional proceedings to inform the record in public, with opportunity for review, cross-examination, briefing, argument, and due consideration.

At this time, considering all of the above, AFCL requests that this LATE FILED pleading be accepted, and that the Commission Reconsider its September 20, 2018 decision and December 19, 2018 written order, and remand the siting docket to the Administrative Law Judge for rehearing and due process, including public fact-finding regarding modeling and use of a 0.0 ground factor, with opportunity for discovery, cross-examination, briefing, and argument.

Respectfully submitted,

February 13, 2019



Carol A. Overland #254617
Attorney for AFCL
Legalelectric
1110 West Avenue
Red Wing, MN 55066
(612) 227-8638
overland@legalelectric.org

meetings between Freeborn Wind and MPCA and/or Commerce representatives. Separate responses from Commerce have not been received.

4. Attached as Exhibit B is a true and correct copy of AFCL's Data Practices Act Request to MPCA.
5. Attached as Exhibit C is a true and correct copy of AFCL's Data Practices Act Request to Commerce. Other than an acknowledgement of receipt, there has been no response, no provision of documents.
6. Attached as Exhibit D is a true and correct copy of a full email thread as provided by MPCA, which includes:
 - Wednesday, May 30, 2018 8:36 AM: Litchfield to Davis, Wachtler, Kohlasch, cc: Hankard (including Brusven/Fredrickson & Byron Letter dated September 18, 2018)
 - Wednesday, May 30, 2018 12:47 PM: Kohlasch to Litchfield, Davis, Wachtler cc: Hankard
 - Friday, September 14, 2018 5:42 PM: Litchfield to Wachtler, Kohlasch
 - Saturday, September 15, 2018 2:08 PM: Wachtler to Litchfield, Kohlasch
 - Sunday, September 16, 2018 11:38 AM: Litchfield to Wachtler, Kohlasch
 - Sunday, September 16, 2018 8:19 PM: Wachtler to Litchfield
 - Sunday, September 16, 2018 8:34 PM: Litchfield to Wachtler
 - Sunday, September 16, 2018 8:50 PM: Wachtler to Litchfield
 - Monday, September 17, 2018 12:37 PM: Litchfield to Wachtler
 - Monday, September 17, 2018 5:22 PM: Litchfield to Wachtler.
7. Attached as Exhibit E is a true and correct copy of another full email thread as provided by the MPCA, which includes some of the same emails and a "new" ones asserting that "demonstrating compliance at 45 dBA with a 50 DBA ambient may be technically impossible when following ANSI standards" in the last one listed:
 - Wednesday, May 30, 2018 8:36 AM: Litchfield to Davis, Wachtler, Kohlasch, cc: Hankard
 - Wednesday, May 30, 2018 12:47 PM: Kohlasch to Litchfield, Davis, Wachtler cc: Hankard
 - Friday, September 14, 2018 5:42 PM: Litchfield to Wachtler, Kohlasch
 - Saturday, September 15, 2018 2:08 PM: Wachtler to Litchfield, Kohlasch
 - Saturday, September 15, 2018 1:54 PM: Litchfield to Wachtler and Kohlasch
 - Saturday, September 15, 2018 6:48 PM: Kohlasch to Wachtler
 - Sunday, September 16, 2018 4:01 PM: Wachtler to Kolasch

8. Attached as Exhibit F is a true and correct copy of “May 30, 2018 Meeting Freeborn Handout Kohlasch Notes Freeborn Highlights_05” provided by MPCA. This document, MPCA name is “May 30” Litchfield did not request a meeting with MPCA and Commerce until May 30, 8:36 AM, and the meeting was scheduled for the following day, May 31, 2018 (see Exhibit E, email Wednesday, May 30, 2018, 12:47 PM). The participants listed on this document, “AWEA, Wind on the Wires, Turbine Manuf., other wind developers/competitors” goes beyond Litchfield and Hankard. The chart and notes may have been from another meeting or the date used in the file is off, or Litchfield brought many others to the meeting. Pay attention to the p. 5 note regarding ground effect, “Invenergy modeling uses a Ground Effect buffer of \emptyset = all paved surfaces (hard) with no absorptive land cover; other modelers will use a factor of 0.5 which will lead to a noise reduction of 3 Dba;” The record for Freeborn Wind is based on the Invenergy modeling, discussed often and at length, at 0.0 ground factor. No modeling for any other ground factor input was produced or discussed.

9. Attached as Exhibit G is a true and correct copy of a part of Invenergy’s Freeborn Wind sound expert, Hankard, testimony in the Badger Hollow solar project hearing, where he testified, regarding the Badger Hollow solar project and use of 0.5 ground factor:

The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably – well, with the exception perhaps of wind turbine projects which are different because the source is elevated. Bot for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90-99 percent of the studies use 0.5.

Exhibit G, Tr. p. 122, l. 7-14.

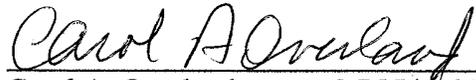
10. Attached as Exhibit H is a true and correct copy of “May 30_Meeting Freeborn Handout Freeborn Highlights_01,” the noise related Findings of Fact proposed by Freeborn Wind. These are not the findings from the ALJ’s recommendation. This document’s MPCA name is “May 30” but Litchfield did not request a meeting with MPCA and Commerce until May 30, 8:36 AM, and the meeting was scheduled for the following day, May 31, 2018.

11. Attached as Exhibit I is a true and correct copy of “May 30_Meeting_Freeborn_Handout Freeborn Highlights_02” which is selected pages of Freeborn Wind’s post-hearing brief, pages 17-24, regarding noise. This document’s MPCA name is “May 30” but Litchfield did not request a meeting with MPCA and Commerce until May 30, 8:36 AM, and the meeting was scheduled for the following day, May 31, 2018

12. Attached as Exhibit J is a true and correct copy of "May 30_Meeting_Freeborn_Handout Freeborn Highlights_03" which is selected pages of Freeborn Wind's Reply Brief, pps. 5-8, regarding noise.
13. Attached as Exhibit K is a true and correct copy of "May 30_Meeting_Freeborn_Handout Freeborn Highlights_04" which is the post-hearing Ex. FR-18, Affidavit of Mike Hankard and attached calculation of total predicted noise based on predicted wind turbine noise levels and observed nighttime ambient noise levels. As with Hankard's noise modeling included in Appendix C to the Application, and Hankard's testimony, this modeling is based with "a ground factor of 0.0. See Hankard Affidavit, para. 8. The tables' 2nd and 3rd from left columns, Ambient 45 and 50, show many instances of 50 and over dBA, both as modeled, and when considered with the +/- 3 dBA "margin of error."

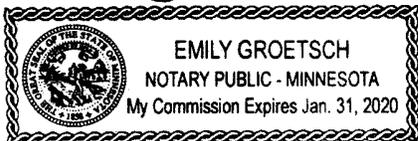
Further your affiant sayeth naught.

Dated: February 13, 2019


Carol A. Overland MN Lic. 254617
Attorney for Association of Freeborn
County Landowners
Legalelectric
1110 West Avenue
Red Wing, MN 55066
(612) 227-8638
overland@legalelectric.org

Signed and sworn to before me this
13th day of February, 2019


Notary Public



AFCL EXHIBIT A

Subject: R#26891
From: "Boettcher, Dale (MPCA)" <dale.boettcher@state.mn.us>
Date: 2/12/2019, 7:44 AM
To: "overland@legalectric.org" <overland@legalectric.org>

Carol

Here is the information for the site that you have requested. Please review and confirm.
I will closing out your request.

Thank you
Dale

The name of the file you need is: **DB_R26891_021219_031219**

Please follow the below link to gain access to your files: : ftp://files.pca.state.mn.us/pub/file_requests/

****Please note that files are kept at this location for 30 days than will be deleted. Please save to your computer locally and promptly.****

Notes on viewing TIF files on FTP site:

When files are uploaded to an FTP site, it is the intention that the files will be downloaded locally for viewing. The issue of not being able to view these files only occurs if you try to open the files directly from the FTP site. Here is a solution to successfully opening TIF files from the FTP site:

Internet Explorer:

Right-click file > Choose **Save Target As...** > Select location to Save in: (suggest desktop)
Open document from saved location.

Firefox:

Right-click file > Choose **Save Link As...** > Select location to Save in: (suggest desktop)
Open document from saved location.

Dale A Boettcher

*Remediation/AL. File Manager, MPCA Records Management Unit
Minnesota Pollution Control Agency (MPCA)
520 Lafayette Rd N
Saint Paul, MN 55155-4194
651-757-2441*

The mission of the MPCA is to protect and improve the environment and enhance human health.



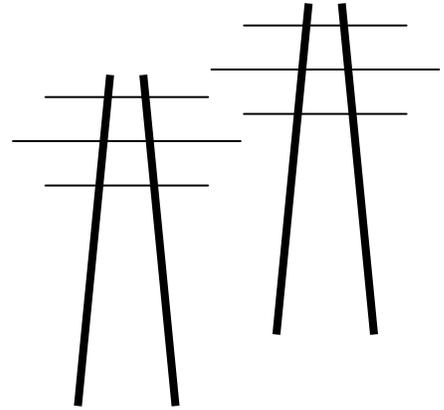
NOTICE: This email (including attachments) is covered by the Electronic Communications Privacy Act, 18 U.S.C. 2510-2521. This email may be confidential and may be legally privileged. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you

AFCL EXHIBIT B

Legalelectric, Inc.

Carol Overland Attorney at Law, MN #254617
Energy Consultant—Transmission, Power Plants, Nuclear Waste
overland@legalelectric.org

1110 West Avenue
Red Wing, Minnesota 55066
612.227.8638



DATA PRACTICES ACT REQUEST

January 9, 2019

Frank Kohlasch
Air Assessment Section
frank.kohlasch@state.mn.us
MPCA
520 Lafayette Road North
St. Paul, MN 55155-4194

Laura Bishop
Commissioner
laura.bishop@state.mn.us
MPCA
520 Lafayette Road North
St. Paul, MN 55155-4194

RE: DATA PRACTICES ACT REQUEST
Discussions and Agreement between Freeborn Wind and/or Dept. of Commerce
and MPCA

At this time, I request all documents, including but not limited to notes, records of phone calls, and emails regarding the Agreement between Freeborn Wind, the Dept. of Commerce, and MPCA.

Please assemble the documents and contact me to schedule a file review.

In the requests below, Applicant is defined as Applicant and/or representatives of Applicant. Agreement is defined as any and all agreements, formal and/or informal.

- Provide documentation of agreement between Applicant, Commerce, and MPCA.
- Identify representatives of Applicant, Commerce, and MPCA that entered into Agreement.
- Provide emails to and from Applicant, Commerce and MPCA between June 8, 2018 and present.
- On what dates were discussions had between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.

AFCL EXHIBIT B

- Did PUC representative(s) (Commissioners and/or staff) participate directly or indirectly in these discussions? If so, identify participant(s) and dates of participation. Provide any and all responsive documentation.
- Identify representatives for Applicant, Commerce, MPCA and PUC involved in discussions and dates of participation. Provide any and all responsive documentation.
- On what date and time was Commission staff informed of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were Commissioners informed of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were parties in the case notified of discussions between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were parties in the case notified of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- For each MPCA representative identified above, what is that Commerce representative's understanding of ground factor used in noise modeling entered as evidence in PUC Docket WS-17-410? Provide any and all responsive documentation.
- For each MPCA representative identified above, what is that Commerce representative's understanding of "(NARUC ISO 9613-2 with 0.5 ground) as used in Freeborn Wind's "Special Condition." Provide any and all responsive documentation.

If you have any questions or require anything further, please let me know.

Very truly yours,



Carol A. Overland
Attorney at Law

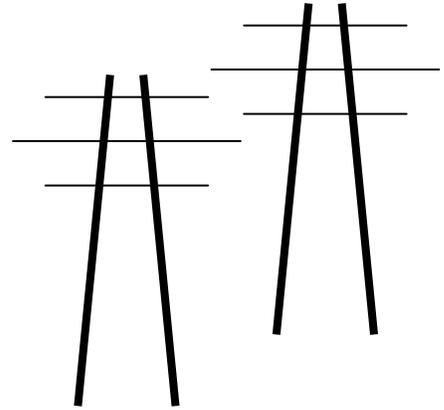
cc: Association of Freeborn County Landowners

AFCL EXHIBIT C

Legalelectric, Inc.

Carol Overland Attorney at Law, MN #254617
Energy Consultant—Transmission, Power Plants, Nuclear Waste
overland@legalelectric.org

1110 West Avenue
Red Wing, Minnesota 55066
612.227.8638



DATA PRACTICES ACT REQUEST

January 9, 2019

Bill Grant
bill.grant@state.mn.us
Deputy Commissioner
Department of Commerce
85 – 7th Place East, Suite 500
St. Paul, MN 55101

John Wachtler
john.wachtler@state.mn.us
EERA
Department of Commerce
85 – 7th Place East, Suite 500
St. Paul, MN 55101

RE: DATA PRACTICES ACT REQUEST
Discussions and Agreement between Freeborn Wind and/or Dept. of Commerce
and MPCA

At this time, I request all documents, including but not limited to notes, records of phone calls, and emails regarding the Agreement between Freeborn Wind, the Dept. of Commerce, and MPCA.

Please assemble the documents and contact me to schedule a file review.

In the requests below, Applicant is defined as Applicant and/or representatives of Applicant. Agreement is defined as any and all agreements, formal and/or informal.

- Provide documentation of agreement between Applicant, Commerce, and MPCA.
- Identify representatives of Applicant, Commerce, and MPCA that entered into Agreement.
- Provide emails to and from Applicant, Commerce and MPCA between June 8, 2018 and present.
- On what dates were discussions had between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.

AFCL EXHIBIT C

- Did PUC representative(s) (Commissioners and/or staff) participate directly or indirectly in these discussions? If so, identify participant(s) and dates of participation. Provide any and all responsive documentation.
- Identify representatives for Applicant, Commerce, MPCA and PUC involved in discussions and dates of participation. Provide any and all responsive documentation.
- On what date and time was Commission staff informed of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were Commissioners informed of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were parties in the case notified of discussions between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- On what date and time were parties in the case notified of Agreement between Applicant, Commerce, and MPCA? Provide any and all responsive documentation.
- For each Commerce representative identified above, what is that Commerce representative's understanding of ground factor used in noise modeling entered as evidence in PUC Docket WS-17-410? Provide any and all responsive documentation.
- For each Commerce representative identified above, what is that Commerce representative's understanding of "(NARUC ISO 9613-2 with 0.5 ground) as used in Freeborn Wind's "Special Condition." Provide any and all responsive documentation.

If you have any questions or require anything further, please let me know.

Very truly yours,



Carol A. Overland
Attorney at Law

cc: Association of Freeborn County Landowners

AFCL EXHIBIT D

From: Wachtler, John (COMM)
Sent: Monday, September 17, 2018 5:32 PM
To: Kohlasch, Frank (MPCA)
Subject: Fwd: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards
Attachments: Freeborn_ Letter Regarding Special Condition on Noise_64862108(2)-c.docx; ATT00001.htm

Sent from my iPhone

Begin forwarded message:

From: "Litchfield, Daniel" <DLitchfield@invenergyllc.com>
Date: September 17, 2018 at 5:22:29 PM CDT
To: "Wachtler, John (COMM)" <john.wachtler@state.mn.us>
Subject: RE: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards

John,

Does the attached look acceptable to you? If so, I'd suggest we file this tomorrow and you file a short letter confirming you agree. Then we show up Thursday morning.

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | 773-318-1289 | @InvenergyLLC

From: Litchfield, Daniel
Sent: Monday, September 17, 2018 12:37 PM
To: 'Wachtler, John (COMM)' <john.wachtler@state.mn.us>
Subject: RE: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards

John,

Below are two proposed conditions that would go in section 6.0 – Special Conditions – of the Proposed Site Permit. These take a different approach than EERA's proposed language, but I think the intent is the same except for insertion of the +3 dBA tolerance instead of +1 dBA. The +3 is strongly supported by the case record – both in the MPCA's own guidance document and in testimony by Hankard and discussion with the ALJ at the public hearing. So we feel that is the justifiable tolerance.

The post-construction monitoring condition is likewise intended to get to the point stated by EERA/MPCA, but in a way that is actually measurable.

Also, I wanted to give you a courtesy heads up that we will be filing a motion to strike Mr. Kohlasch's letter as untimely and clarify that we think it could be an unlawful rulemaking. However, as I am attempting to demonstrate, we are willing to negotiate in good faith a special condition on the topic with EERA (and MPCA if they want to be involved), that will apply solely to our project.

AFCL EXHIBIT D

Please call me if you would like to discuss. I'll check in with you tomorrow.

6.1 Pre-Construction Noise Modeling

Freeborn Wind Energy LLC shall file a plan, including modeling and/or proposed mitigation, at least 60 days prior to the pre-construction meeting that demonstrates it will not cause or significantly contribute to an exceedance of the MPCA Noise Standards.

To ensure that the turbine-only noise does not cause or significantly contribute to an exceedance of the MPCA Noise Standards, modeled wind turbine-only sound levels (NARUC ISO 9613-2 with 0.5 ground) at receptors shall not exceed 47 dB(A) L₅₀-one hour. Given this, at no time will turbine-only noise levels exceed the MPCA Noise Standards, and when total sound does exceed the limits it will be primarily the result of wind or other non-turbine noise sources. Under these conditions, the contribution of the turbines will be less than 3 dBA, which is the generally recognized minimum detectible change in environmental noise levels (non-laboratory setting). For example, when nighttime background sound levels are at 50 dB(A) L₅₀-one hour, a maximum turbine-only contribution of 47 dB(A) L₅₀-one hour would result in a non-significant increase in total sound of less than 3 dB(A).

6.2 Post-Construction Noise Monitoring

If the Noise Studies conducted under Section 7.4 document an exceedance of the MPCA Noise Standards where turbine-only noise levels produce more than 47 dB(A) L₅₀-one hour at nearby receptors, then the Permittee shall work with the Department of Commerce to develop a plan to minimize and mitigate turbine-only noise impacts.

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | 773-318-1289 | @InvenergyLLC

From: Wachtler, John (COMM) [<mailto:john.wachtler@state.mn.us>]
Sent: Sunday, September 16, 2018 8:50 PM
To: Litchfield, Daniel <DLitchfield@invenergyllc.com>
Subject: RE: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards

I'm actually taking a legal education class tomorrow on compliance issues of all things. It starts at 9:00....

There is a break at 10:15,

otherwise 8:00 am would probably work while I'm driving to Minneapolis.

From: Litchfield, Daniel <DLitchfield@invenergyllc.com>
Sent: Sunday, September 16, 2018 8:34 PM
To: Wachtler, John (COMM) <john.wachtler@state.mn.us>
Subject: Re: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards

Thanks John. What about the other points I raised? What time is good for you to talk tomorrow? Can we do 9 a.m.?

AFCL EXHIBIT D

Dan Litchfield
773-318-1289

----- Original message -----

From: "Wachtler, John (COMM)" <john.wachtler@state.mn.us>
Date: 9/16/18 8:19 PM (GMT-06:00)
To: "Litchfield, Daniel" <DLitchfield@invenergyllc.com>
Subject: [EXTERNAL] RE: Freeborn Wind and MPCA sound standards

Dan, I just got back home and am looking at your email more closely. I see the permit condition in 7.4.2 regarding "continuing for the first 12 months." That isn't the language we suggested, of course. It should be completed with 12 months. Mike K, I assume at this point, must have accidentally added that. I'll call him tomorrow about it.

From: Litchfield, Daniel <DLitchfield@invenergyllc.com>
Sent: Sunday, September 16, 2018 11:38 AM
To: Wachtler, John (COMM) <john.wachtler@state.mn.us>
Cc: Kohlasch, Frank (MPCA) <frank.kohlasch@state.mn.us>
Subject: RE: Freeborn Wind and MPCA sound standards

Good morning John and Frank,

Here are the basic details I'd like to discuss:

1. Proposed Permit condition 7.4.1 (1) is internally inconsistent: "If background sound levels are less than the applicable standard at nearby receptors, the modeled turbine-only noise levels cannot cause an exceedance of the applicable state standard at nearby receptors, inclusive of the measured background noise level. "Cause" means that the project turbine-only contribution is in excess of the applicable state standard."
 - a. The first sentence is confusing because it says "modeled turbine-only noise levels" but then clarifies that it is "inclusive of the measured background noise level." So I understand the first sentence to essentially mean "total noise" has to meet the standard.
 - b. But then the second sentence seems to disagree with the first and it could be interpreted to mean that the turbine-only noise can be up to 50 dBA L₅₀-one hour.
2. The second paragraph of 7.4.2 ("continuing for the first 12 months") seems to propose 12 months of operational monitoring, not *within* the first 12 months, which is what has been done and is what EERA recommended in its exceptions to the ALJ report.
3. Finally, we think that demonstrating compliance with the final paragraph (showing we're at 45 dBA or less when wind is at 50 dBA) is technically impossible, per ANSI standards and MPCA guidance. My concern is that this isn't an "innocent until proven guilty" scenario – as I understand it, we have to demonstrate innocence, or compliance. And we will not be able to do that using prudent measuring practices:
 - a. S12.9 Part 3 (2013) Quantities and Procedures for Description and Measurement of Environmental Sound - Part 3: Short-Term Measurements With an Observer Present. Also relevant to environmental noise measurements is ANSI S12.18-1994 (R2009) Outdoor Measurement of Sound Pressure Level. Correction for continuous background sound, states: "If the difference between the measurement period equivalent-

AFCL EXHIBIT D

continuous total sound pressure level (sound that is the sum of source in question and the continuous background sound) and the corresponding continuous background sound pressure level is less than 3 dB, then the reported source sound level shall be set equal to -99 dB for subsequent calculations, or to n/a". Let me explain this with an example: If your turbine-only limit is 45 dBA, once the noise level from the wind in the trees exceeds about 42 dBA you are technically not following the standard. There is too much background noise present, and it is similar in frequency content so can't be filtered (like insects, frogs or birds). On a traditional project like a combustion turbine, we would just wait for the wind to die down and take our measurement. No such luxury for wind farms.

b. MPCA standards:

i. "A Guide to Noise Control in Minnesota," section 3.1, both the "weather condition" and "background noise" sections - "Measurements should not be made when noise from wind or precipitation results in a difference between the background sound level and noise source being measured that is less than 10 dBA." And "The difference between the sound level of the source being monitored and that of the background noise must be less than 10dBA."

ii. 7030.0060, Subp. 4 (C) C. "Measurements must not be made in sustained winds or in precipitation which results in a difference of less than ten decibels between the background noise level and the noise source being measured."

We are drafting some proposed alternate language that could go in section 6.0: Special Conditions and would like to review that with you. Also, we'd like to propose an amendment to paragraph 2 of 7.4.1 so that the tolerance is 5 dBA, which is supported by our record "A Guide to Noise Control in Minnesota • November 2015," section 2.3: "The human ear can usually tell the difference when sound changes by 3 dBA and a 5 dBA change is clearly noticeable."

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | 773-318-1289 | @InvenergyLLC

From: Wachtler, John (COMM) [<mailto:john.wachtler@state.mn.us>]
Sent: Saturday, September 15, 2018 2:08 PM
To: Litchfield, Daniel <DLitchfield@invenergyllc.com>
Cc: Kohlasch, Frank (MPCA) <frank.kohlasch@state.mn.us>
Subject: [EXTERNAL] Re: Freeborn Wind and MPCA sound standards

Dan, can you tell us more details about what you want to meet about?

Also feel free to try me on my cell this weekend if you'd like. I'm out of town but should be able to answer.

651-724-1063

Sent from my iPhone

On Sep 14, 2018, at 5:42 PM, Litchfield, Daniel <DLitchfield@invenergyllc.com> wrote:

AFCL EXHIBIT D

Gentlemen:

Happy Friday.

I respectfully and urgently request a meeting Monday or Tuesday next week. Frank's letter and its subsequent interpretation by PUC staff has resulted in Proposed Permit conditions that we feel are fundamentally unworkable, let alone unprecedented in Minnesota. Mike and I would really appreciate the opportunity to sit down, face-to-face and explain why. Please let me know of your availability. I will throw out 11 am on Tuesday for starters, but I will make any time that you can find in your schedule prior to Wednesday (it is Yom Kippur, I will be with my family). I am in Chicago, so if Monday morning is the only time that works, kindly let me know before Sunday evening. My hope is we can come to an understanding of why the proposed permit condition language will not allow for construction of wind turbines and jointly propose new language on Thursday.

Sincerely,

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | 773-318-1289 | @InvenergyLLC

From: Kohlasch, Frank (MPCA) [<mailto:frank.kohlasch@state.mn.us>]
Sent: Wednesday, May 30, 2018 12:47 PM
To: Litchfield, Daniel <DLitchfield@invenergyllc.com>; Davis, Richard (COMM) <richard.davis@state.mn.us>; Wachtler, John (COMM) <john.wachtler@state.mn.us>
Cc: Michael Hankard <mhankard@hankardinc.com>
Subject: RE: Freeborn Wind and MPCA sound standards

Dan,

I checked John's schedule and my schedule and we can meet tomorrow from 10-11 am at the MPCA. I have reserved Conference Room 102 at the MPCA for a potential meeting. If this time doesn't work, please let me know and I will see if there is time Thursday afternoon.

Also, I want to be clear that the MPCA and Department of Commerce don't have a response prepared to the ALJ's report at this time. We continue to work together to develop the state's response and will provide more information once an approach has been reviewed by the leadership of both agencies. That said, we are willing to meet and listen to your concerns and proposals.

Thanks,
Frank

Frank L. Kohlasch, Manager
Air Assessment Section
Environmental Analysis & Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Rd. N.
St. Paul, MN 55155
(651)757-2500

AFCL EXHIBIT D

frank.kohlasch@state.mn.us

Stay on top of Minnesota's Air Quality Index at www.pca.state.mn.us/air/current-air-quality-index

NOTICE: This email (including attachments) may be confidential and may be legally privileged. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you.

From: Litchfield, Daniel <DLitchfield@inenergyllc.com>

Sent: Wednesday, May 30, 2018 8:36 AM

To: Davis, Richard (COMM) <richard.davis@state.mn.us>; Wachtler, John (COMM) <john.wachtler@state.mn.us>; Kohlasch, Frank (MPCA) <frank.kohlasch@state.mn.us>

Cc: Michael Hankard <mhankard@hankardinc.com>

Subject: Freeborn Wind and MPCA sound standards

Gentlemen:

I am seeking to convene a meeting of EERA, PCA and our team, mainly just me and Mike Hankard, our acoustic consultant. We can expand the group to include others, including attorneys, if that works for you.

I will be available to meet tomorrow between 10 am and 3 PM in the St. Paul area, or Friday morning and the earlier the better. Or we could look to next week.

Agenda-wise, I offer 3 topics of discussion and welcome your contributions/modifications:

1. We believe the PCA rules are very clearly about "noise" and not "ambient sound" and, thus, we have correctly designed our project (Freeborn Wind Energy LLC) to cause less than a 50 dBA L₅₀-one hour contribution.
2. An interpretation that the standard is about "total ambient sound" is new, whether it is correct or not. Attached is a summary of how PCA/EERA/PUC have looked at the topic of noise for all recently-permitted wind farms. Note the Palmer's Creek Site Permit was granted earlier this month with the clear understanding "When ambient sound level already approaching or exceeding the 50 dBA threshold the Total Sound level exceeds 50 dBA."
3. A "total ambient" interpretation will have absurd and far-reaching results beyond wind energy facilities. Windy spots of Minnesota routinely experience ambient sound levels above 50 dBA. If that is the new limit, then all sources of "noise" must be limited, right?

Dan Litchfield | Director, Renewable Development

Inenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606

dlitchfield@inenergyllc.com | M 312-224-1400 | D 312-582-1057 | C 773-318-1289 | @InenergyLLC

This electronic message and all contents contain information which may be privileged, confidential or otherwise protected from disclosure. The information is intended to be for the addressee(s) only. If you are not an addressee, any disclosure, copy, distribution or use of the contents of this message is prohibited. If you have received this electronic message in error, please notify the sender by reply e-mail and destroy the original message and all copies.

NOTICE: This email (including attachments) is covered by the Electronic Communications Privacy Act, 18 U.S.C. 2510-2521. This email may be confidential and may be legally privileged.

AFCL EXHIBIT D

If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you

AFCL EXHIBIT E

From: Wachtler, John (COMM)
Sent: Sunday, September 16, 2018 4:01 PM
To: Kohlasch, Frank (MPCA)
Subject: Re: [EXTERNAL] Re: Freeborn Wind and MPCA sound standards

I think they were so focused on their "it's not a total sound level" argument they didn't really focus on measuring 45

Sent from my iPhone

On Sep 15, 2018, at 6:48 PM, Kohlasch, Frank (MPCA) <frank.kohlasch@state.mn.us> wrote:

John,

How did they think the 45 db condition would work before Tuesday? I don't understand how the MPCA letter changed anything for them, since the 1 db contribution when the background is high was always relative to the 50 db standard.

I'm not familiar with the language of the condition in the draft permit. Is the trigger for a potentially high background from wind and vegetation tagged to wind speed? That would avoid the need to measure a background level, absent turbine contributions.

Thanks,
Frank

Sent on the new Sprint Network from my Samsung Galaxy S®4

----- Original message -----

From: "Litchfield, Daniel" <DLitchfield@invenergyllc.com>
Date: 09/15/2018 1:54 PM (GMT-08:00)
To: "Wachtler, John (COMM)" <john.wachtler@state.mn.us>
Cc: "Kohlasch, Frank (MPCA)" <frank.kohlasch@state.mn.us>
Subject: Re: [EXTERNAL] Re: Freeborn Wind and MPCA sound standards

John,

Thanks for your message. I'm doing some family stuff now but will email later and would be happy to take you up on your offer and chat tomorrow.

I promise it's not a general whine. I think some of the wording in the permit conditions is inconsistent with your intent (7.4.1.1 - the two sentences are incompatible, and continuous monitoring for 12 months??), and I also think demonstrating compliance at 45 dba with a 50 DBA ambient may be technically impossible when following ANSI standards. I'll share details later.

Dan Litchfield
773-318-1289

AFCL EXHIBIT E

----- Original message -----

From: "Wachtler, John (COMM)" <john.wachtler@state.mn.us>
Date: 9/15/18 2:08 PM (GMT-06:00)
To: "Litchfield, Daniel" <DLitchfield@invenergyllc.com>
Cc: "Kohlasch, Frank (MPCA)" <frank.kohlasch@state.mn.us>
Subject: [EXTERNAL] Re: Freeborn Wind and MPCA sound standards

Dan, can you tell us more details about what you want to meet about?

Also feel free to try me on my cell this weekend if you'd like. I'm out of town but should be able to answer.

651-724-1063

Sent from my iPhone

On Sep 14, 2018, at 5:42 PM, Litchfield, Daniel <DLitchfield@invenergyllc.com> wrote:

Gentlemen:

Happy Friday.

I respectfully and urgently request a meeting Monday or Tuesday next week. Frank's letter and its subsequent interpretation by PUC staff has resulted in Proposed Permit conditions that we feel are fundamentally unworkable, let alone unprecedented in Minnesota. Mike and I would really appreciate the opportunity to sit down, face-to-face and explain why. Please let me know of your availability. I will throw out 11 am on Tuesday for starters, but I will make any time that you can find in your schedule prior to Wednesday (it is Yom Kippur, I will be with my family). I am in Chicago, so if Monday morning is the only time that works, kindly let me know before Sunday evening. My hope is we can come to an understanding of why the proposed permit condition language will not allow for construction of wind turbines and jointly propose new language on Thursday.

Sincerely,

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | 773-318-1289 | @InvenergyLLC

From: Kohlasch, Frank (MPCA) [<mailto:frank.kohlasch@state.mn.us>]
Sent: Wednesday, May 30, 2018 12:47 PM
To: Litchfield, Daniel <DLitchfield@invenergyllc.com>; Davis, Richard (COMM) <richard.davis@state.mn.us>; Wachtler, John (COMM) <john.wachtler@state.mn.us>
Cc: Michael Hankard <mhankard@hankardinc.com>
Subject: RE: Freeborn Wind and MPCA sound standards

Dan,

I checked John's schedule and my schedule and we can meet tomorrow from 10-11 am at the MPCA. I have reserved Conference Room 102 at the MPCA for a potential

AFCL EXHIBIT E

meeting. If this time doesn't work, please let me know and I will see if there is time Thursday afternoon.

Also, I want to be clear that the MPCA and Department of Commerce don't have a response prepared to the ALJ's report at this time. We continue to work together to develop the state's response and will provide more information once an approach has been reviewed by the leadership of both agencies. That said, we are willing to meet and listen to your concerns and proposals.

Thanks,
Frank

Frank L. Kohlasch, Manager
Air Assessment Section
Environmental Analysis & Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Rd. N.
St. Paul, MN 55155
(651)757-2500

frank.kohlasch@state.mn.us

Stay on top of Minnesota's Air Quality Index at www.pca.state.mn.us/air/current-air-quality-index

NOTICE: This email (including attachments) may be confidential and may be legally privileged. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you.

From: Litchfield, Daniel <DLitchfield@inenergyllc.com>
Sent: Wednesday, May 30, 2018 8:36 AM
To: Davis, Richard (COMM) <richard.davis@state.mn.us>; Wachtler, John (COMM) <john.wachtler@state.mn.us>; Kohlasch, Frank (MPCA) <frank.kohlasch@state.mn.us>
Cc: Michael Hankard <mhankard@hankardinc.com>
Subject: Freeborn Wind and MPCA sound standards

Gentlemen:

I am seeking to convene a meeting of EERA, PCA and our team, mainly just me and Mike Hankard, our acoustic consultant. We can expand the group to include others, including attorneys, if that works for you.

I will be available to meet tomorrow between 10 am and 3 PM in the St. Paul area, or Friday morning and the earlier the better. Or we could look to next week.

Agenda-wise, I offer 3 topics of discussion and welcome your contributions/modifications:

1. We believe the PCA rules are very clearly about "noise" and not "ambient sound" and, thus, we have correctly designed our project (Freeborn Wind Energy LLC) to cause less than a 50 dBA L₅₀-one hour contribution.
2. An interpretation that the standard is about "total ambient sound" is new, whether it is correct or not. Attached is a summary of how PCA/EERA/PUC have looked at the topic of noise for all recently-permitted wind farms. Note the

AFCL EXHIBIT E

Palmer's Creek Site Permit was granted earlier this month with the clear understanding "When ambient sound level already approaching or exceeding the 50 dBA threshold the Total Sound level exceeds 50 dBA."

3. A "total ambient" interpretation will have absurd and far-reaching results beyond wind energy facilities. Windy spots of Minnesota routinely experience ambient sound levels above 50 dBA. If that is the new limit, then all sources of "noise" must be limited, right?

Dan Litchfield | Director, Renewable Development
Invenergy | One South Wacker Drive, Suite 1800, Chicago, IL 60606
dlitchfield@invenergyllc.com | M 312-224-1400 | D 312-582-1057 | C 773-318-1289 | @InvenergyLLC

This electronic message and all contents contain information which may be privileged, confidential or otherwise protected from disclosure. The information is intended to be for the addressee(s) only. If you are not an addressee, any disclosure, copy, distribution or use of the contents of this message is prohibited. If you have received this electronic message in error, please notify the sender by reply e-mail and destroy the original message and all copies.

NOTICE: This email (including attachments) is covered by the Electronic Communications Privacy Act, 18 U.S.C. 2510-2521. This email may be confidential and may be legally privileged. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you

AFCL EXHIBIT F

"When you have some degree of wind, noise is in the 40s; when the wind is blowing hard, noise is in the 50s"

Pre-Construction Modeling Assumptions and Outcomes	Post-Construction Monitoring Times and locations	Post-Construction Monitoring Details and Results	Outcomes
Prairie Rose (10-425) Permitted: 2011 Built: 2012			
<p>[2011-preGuidance]</p> <p>Calibration factor of 2 dBA to account for uncertainty.</p> <p>Highest "project-related" modeled turbine noise was 45 dBA. (Application at 5-5).</p> <p>Ambient sound levels ranged from 30 dBA to 60 dBA.</p> <p>Total of turbine noise and ambient sound ("Total Sound Level") not calculated.</p>	<p>November 2013</p> <p>Measurements occurred during 7-day period in spring 2013. Background noise monitored at the same time as turbine noise through use of off site locations.</p>	<p>There were two measurements above the L 10 limit when looking at Total Sound. To determine compliance with MPCA standards, non-turbine noise was deducted.</p> <p>Representative range of operational noise conditions included at least one valid measurement hour from cut-in speed (3 m/s) through 9 m/s at hub height. Two data sets – one excluding extraneous noise events and periods of precipitation "(as requested by the Minnesota Department of Commerce)." (Post-Construction Noise Study Report at 15). "Sporadic or extraneous noise events included machinery, automobiles, persons on-site, and other noise not attributed to the Project or the natural environment (wildlife, rustling of vegetation, etc.) ... The noise monitoring data was also compared to wind speed data at microphone and hub height to identify how measured noise levels are affected by wind and turbine noise emissions." (Post-Construction Noise Study Report at 15).</p> <p>A second study was completed to remove exclusions allowed by MPCA for determining compliance. Dataset 2 excludes the same extraneous noise events as dataset 1. Dataset 2 also excludes periods of precipitation and high winds at microphone height, per MPCA procedures." (Post-Construction Noise Study Report at 15).</p>	<p>Report accepted. DOC-EERA recommended approval; Commission approved Post-Construction Noise Study Methodology on April 30, 2013</p>

Meetings + Concerns:

*AWEIA, Wind on the Water, Turbines Manuf., other wind developers/competitors
- existing operators*

- Sound of the wind routinely exceeds 50 dBA*
- Guidance (MPCA) is "missing a sentence": the source noise contribution w/ background subtracted out*
- Turbines themselves are not "causing" the exceedance of the noise stud.*

Wind + Wind Turbine noise spectrum are similar, not the same (in Hz)

AFCL EXHIBIT F

- was post-processing to try and discriminate between wind spectrum and Turbine spectrum
- Challenges when the Wind spectrum and Turbine Spectrum look the very similar

		<p>"As demonstrated during pre-construction noise measurement, existing sound levels in the Project area already exceeded MPCA noise limits. Therefore, determining the contribution of Project-related noise plays a large role in determining project compliance with MPCA." (Post-Construction Noise Study Report at 15-16).</p> <p>ML1 – 2 hours exceeded. Excess appears to be wind related but data could not be confirmed.</p> <p>BG2 – 2 hours exceeded. Presence of wind gusts suggest wind influenced exceedance.</p> <p>BG6 (no turbines) exceeded 50 dbA in 11 hours – similar preconstruction measurements had been taken.</p> <p>Highest measured L50 after exclusions was 49.3 dbA.</p>	
<p>Pleasant Valley (09-1197) Permitted: 2010/2014 Built: 2015</p>			
<p>Added 2 dB uncertainty factor to turbine sound power levels</p> <p>The Total Noise levels at each of the 713 receptors are below 50 dBA when ambient sound is not considered. When a 35 dBA ambient sound level is considered, one receptor, 1433, has a Total Sound level of 50.0 dBA .</p>	<p>August 2016</p> <p>5 locations (4 onsite, 1 offsite) monitored for 2 weeks in May–June 2016. Week 1 all turbines operational except for maintenance; week 2 40 turbines were off during nighttime hours.</p>	<p>There were two measurements above the L 10 limit based on turbines noise plus ambient sound identified through measurements. To determine compliance with MPCA standards, non-turbine noise was deducted:</p> <p>"Assessing contribution of the Project is essential to determine attribution as described under Appendix A of the LWECs Guidance." (Post-Construction Noise Assessment at 11).</p> <p>MO1 – 4 exceedances at L10, likely due to birds. Daytime exceedance not of L10 not considered (because occurred in daytime and below daytime standard).</p>	<p>Commission approved Post-Construction Noise Measurement Study on January 27, 2016 Report accepted. No further action.</p>

Distortion issue at 11 mps has been solved w/ more microphone shielding
 still get ~~noise~~ sound from trees + vegetation at 11 mps ² → even at 4 mps _{5 meters} ^{eters}

AFCL EXHIBIT F

NY uses WHO's annual noise stud

- reg. data for : a) prot./distribution of wind speeds by distribution of wind turbine operation → noise

c) prot./distribution of atmospheric propagation characteristics (e.g. calm is high propagation)

		<p>M02- 4 hours of exceedances at L10, likely due to bird chirping.</p> <p><u>"In order to properly determine the sound contribution of the facility, the ambient sound level must be deducted from the total noise measured."</u> (Post-Construction Noise Assessment at 51).</p> <p>"Using the polynomial functions, the A-weighted Leqs are estimated for each wind speed (WS) bin for both the turbine ON and OFF periods. The logarithmic difference between the polynomial values was then calculated, as a way of estimating the facility's noise contribution to the cumulative sound levels at M04. The maximum arithmetic difference between the polynomial curves for the turbine ON and OFF periods is 5.4 dB at an average wind speed of 8.5 m/s, while the maximum logarithmic difference, which corresponds to the estimated facility noise contribution, is 44.1 dBA and occurs at an average wind speed of 9.5 m/s." (Post-Construction Noise Assessment at 52).</p> <p>"The analysis therefore indicates that the maximum facility contribution at M04 of 44.1 dBA, estimated as an Leq value which is closely equivalent to the L50 for turbine sound, is well below the maximum permissible nighttime value of 50 dBA. This confirms that any exceedance of the MPCA limits would be largely attributed to sounds from the existing environment and not the facility." (Post-Construction Noise Assessment at 53).</p>	
Odell (13-843)			

Invenez modeling uses a Ground Effect buffer of $Q = \frac{2}{3}$ all paved surfaces (hard) w/ no absorptive land cover ; other modelers will use a factor of 0.5 which will lead to a noise reduction of 3 dBA ;

OH: Ambient floor level of 42.3 dBA + wind can add no more than 6 dBA, so the ^{max.} value is 48.3 dBA

Permitted: 2014 Built: 2016			
2013	October 2017	Extraneous noises excluded. Removed high winds (<11 mph) and precipitation events.	Commission approved Post-Construction Noise Measurement Study Protocol on August 22, 2016.
<p>Observed ambient sound exceeding 50 dBA.</p> <p>Added turbine noise to multiple levels of ambient noise, 40, 50, and 60 dBA.</p> <p>Noted that Total Sound did not exceed 50 dBA assuming a 40 dBA ambient level.</p> <p>Total Sound exceed 50 dBA when ambient sound level was 50 dBA or above. (See Table 6 of Noise Analysis)</p>	<p>Measurements at 6 locations over two week period in July and August 2017. 4 on-site locations and 2 off-site locations.</p>	<p>There was one measurement of turbine noise plus ambient that was above the L10 level. To determine compliance with MPCA standards, non-turbine noise was deducted:</p> <p>ML-4 had 1 hour of exceedance at L10. To attempt to determine contribution of turbine emissions, measurement data from background locations can be logarithmically subtracted from on-site data (reference to Appendix A of Guidelines).</p> <p>"Exceedances of the MPCA noise standards for the one hour accounts for 0.4% of these 277 hours, indicating that 99.6% of the monitoring period was in compliance with the MPCA standard. This is considered acceptable in the context of regulating wind turbine noise emissions in Minnesota." (Post-Construction Noise Survey Report at 27).</p>	<p>Report accepted.</p>
Elm Creek II (09-553) Permitted: 2010 Built: 2013			
<p>Modeling of turbine noise only. Showed levels below 50 dBA.</p> <p>The maximum distances calculated where an exceedance of the 50 dBA limit would no longer occur is 190 m (623 ft) for the GE 1.5 MW turbine, 248 m (813 ft) for the Gamesa 2.0 MW turbine, 357 m (1,171 ft) for</p>	<p>2011 (pre EERA Guidance)</p> <p>Measured at 4 locations in project area and 1 outside project area. Measured over 12 days.</p>	<p>The Post-construction Study measured "Total Noise" (ambient plus Project).</p> <p>"Given the potential influence of non-Project sounds on the L10 metric, it is expected that the measured ambient-plus-Project L10 sounds levels may routinely exceed the predicted Project-only levels." (Report at 7).</p>	<p>"The measured ambient-plus-Project sound levels were found to correspond well with model-predicted levels and therefore to</p>

AFCL EXHIBIT F

<p>the Mitsubishi 2.4 MW turbine, and 240 m (788 ft) for the Vestas 3.0 MW turbine.” (Application at 5-4).</p> <p>According to the Post-Construction Noise Report, the predicted sound level at one site was 53 dBA.</p>		<p>The measured Total Noise levels were less than 50 dBA for greater than 99 percent of the noise monitoring period. (Report at 13).</p> <p>“The measured ambient-plus-Project L10 levels occasionally exceeded the predicted Project level, but ... the L10 metric is not representative of Project sound levels and these exceedances are reasonably expected given the influence of other noise sources such as agricultural activities, birds, insects, thunder, and intermittent traffic on the adjacent road. The most representative comparison of the Project levels is the provided by the nighttime L50, as sources of extraneous noise are limited at night and the L50 metric is less influenced by extraneous short-duration events. The measured ambient-plus-Project levels for nighttime L50 were within predicted levels for more than 99 percent of the study duration.” (Report at 14).</p>	<p>comply with the State noise standards for more than 99 percent of the study duration.”</p> <p>Commission approved Sound Monitoring Protocol on March 14, 2011. Report accepted.</p>
<p>Community Wind South (11-863) Permitted: 2012 Built: 2012</p>			
<p>2011 (Pre-Guidance) Ground attenuation 0.5</p> <p>Ambient L50 sound levels ranged from 49 to 55 dBA during both the daytime and nighttime.</p> <p>Modeling assumed ambient L50 sound at 40 dBA, 50 dBA, and 60 dBA.</p> <p>When assuming ambient sound levels of 50 dBA, the predicted Total Noise levels ranged from 50.0 dBA</p>	<p>Plan submitted in 2012</p>	<p>No monitoring results available on eDockets.</p>	<p>Modelling indicated no turbine noise at residence over 42 dBA</p>

AFCL EXHIBIT F

<p>to 50.7 dBA, indicating that the change in sound levels caused by the wind farm would range from 0.0 dBA to 0.7 dBA.</p> <p>The modeling estimated that the turbine noise impact from the proposed turbines on any receptor within the Project Area will not be greater than 42.7 dBA.</p>			
<p>Blazing Star (16-686) (Blazing Star 2 took similar approach not separately summarized here) Permitted: 2017 Built: est. 2019</p>			
<p>Ground attenuation 0.7 2 dB uncertainty factor used</p> <p>Daytime sound levels throughout the project area generally ranged between 27 and 47 dBA, while nighttime sound levels were generally between 22 and 44 dBA.</p> <p>Modelled receivers at 2 heights.</p> <p>Presented average, max and min L50 for turbine noise.</p> <p>Maximum Project-only noise L50 ranged from 46 to 49 dBA.</p> <p>Added average L50 ambient noise at each location to modelled turbine</p>			<p>Permit granted</p>

AFCL EXHIBIT F

<p>noise. Presented overall nighttime L50 results. Appendix provides total noise at 35, 40, 45, 50, and 55 dBA ambient conditions for each receptor. Total noise exceeded 50 dBA when ambient sound was assumed to be 50 dBA. (Appendix A to Noise Analysis)</p> <p>“When added to the overall nighttime L50 from monitored locations, sound levels remain below 50 dBA, but the background L50 does and will vary from hour to hour, as shown in the monitor results.” (Noise Analysis at 55).</p>			
<p>Red Pine (16-618) Permitted: 2017 Built: 2017</p>			
<p>4 locations monitored for ambient sound. Concluded average daytime L50 ambient was 35 dBA, nighttime 28 dBA.</p> <p>Turbines were modeled at manufacturers sound power level and in “worst case” with 2dB uncertainty factor added.</p> <p>Ambient 35 dBA added to nighttime and 40 dBA added to daytime levels.</p> <p>Maximum noise was 49.2 dBA.</p>	<p>Not yet completed.</p>		<p>Permit granted</p>
<p>Nobles 2 (17-597)</p>			

AFCL EXHIBIT F

Permitted: est. 2018			
<p>Observed average L50 daytime ambient of 37 dBA, nighttime 32 dBA.</p> <p>48.8 dBA max modelled turbine noise level representing the "loudest realistic noise from the turbines"; ambient noise assumption not specified.</p>			<p>Permit decision expected summer 2018</p>
Bitter Root (17-749) Permitted: est . 2018			
<p>Oct 2017</p> <p>Assumed Vestas with serrated trailing edge operating in Noise Mode 0 and 40 turbines when only 37 will be constructed.</p> <p>Highest modeled receptor was 46.7 dBA for Total Sound.</p> <p>Considered 35 dBA to be representative ambient nighttime noise. Added a "typical rural ambient background sound (35 dBA) to modeled results and compared to the Noise Standards."</p>			<p>Permit pending</p>
Freeborn Wind (17-410) Permitted: est. 2018			
			<p>Permit pending</p>

AFCL EXHIBIT F

<p>Observed nighttime ambient noise levels at the measurement locations ranging from 29-51 dB(A) L₉₀</p> <p>The predicted total noise level at each receptor assumed a range of ambient noise levels: (33 dB(A)), the highest ambient noise level (57 dB(A)), and three intermediate turbine noise levels (40, 45, and 50 dB(A)).</p> <p>The turbine-only noise levels chosen represent the highest single predicted turbine-only noise level on the project (~49 dB(A)), the next highest predicted turbine-only noise level (47 dB(A)), a level 3 dB(A) below this (44 dB(A)), and 40 dB(A). The range of ambient levels chosen represent ~5 dB(A) increments between the highest and lowest ambient noise levels measured at the site during wind conditions in which the turbines would have operated.</p> <p>When assuming ambient sound levels are 45 dB(A) or less, total sound levels are 50 dB(A) or less regardless of the turbine-only noise level. When ambient noise levels are in the 45 to 50 dB(A) range, turbines contribute to the total</p>			
---	--	--	--

AFCL EXHIBIT F

<p>when turbine-only noise levels are about 44 dBA or greater. The degree of contribution (attribution) is dependent on which level is greater, that of the turbines or that of all other ambient noise sources.</p> <p>Once ambient noise levels exceed 50 dB(A), the total noise level of course also exceeds 50 dB(A), but the turbines are not a significant contributor.</p>			
<p>Palmer's Creek (17-265)</p>			
<p>Feb 2017</p> <p>Monitored ambient levels at 4 locations (3 in and 1 outside Project Area) for 7 days in Jan 2017</p> <p>Several sites exceeded noise standards preconstruction. Ambient levels ranged from L50 45.1 to 60.4 dBA.</p> <p>Depicted Total Sound assuming 35, 40, 45, 50, 55 and 60 dBA ambient levels.</p> <p>When ambient sound level already approaching or exceeding the 50 dBA threshold the Total Sound level exceeds 50 dBA."</p>			<p>Site Permit granted May 10, 2018, order pending</p>
<p>Stoneray (13-216) Permitted: 2014/2018</p>			

AFCL EXHIBIT F

<p>2017 Noise Analysis for SP amendment</p> <p>Max modeled turbine-only sound level was 48.4 dBA at any receptor.</p> <p>Assumed ambient levels of 40 dba (nighttime) 55 dBA (daytime). "Using both of these values and the highest modeled sound level at any receiver (48.4 dBA) to calculate overall sound levels, the maximum sound level at night is estimated to be 49.0 dBA and 55.9 dBA during the day." (Application at 17).</p>			<p>Permit amendment issued 2/2018</p>
---	--	--	---------------------------------------

AFCL EXHIBIT F

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

BEFORE THE

PUBLIC SERVICE COMMISSION OF WISCONSIN

APPLICATION FOR A CERTIFICATE OF)
PUBLIC CONVENIENCE AND NECESSITY OF) Docket No.
BADGER HOLLOW SOLAR FARM, LLC, TO)
CONSTRUCT A SOLAR ELECTRIC GENERATION) 9697-CE-100
FACILITY, TO BE LOCATED IN IOWA)
COUNTY, WISCONSIN)

APPLICATION FOR A CERTIFICATE OF)
PUBLIC CONVENIENCE AND NECESSITY OF) Docket No.
BADGER HOLLOW SOLAR FARM, LLC, TO)
CONSTRUCT AN ELECTRIC TIE LINE TO) 9697-CE-101
CONNECT A SOLAR ELECTRIC GENERATION)
FACILITY TO THE EXISTING TRANSMISSION)
SYSTEM, TO BE LOCATED IN IOWA COUNTY,)
WISCONSIN)

EXAMINER MICHAEL NEWMARK, PRESIDING

Tr. 45-234 PARTY HEARING SESSION

Reported By:

LYNN M. BAYER, RPR, RMR,
Halma Reporting Group
(414) 271-4466

HEARING HELD:

January 16, 2019

Public Service Commission
Madison, Wisconsin

EXHIBITS:

Hankard 2, MaRous 2,
Litchfield 20, 21
Palmer 6

10:00 a.m.

1 A I do recall that.

2 Q Do you believe that it would have been appropriate to
3 apply a ground factor of 0.2 or 0.3 to your analysis
4 of the Badger Hollow project?

5 A No.

6 Q Why not?

7 A The model that we use has been shown to predict
8 conservatively with 0.5. I mean, 0.5 ground factor
9 is used in probably -- well, with the exception
10 perhaps of wind turbine projects which are different
11 because the source is elevated. But for projects
12 like a typical power plant, a solar plant where the
13 sources are relatively close to the ground, I would
14 say 90 to 99 percent of the studies use 0.5. And
15 when consultants like myself go out and measure these
16 plants after they're constructed to verify our
17 modeling assumptions, that assumption checks out as
18 being, if anything, overpredicting the levels. So
19 there's no need to -- there would be no justification
20 to use something like a .2 or .3 which would predict
21 yet higher levels because we're already demonstrating
22 that the model is probably overpredicting. So that
23 would not be justified for those reasons.

24 MR. NOWICKI: Thank you. No further
25 questions.

AFCL EXHIBIT H

Freeborn FOF

values. All but one of the [six] closest residences meets that threshold.”¹⁹⁴ Mr. MaRous conducted a site specific assessment of the residence located 1,189 feet from the nearest turbine to determine whether there would be an effect on its value. The primary landowner lives on property in Iowa with wind turbines and stated that he believes the turbine lease and location, as proposed, will not have a negative impact on the property value. Accordingly, Mr. MaRous concluded that the Project will not adversely affect land values.¹⁹⁵

126. There is no evidence in the record that shows a Property Value Guarantee (“PVG”) is warranted for the Project. First, the record evidence demonstrates the Project will not negatively impact property values in the Project area. Further, neither DOC-EERA nor the Commission can efficiently or effectively administer a Site Permit condition that would require Freeborn Wind to establish PVGs with homeowners; nor would it be feasible to direct a local government department to implement and administer such a program.¹⁹⁶

127. The record demonstrates that the Project will not negatively impact property values or participating or non-participating landowners, within or near the Project Area.¹⁹⁷

D. Noise

128. The operation of wind turbines produces noise.¹⁹⁸ “Noise” is defined as “any sound *not occurring in the natural environment*, including, but not limited to, sounds emanating from aircraft and highways, and industrial, commercial, and residential sources.”¹⁹⁹ The level of noise varies with the speed of the turbine and the distance of the listener from the turbine.²⁰⁰

129. LWECs, along with all other sources of man-made noise, must comply with the MPCA’s Noise Standards found in Minn. R. Ch. 7030.²⁰¹ The Noise Standards regulate noise from the operation of the wind turbines and other project-related sources. The Noise Standards limit the sound pressure level, measured in decibels, using the A-weighted scale (dB(A)).²⁰² The Noise Standards specify both L₁₀ and L₅₀ limits for one hour periods for daytime and nighttime hours.²⁰³ L₁₀ is the sound pressure level exceeded ten percent of the time for a one hour survey, and L₅₀ is the sound pressure level exceeded 50 percent of the time for a one hour survey.²⁰⁴

130. The Noise Standards are specific to the type of land use adjacent to the Project. The most stringent limits are for Noise Area Classification (“NAC”) 1, which includes household

¹⁹⁴ Ex. FR-9 at 6-7 (MaRous Direct). Three times the turbine height for the V110 model is 1,329 feet and for the V116 model is 1,359 feet. *Id.* at 7.

¹⁹⁵ Ex. FR-9 at 7 (MaRous Direct). The owner of this residence, Paul Follmuth, expressed his strong support for the Project at the public hearing. *See* Public Hearing Tr. at 180-183 (Feb. 20, 2018) (Follmuth).

¹⁹⁶ *See* Ex. EERA-8 at 13 (Comments and Recommendations on a Preliminary Draft Site Permit).

¹⁹⁷ *See* Ex. FR-9 at 3-4, 7 (MaRous Direct); Ex. EERA-8 at 13 (Comments and Recommendations on a Preliminary Draft Site Permit) (citing studies and surveys of Minnesota counties showing that “neither properties hosting turbines nor those adjacent to those properties” “have been negatively impacted by the presence of wind farms.”).

¹⁹⁸ Ex. FR-5 at 4 (Hankard Direct).

¹⁹⁹ Minn. Stat. § 116.06, subd. 15 (emphasis added).

²⁰⁰ Ex. FR-5 at 4 (Hankard Direct).

²⁰¹ Minn. Stat. § § 116.07(c) and 216E.03, subd. 7(d) and Minn. R. Ch. 7030.

²⁰² Minn. R. 7030.0020 and 7030.0040.

²⁰³ Minn. R. 7030.0040.

²⁰⁴ Minn. R. 7030.0020, subp. 7 and 8.

AFCL EXHIBIT H

units, including farm houses.²⁰⁵ In NAC 1, the nighttime noise limit is 50 dB(A).²⁰⁶ The Noise Standards also contain specific measurement procedures to be used for accurately measuring the noise from the source only, while taking care not to include noise from “background noise”, which is defined as “any ambient noise other than the noise to be measured, including wind, precipitation, traffic, etc.”²⁰⁷ The MPCA provides guidance on the implementation of its Noise Standards.²⁰⁸

131. The MPCA separately defines sound occurring in the natural environment. “Background, or ambient, noise” consists of “all noise sources other than the noise source of concern.”²⁰⁹ Because wind is often a major source of background noise, it can frequently present problems when trying to isolate and monitor a specific source of noise.²¹⁰ Accordingly, MPCA’s measurement protocols and guidance state that high wind and rainy weather conditions should be avoided when measuring the noise source.²¹¹ Further, when analyzing a specific noise source along with other noise sources, correction factors can be used to isolate the noise source being monitored and calculate its individual noise level. Specifically, total noise levels from all sources are to be measured and recorded. Then the noise source being measured should be turned off, and a noise level reading taken with all other existing noise sources in operation. Then, the background noise is subtracted from the total noise level to find the noise level of the source being measured.²¹² It is the source noise that must meet the levels set in the Noise Standards.

132. DOC-EERA issued the “Guidance for LWECs Noise Study Protocol and Report” in 2012 addressing post-construction measurement protocols in an effort to standardize sound monitoring methodologies, analysis and presentation.²¹³ The Guidance document intended to assist permittees in conducting post-construction noise compliance surveys; it does not provide detailed recommendations or guidance on pre-construction noise modeling analysis.²¹⁴ Further, the Guidance document is a recommendation from DOC-EERA; it is not binding on applicants or permittees.²¹⁵

133. As part of its Application, Freeborn Wind measured background noise levels and conducted a Noise Analysis to model the predicted project-related noise to ensure that its proposed project layout will comply with the Noise Standards.²¹⁶ Freeborn Wind’s Noise Analysis measured background noise levels in the Project Area to characterize the existing

²⁰⁵ Minn. R. 7030.0050, subp. 2.

²⁰⁶ Minn. R. 7030.0040, subp. 2.

²⁰⁷ Minn. R. 7030.0060 and “A Guide to Noise Control in Minnesota; Acoustical Properties, Measurement, Analysis and Regulation,” MPCA (November 2015) available at: www.pca.state.mn.us (accessed March 8, 2018) [hereinafter “MPCA Guide”] at 13.

²⁰⁸ See, e.g., MPCA Guide.

²⁰⁹ MPCA Guide at 11.

²¹⁰ *Id.*

²¹¹ Minn. R. 7030.0060 and MPCA Guide at 11.

²¹² MPCA Guide at 12.

²¹³ Ex. EERA-9 (2012 Noise Protocol Guidance).

²¹⁴ Ex. EERA-9 (2012 Noise Protocol Guidance) and Evidentiary Hearing Tr. Vol 2 at 183, 186 (Feb. 22, 2018) (Davis).

²¹⁵ Evidentiary Hearing Tr. Vol. 2 at 184 (Feb. 22, 2018) (Davis).

²¹⁶ See Ex. FR-1, Appendix B (Application).

AFCL EXHIBIT H

acoustic environment as it relates to wind turbine operations.²¹⁷ Background noise levels vary significantly in the Project Area, depending on many factors such as the presence of traffic, wind speed, prevailing atmospheric conditions, and time of day.²¹⁸

134. Observed nighttime background noise levels ranged from 29 to 51 dB(A) L_{90} ²¹⁹ during conditions under which the turbines would have operated.²²⁰ The average background noise L_{50} levels range from 33 to 57 dB(A) under conditions during which the turbines would operate (“Critical” and “Full Power” turbine operations). The average background noise L_{10} levels range from 37 to 60 dB(A) under conditions during which the turbines would operate (“Critical” and “Full Power” turbine operations).²²¹

135. The Noise Analysis also modeled noise levels expected from the Project turbines and main transformers. Turbine noise levels expected from full operation of the Project will be 50 dB(A) (one-hour L_{50}) or less at all residences in the area at all times and under all operating and atmospheric conditions. With the exception of one residence, where maximum turbine noise levels are predicted to be 48.9 dB(A), the noise levels from the Project are predicted to be 47 dB(A) or less.²²²

136. This modeling was conducted using conservative assumptions. These are the loudest one-hour levels expected to occur, and the modeling assumes all turbines were operating and producing maximum acoustic output, these emissions propagate out fully in all directions, and that atmospheric conditions will be relatively ideal for the propagation of sound.²²³ In addition, the predicted turbine-only noise levels include the other conservative modeling inputs described in the Noise Analysis, such as a ground factor of 0.0, air temperature of 10°C, and 70 percent relative humidity, resulting in the least amount of ground and atmospheric sound absorption and the highest levels of sound reaching the receivers.²²⁴ Also, 52 of the northernmost turbines located in Iowa were included in the model.²²⁵ Accordingly, these are the loudest one-hour levels expected to occur, and much of the time turbine noise levels will be less.²²⁶ Freeborn Wind’s acoustical expert has verified these conservative assumptions through field measurements at other operating wind projects.²²⁷

137. Freeborn Wind also predicted the total sound level at receptors in the Project Area by logarithmically adding the background noise level to the turbine-only noise level.²²⁸ Estimating total noise levels pre-construction provides a data set to compare to post-construction

²¹⁷ Ex. FR-5 at 9 (Hankard Direct).

²¹⁸ Ex. FR-1, Appendix B at 4, 9 (Application).

²¹⁹ The L_{90} is the most commonly used metric used to quantify background noise levels, and represents the noise level exceeded 90 percent of the measurement interval. Ex. FR-18 at 1 (Hankard Affidavit and Noise Tables).

²²⁰ Ex. FR-1, Appendix B at 9 (Application).

²²¹ Ex. FR-18 at 2, 4 (Hankard Affidavit and Noise Tables).

²²² Ex. FR-5 at 11 (Hankard Direct); *see also* Ex. FR-18 at 5-8, 9 (Hankard Affidavit and Noise Tables).

²²³ Ex. FR-1, Appendix B at 13 (Application); Ex. FR-18 at 2 (Hankard Affidavit and Noise Tables).

²²⁴ Ex. FR-1, Appendix B at 12-13 (Application).

²²⁵ Ex. FR-1, Appendix B at 11 (Application).

²²⁶ Ex. FR-5 at 11 (Hankard Direct); Ex. FR-1, Appendix B at 13 (Application).

²²⁷ Ex. FR-5 at 12 (Hankard Direct).

²²⁸ Ex. FR-18 at 2 (Hankard Affidavit and Noise Tables).

AFCL EXHIBIT H

measured noise levels.²²⁹ Post-construction, total noise must be measured and then background noise levels must be subtracted from the total to estimate the turbine-only noise contribution.²³⁰ The degree of contribution (attribution) is dependent on which level is greater: that of the turbines or that of all other background noise sources.²³¹

138. The results of this analysis show that, when background noise levels are 45 dB(A) or less, total sound levels are 50 dB(A) or less regardless of the turbine-only noise level. When background noise levels are in the 45 to 50 dB(A) range, turbines contribute to the total when turbine-only noise levels are approximately 44 dB(A) or greater. Once background noise levels exceed 50 dB(A), the total sound level exceeds 50 dB(A), but the turbines are not a significant contributor.²³² Due to the conservative nature of the turbine-only noise modeled for the Project, it can be confidently concluded that the Project will comply with the Noise Standards once operational.²³³

139. At the evidentiary hearing and in public comment, there was some discussion of the language in Appendix A of Ex. EERA-9, specifically the sentence under modeling that reads “Developers should not propose projects where total noise is estimated to exceed the noise standards at receptor property” and whether the Noise Standards sets limits on “total noise” or “project-related (i.e., turbine) noise.”²³⁴ The MPCA comment letter to the 2012 Noise Guidance uses imprecise language throughout. That sentence and the modeling and compliance discussions that followed can only be interpreted to mean project-related noise levels cannot exceed the Noise Standards. Any other interpretation would be inconsistent with the definition of noise in Minn. Stat. § 116.06, subd. 15.

140. Public comments also raised concerns regarding LFN and infrasound.²³⁵ LFN is generally defined as having a frequency between 20 and 200 Hertz (“Hz”).²³⁶ Wind turbines also produce infrasound, which is generally defined as sound in the approximately 1 to 20 Hz frequency range. The levels of infrasound produced by wind turbines are many orders of magnitude below currently accepted thresholds of human hearing. Thus, the amount of infrasound produced by wind turbines cannot be heard at all.²³⁷

141. Limiting wind turbine noise emissions using a dB(A) standard (such as the Noise Standards) automatically limits LFN and infrasound. Wind turbine noise has a relatively consistent spectral (frequency) shape; thus, once one part of the spectrum is limited, the rest of the spectrum is limited as well.²³⁸ The 50 dB(A) limit at residences controls Project LFN levels

²²⁹ Ex. EERA-9, Appendix A (2012 Noise Guidance).

²³⁰ Ex. EERA-9, Appendix A (2012 Noise Guidance) and MPCA Guide at 12.

²³¹ Ex. FR-18 at 2-3 (Hankard Affidavit and Noise Tables).

²³² Ex. FR-18 at 2-3, 9 (Hankard Affidavit and Noise Tables).

²³³ Evid. Hearing Tr. Vol. 1B at 112 (Feb. 21, 2018) (Hankard).

²³⁴ See e.g., Evidentiary Hearing Tr. Vol. 2 at 185 (Feb. 22, 2018) (Davis) and Comment of Kristi Rosenquist (March 14, 2019) (eDockets No. 20183-140988-01).

²³⁵ E.g., Comment by Kristi Rosenquist (Oct. 6, 2017) (eDocket No. [201710-136197-01](#)); Comment by Brian Olson (Oct. 9, 2017) (eDocket No. [201710-136293-01](#)); Comment by Erik Nelson (Oct. 9, 2017) (eDocket No. [201710-136273-01](#)).

²³⁶ Ex. FR-5 at 5 (Hankard Direct). LFN is most commonly quantified using the C-weighted decibel (“dB(C)”). *Id.*

²³⁷ Ex. FR-5 at 5-6 (Hankard Direct).

²³⁸ Ex. FR-5 at 7 (Hankard Direct).

AFCL EXHIBIT H

to approximately 60 dB(C) or less at residences, and limits infrasound to levels orders of magnitude below the human hearing threshold.²³⁹ Accordingly, no additional mitigation of LFN or infrasound is supported by the record.

142. The record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts from Project-related noise. Further, the Draft Site Permit contains adequate conditions to monitor and mitigate the noise from the Project. Draft Site Permit Condition 4.3 requires turbines to be placed in appropriate locations to ensure compliance with the Noise Standards.²⁴⁰ Due to the conservative nature of the turbine-only noise modeled for the Project and, it can be concluded that the Project will comply with the Noise Standards once operational.

E. Shadow Flicker

143. Shadow flicker from wind turbines occurs when rotating wind turbine blades move between the sun and the observer. When the blades rotate, this shadow creates a pulsating effect, known as shadow flicker. For shadow flicker to occur, the sun must be shining with no clouds to obscure it, the rotor blades must be spinning and must be located between the receptor and the sun, and the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it.²⁴¹

144. Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors, including: sun angle and sun path, turbine and receptor locations, cloud cover and degree of visibility, wind direction, wind speed, obstacles, contrast, and local topography.²⁴²

145. While some residents may find shadow flicker annoying, there is no scientific data that suggests that shadow flicker exposure, at the rates that are anticipated from the proposed turbine models, will cause negative human health impacts.²⁴³

146. Shadow flicker from turbines is not harmful to the health of photosensitive individuals, including those with epilepsy.²⁴⁴ Seizures that occur as a result of flashes of light (a condition known as photic-stimulated epilepsy) happen as a result of frequencies greater than 5 Hz, usually substantially higher.²⁴⁵ The frequency of any shadow flicker from wind turbines will be approximately 0.5-1 Hz, which is considerably below the range that would elicit a seizure even in someone who is vulnerable to seizures as a result of flashes of light.²⁴⁶ The maximum speed of the turbines will result in 14.88 blade revolutions per minute, which equates to 0.75

²³⁹ Ex. FR-5 at 7 (Hankard Direct).

²⁴⁰ Draft Site Permit at 3 (Jan. 30, 2018) (eDocket No. [20181-139549-01](#)).

²⁴¹ Ex. FR-1, Appendix C at 2-3 (Application).

²⁴² Ex. FR-1, Appendix C at 2-3 (Application).

²⁴³ Ex. EERA-8 at 18 (Comments and Recommendations on Preliminary Draft Site Permit); *see also* Ex. FR-6, Sched. 2 at 6 (Roberts Direct); Ex. FR-6, Sched. 5 at 8-9 (Roberts Direct); Ex. FR-6, Sched. 16 at 127 (Roberts Direct); Ex. FR-6, Sched. 25 at 4 (Roberts Direct); Ex. FR-6, Sched. 26 at 16 (Roberts Direct).

²⁴⁴ Ex. FR-7 at 5 (Corrected Ellenbogen Direct); *see also* Ex. FR-6, Sched. 2 at 6 (Roberts Direct); Ex. FR-6, Sched. 6 at 14 (Roberts Direct); Ex. FR-6, Sched. 26 at 16 (Roberts Direct); Ex. FR-6, Sched. 29 at 37 (Roberts Direct).

²⁴⁵ Ex. FR-7 at 5 (Corrected Ellenbogen Direct).

²⁴⁶ Ex. FR-7 at 5 (Corrected Ellenbogen Direct).

AFCL EXHIBIT H

changes to residential properties caused by wind turbines. The county assessors all stated that wind turbines had no impact on land values in their counties.⁷² There was one report of a tax valuation appeal based on proximity to wind turbines, but it was denied due to lack of evidence.⁷³

Mr. MaRous's un rebutted testimony demonstrates that the Project will not adversely affect land values in the Project Area.⁷⁴

D. Noise.

LWECS, along with all other "sources" of man-made noise, must comply with the MPCA's Noise Standards found in Minnesota Rules Chapter 7030.⁷⁵ Draft Site Permit Condition 4.3 requires turbines to be placed in appropriate locations to ensure compliance with the Noise Standards.⁷⁶

"Noise" is defined as "any sound *not occurring in the natural environment*, including, but not limited to, sounds emanating from aircraft and highways, and industrial, commercial, and residential sources."⁷⁷ In this case, the Noise Standards regulate noise from the operation of the wind turbines and other project-related sources. The Noise Standards limit the sound pressure level, measured in decibels, using the A-weighted scale ("dB(A)").⁷⁸ The Noise Standards specify both L₁₀ and L₅₀ limits for one hour periods for daytime and nighttime hours.⁷⁹ L₁₀ is the

⁷² Ex. FR-1, Appendix E at 34 (Minnesota) at 35 (Illinois) (Application); Ex. FR-9 at 5-6 (MaRous Direct).

⁷³ Ex. FR-9 at 6 (MaRous Direct).

⁷⁴ Ex. FR-9 at 4-5 (MaRous Direct).

⁷⁵ Minn. Stat. §§ 116.07(c) and 216E.03, subd. 7(d) and Minn. R. Ch. 7030.

⁷⁶ Draft Site Permit at 3 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁷ Minn. Stat. § 116.06, subd. 15 (emphasis added).

⁷⁸ Minn. R. 7030.0020 and 7030.0040.

⁷⁹ Minn. R. 7030.0040.

AFCL EXHIBIT I

sound pressure level exceeded ten percent of the time for a one hour survey, and L₅₀ is the sound pressure level exceeded 50 percent of the time for a one hour survey.⁸⁰

The Noise Standards in Minn. R. 7030.0040 are specific to the type of land use adjacent to the Project and apply to all “sources.” The most stringent limits are for Noise Area Classification (“NAC”) 1, which includes household units, including farm houses.⁸¹ For NAC1, the noise limits are as follows:⁸²

NAC	Daytime		Nighttime	
	L ₅₀	L ₁₀	L ₅₀	L ₁₀
NAC1	60	65	50	55

The Noise Standards also contain specific measurement procedures to be used for accurately measuring the noise from the source only, while taking care not to include “background noise”, which is defined as “any ambient noise other than the noise to be measured, including wind, precipitation, traffic, etc.”⁸³ The MPCA provides guidance on the implementation of its Noise Standards and how to measure the “source” to determine compliance.⁸⁴

The MPCA separately defines sound occurring in the natural environment. “[B]ackground, or ambient, noise” consists of “all noise sources other than the noise source of concern.”⁸⁵ Because wind is often a major source of background noise, it can frequently present problems when trying to isolate and monitor a specific source of noise.⁸⁶ Accordingly, MPCA’s measurement protocols and guidance state that high wind and rainy weather conditions should be

⁸⁰ Minn. R. 7030.0020, subp. 7 and 8.

⁸¹ Minn. R. 7030.0050, subp. 2.

⁸² Minn. R. 7030.0040, subp. 2.

⁸³ Minn. R. 7030.0060 and MPCA Guide at 13.

⁸⁴ See, e.g., MPCA Guide.

⁸⁵ MPCA Guide at 11.

⁸⁶ *Id.*

AFCL EXHIBIT I

avoided when measuring the noise source.⁸⁷ Further, when analyzing a specific noise source along with other noise sources, correction factors can be used to isolate the noise source being monitored and calculate its individual noise level.⁸⁸ Specifically, total noise levels from all sources, i.e., the noise source of interest and the background noise are to be measured and recorded.⁸⁹ Then the noise source being measured should be turned off, and a noise level reading taken with all other existing noise sources in operation.⁹⁰ Then, the background noise is subtracted from the total noise level to find the noise level of the source being measured.⁹¹

Because LWECS, like the Project, are necessarily sited in windy areas of the state to most efficiently capture the wind resource, separating the wind turbine noise and background noise levels is paramount for determining compliance with the Noise Standards. Recognizing the need to standardize sound monitoring methodologies, analysis and presentation, DOC-EERA issued the “Guidance for LWECS Noise Study Protocol and Report” in 2012 addressing post-construction measurement protocols.⁹² This Guidance document is a recommendation from DOC-EERA; it is not binding on applicants or permittees.⁹³ Moreover, the Guidance is intended to assist permittees in conducting **post-construction** noise compliance surveys, it does not provide detailed recommendations or guidance on pre-construction noise modeling analysis.⁹⁴

As part of its Application, Freeborn Wind measured background noise levels and conducted a Noise Analysis to model the predicted project-related noise to ensure that its

⁸⁷ Minn. R. 7030.0060 and MPCA Guide at 11.

⁸⁸ MPCA Guide at 12.

⁸⁹ *Id.*

⁹⁰ *Id.*

⁹¹ *Id.*

⁹² Ex. EERA-9 (2012 Noise Protocol Guidance).

⁹³ Evidentiary Hearing Tr. Vol. 2 at 184 (Feb. 22, 2018) (Davis).

⁹⁴ Ex. EERA-9 (2012 Noise Protocol Guidance) and Evidentiary Hearing Tr. Vol 2 at 183, 186 (Feb. 22, 2018) (Davis).

AFCL EXHIBIT I

proposed Project layout will comply with the Noise Standards.⁹⁵ Freeborn Wind's Noise Analysis measured background noise levels in the Project Area to characterize the existing acoustic environment as it relates to wind turbine operations.⁹⁶ Background noise levels vary significantly in the Project Area, depending on many factors, such as the presence of traffic, wind speed, prevailing atmospheric conditions, and time of day.⁹⁷ Observed nighttime background noise levels ranged from 29 to 51 dB(A) L₉₀ during conditions under which the turbines would have operated.⁹⁸ The average background noise L₅₀ levels range from 33 to 57 dB(A) under conditions during which the turbines would operate ("Critical" and "Full Power" turbine operations).⁹⁹ The average background noise L₁₀ levels range from 37 to 60 dB(A) under conditions during which the turbines would operate ("Critical" and "Full Power" turbine operations).¹⁰⁰

In addition to measuring background noise levels, the Noise Analysis also modeled noise levels expected from the Project turbines and main transformers. Turbine noise levels expected from full operation of the Project will be 50 dB(A) (one-hour L₅₀) or less at all residences in the area at all times and under all operating and atmospheric conditions.¹⁰¹ With the exception of

⁹⁵ See Ex. FR-1, Appendix B (Application).

⁹⁶ Ex. FR-5 at 9 (Hankard Direct).

⁹⁷ Ex. FR-1, Appendix B at 4, 9 (Application).

⁹⁸ Ex. FR-1, Appendix B at 9 (Application). The L₉₀ is the most commonly used metric used to quantify background noise levels, and represents the noise level exceeded 90 percent of the measurement interval. Ex. FR-18 at 1 (Hankard Affidavit and Noise Tables).

⁹⁹ Ex. FR-18 at 2, 4 (Hankard Affidavit and Noise Tables).

¹⁰⁰ Ex. FR-18 at 2, 4 (Hankard Affidavit and Noise Tables).

¹⁰¹ Ex. FR-5 at 11 (Hankard Direct); see also Ex. FR-18 at 5-9 (Hankard Affidavit and Noise Tables).

AFCL EXHIBIT I

one residence, where maximum turbine noise levels are predicted to be 48.9 dB(A), the noise levels from the Project are predicted to be 47 dB(A) or less.¹⁰²

The modeling was conducted using conservative assumptions. For example, the modeling assumes all turbines were operating and producing maximum acoustic output, these emissions propagate out fully in all directions, and that atmospheric conditions will be relatively ideal for the propagation of sound.¹⁰³ The predicted turbine-only noise levels include the other conservative modeling inputs described in the Noise Analysis, including, for example, a ground factor of 0.0, air temperature of 10°C, and 70 percent relative humidity, resulting in the least amount of ground and atmospheric sound absorption and the highest levels of sound reaching the receivers.¹⁰⁴ Also, 52 of the northernmost turbines located in Iowa were included in the model.¹⁰⁵ Accordingly, these are the loudest one-hour levels expected to occur, and much of the time turbine noise levels will be less.¹⁰⁶ Freeborn Wind's acoustical expert has verified these conservative assumptions through field measurements at other operating wind projects.¹⁰⁷

Freeborn Wind also predicted the total sound level at receptors in the Project Area by logarithmically adding the background noise level to the turbine-only noise level.¹⁰⁸ Estimating total sound levels pre-construction, i.e., Project noise and background noise, provides a data set

¹⁰² Ex. FR-5 at 11 (Hankard Direct); *see also* Ex. FR-18 at 5-9 (Hankard Affidavit and Noise Tables).

¹⁰³ Ex. FR-1, Appendix B at 13 (Application); Ex. FR-18 at 2 (Hankard Affidavit and Noise Tables).

¹⁰⁴ Ex. FR-1, Appendix B at 12-13 (Application).

¹⁰⁵ Ex. FR-1, Appendix B at 11 (Application).

¹⁰⁶ Ex. FR-5 at 11 (Hankard Direct); *see also* Ex. FR-18 at 5-9 (Hankard Affidavit and Noise Tables).

¹⁰⁷ Ex. FR-5 at 12 (Hankard Direct).

¹⁰⁸ Ex. FR-18 at 2 (Hankard Affidavit and Noise Tables).

AFCL EXHIBIT I

to compare to post-construction measured sound levels.¹⁰⁹ Post-construction, total sound must be measured (as that is all one can measure), and then background noise levels must be subtracted from the total to estimate the turbine-only noise contribution.¹¹⁰ The degree of contribution (attribution) is dependent on which level is greater: that of the turbines or that of all other background noise sources.¹¹¹ This is particularly true when one is dealing with logarithmic addition, which more greatly favors the loudest level. The results of this analysis show that, when background noise levels are 45 dB(A) or less, total sound levels are 50 dB(A) or less regardless of the turbine-only noise level. When background noise levels are in the 45 to 50 dB(A) range, turbines contribute to the total when turbine-only noise levels are approximately 44 dB(A) or greater. Once background noise levels exceed 50 dB(A), the total sound level exceeds 50 dB(A), but the turbines are not a significant contributor.¹¹² Due to the conservative nature of the turbine-only noise modeled for the Project, it can be confidently concluded that the Project will comply with the Noise Standards once operational.¹¹³

At the evidentiary hearing and in public comment, there was some discussion of the language in Appendix A of Ex. EERA-9, specifically the sentence under modeling that reads “Developers should not propose projects where total noise is estimated to exceed the noise standards at receptor property” and whether the Noise Standards sets limits on “total noise” or “project-related (i.e., turbine) noise.”¹¹⁴ The MPCA comment letter to the 2012 Noise Guidance uses imprecise language throughout, and that sentence and the following modeling and

¹⁰⁹ Ex. EERA-9, Appendix A (2012 Noise Guidance).

¹¹⁰ Ex. EERA-9, Appendix A (2012 Noise Guidance) and MPCA Guide.

¹¹¹ Ex. FR-18 at 2-3 (Hankard Affidavit and Noise Tables).

¹¹² Ex. FR-18 at 2, 5-9 (Hankard Affidavit and Noise Tables).

¹¹³ Evidentiary Hearing Tr. Vol. 1B at 112 (Feb. 21, 2018) (Hankard).

¹¹⁴ *See e.g.*, Evidentiary Hearing Tr. Vol. 2 at 185 (Feb. 22, 2018) (Davis) and Comment of Kristi Rosenquist (March 14, 2018) (eDockets No. [20183-140988-01](#)).

AFCL EXHIBIT I

compliance discussions can only be interpreted to mean project-related noise levels cannot exceed the Noise Standards. Any other interpretation would be inconsistent with the definition of noise in Minn. Stat. § 116.06, subd. 15, which is the subject of regulation under Minn. Stat. Chapter 116 and implementing rules, i.e., Minn. R. Ch. 7030.

A number of public comments also raised concerns regarding low frequency noise (“LFN”) and infrasound.¹¹⁵ LFN is generally defined as sound having a frequency between 20 and 200 Hertz (“Hz”).¹¹⁶ Infrasound is generally defined in the ~1 to 20 Hz frequency range.¹¹⁷ The levels of infrasound produced by wind turbines are many orders of magnitude below currently accepted thresholds of human hearing. Thus, the amount of infrasound produced by wind turbines cannot be heard at all.¹¹⁸

Freeborn Wind’s acoustical expert, Mr. Mike Hankard, testified that limiting wind turbine noise emissions using a dB(A) standard (such as the Noise Standards) automatically limits LFN and infrasound. Wind turbine noise has a relatively consistent spectral (frequency) shape; thus, once one part of the spectrum is limited, the rest of the spectrum is limited as well.¹¹⁹ The 50 dB(A) limit at residences controls Project LFN levels to approximately 60 dB(C)¹²⁰ or less at residences, and limits infrasound to levels orders of magnitude below the

¹¹⁵ *E.g.*, Comment by Kristi Rosenquist (Oct. 6, 2017) (eDocket No. [201710-136197-01](#)); Comment by Brian Olson (Oct. 9, 2017) (eDocket No. [201710-136293-01](#)); Comment by Erik Nelson (Oct. 9, 2017) (eDocket No. [201710-136273-01](#)).

¹¹⁶ Ex. FR-5 at 5 (Hankard Direct).

¹¹⁷ Ex. FR-5 at 5 (Hankard Direct).

¹¹⁸ Ex. FR-5 at 5 (Hankard Direct).

¹¹⁹ Ex. FR-5 at 7 (Hankard Direct).

¹²⁰ LFN is most commonly quantified using the C-weighted decibel (“dB(C”). Ex. FR-5 at 7 (Hankard Direct).

AFCL EXHIBIT I

human hearing threshold.¹²¹ Accordingly, no additional mitigation of LFN or infrasound is supported by the record.

E. Shadow Flicker.

Shadow flicker from wind turbines occurs when rotating wind turbine blades move between the sun and the observer.¹²² If the blade's shadow is passing over the window of a building, it will have the effect of increasing and decreasing the light intensity in the room at a low frequency, hence the term "flicker."¹²³

Shadow flicker occurs only under a limited set of conditions. For shadow flicker to occur, the sun must be shining with no clouds to obscure it, the rotor blades must be spinning and must be located between the receptor and the sun, and the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it.¹²⁴ Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors, including: sun angle and sun path, turbine and receptor locations, cloud cover and degree of visibility, wind direction, wind speed, obstacles, contrast, and local topography.¹²⁵

While some residents may find shadow flicker annoying, there is no scientific data that suggests that shadow flicker exposure, at the rates that are anticipated from the proposed turbine models, will cause negative human health impacts.¹²⁶ Shadow flicker from turbines is not harmful to the health of photosensitive individuals, including those with epilepsy.¹²⁷ The maximum speed of the turbines will result in 14.88 blade revolutions per minute, which equates

¹²¹ Ex. FR-5 at 7 (Hankard Direct).

¹²² Ex. FR-1 at 36 (Application).

¹²³ Ex. FR-1 at 36 (Application).

¹²⁴ Ex. FR-1, Appendix C at 2-3 (Application).

¹²⁵ Ex. FR-1, Appendix C at 2-3 (Application).

¹²⁶ Ex. EERA-8 at 18 (Comments and Recommendations on a Preliminary Draft Site Permit).

¹²⁷ Ex. FR-1 at 39 (Application).

AFCL's legal counsel are not evidence and cannot be used to raise an issue of fact where none exists.

B. The Noise Analysis Performed for the Project Used Conservative Estimates to Ensure the Project Will Comply with the Noise Standards.

AFCL argues that Freeborn Wind has provided an insufficient noise analysis to demonstrate compliance with the Minnesota Noise Standards.¹² AFCL's arguments largely center on two concepts: a "margin of error" and the inclusion of ambient (or background) noise within the modeling.¹³ Neither argument has merit.

As discussed in Freeborn Wind's Initial Post-Hearing Brief, there are two defined terms that must be understood and used consistently to correctly apply Minnesota's Noise Standards:

Noise	"any sound not occurring in the natural environment, including, but not limited to, sounds emanating from aircraft and highways, and industrial, commercial, and residential sources." ¹⁴
Background noise	"all noise sources other than the noise source of concern." ¹⁵

The Noise Standards, by the statutory definition, regulate noise from sources not occurring in the natural environment.¹⁶ As Mr. Hankard testified, Minn. R. 7030.0040 states that the Noise Standards apply to "all sources", meaning that they apply to "any kind of source; a wind turbine, a gravel mine, a grain dryer."¹⁷

AFCL first asserts that Freeborn Wind's Noise Analysis contained an insufficient "margin of error" to demonstrate compliance.¹⁸ During the evidentiary hearing, counsel for

¹² See AFCL Initial Brief at 30-37 (March 20, 2018) (eDocket No. [20183-141225-02](#)).
¹³ See AFCL Initial Brief at 33-34 (March 20, 2018) (eDocket No. [20183-141225-02](#)).
¹⁴ Minn. Stat. § 116.06, subd. 15.
¹⁵ "A Guide to Noise Control in Minnesota; Acoustical Properties, Measurement, Analysis and Regulation," MPCA (Nov. 2015) available at: <https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf> (accessed March 8, 2018) [hereinafter "MPCA Guide"] at 11.
¹⁶ See Minn. Stat. § 116.06, subd. 15 and Minn. R. 7030.0040.
¹⁷ Evidentiary Hearing Tr. Vol. 1B at 104 (Feb. 21, 2018) (Hankard).
¹⁸ AFCL Initial Brief at 34 (March 20, 2018) (eDocket No. [20183-141225-02](#)).

AFCL EXHIBIT J

AFCL asked Mr. Hankard a series of questions regarding what “margin of error” was reflected within the noise modeling he conducted.¹⁹ Mr. Hankard testified that the ISO 9613-2 method used for the modeling has a stated margin of error of +/- 3 decibels.²⁰ While AFCL appears to latch on to this number to assert that there could be as many as 40 locations out of the compliance with the Noise Standards if 3 A-weighted decibels (“dB(A)”) were added to the modeled turbine noise, that assertion is false and ignores further record evidence on this point—evidence that rejected AFCL’s mathematical theory. Specifically, Mr. Hankard testified:

Q I am asking you to explain how your margin of error could be applied to the estimated noise levels that you presented. I'm wondering, if I were to argue to you that really 48.9 should be considered actually 3 decibels higher, since you told me there was a 3-decibel margin of error, would that be a fair conclusion, based on your modeling and then what you've told me about margin of error?

A No.

Q Why not?

A Because if I had gone about my modeling with choosing, let's say, the middle factors on all of those things that I just listed, I choose a moderate ground factor and a moderate atmospheric absorption coefficient and made middle-the-road-assumptions, then, yes, I think you could add the 3 decibels onto my results and -- because there would be some uncertainty.

But I'd like to think that I have, from my professional work, taken the uncertainty somewhat out of the equation by, A, using very, very conservative assumptions; and, B, calibrating my results to real-world measurements on previous projects.²¹

Second, AFCL asserts that Freeborn Wind’s Noise Analysis was insufficient because Freeborn Wind did not provide a total noise estimate (*i.e.*, turbine noise plus background noise)

¹⁹ See, e.g., Evidentiary Hearing Tr. Vol. 1B at 64 (Feb. 21, 2018) (Hankard).

²⁰ Evidentiary Hearing Tr. Vol. 1B at 64 (Feb. 21, 2018) (Hankard).

²¹ Evidentiary Hearing Tr. Vol. 1B at 113-114 (Feb. 21, 2018) (Hankard).

AFCL EXHIBIT J

until one week after the evidentiary hearing.²² As discussed at length in Freeborn Wind's Initial Post-Hearing Brief, the Noise Standards limit noise from a source not occurring in the natural environment.²³ AFCL relies on the Minnesota Pollution Control Agency's ("MPCA") comment letter in Appendix A to DOC-EERA's 2012 Noise Guidance for LWECS Noise Study Protocol and Report ("2012 Noise Guidance") to assert that it is total noise that must be below 50 dB(A) to comply with the Noise Standards.²⁴ Agency guidance cannot be interpreted in a manner inconsistent with the statute.²⁵ The clear statutory definition of noise is directly contrary to AFCL's position.²⁶

The reason that background noise is relevant to an analysis of any source's compliance with the Noise Standards is that when measuring noise in the outdoor environment, the natural environment gets measured along with the noise source of concern.²⁷ Background noise must then be subtracted from the total recorded measurements to determine the noise from the measured source (here, wind turbines).²⁸

As described in Appendix A to DOC-EERA's 2012 Noise Guidance, one of the reasons to provide the total noise pre-construction is to set expectations in the community as to what levels of noise are likely to occur once the project is operational.²⁹ Freeborn Wind's Noise Analysis contained the underlying data sets (turbine noise and background noise), but the logarithmic math adding the two was completed in response to questions at the hearing from

²² See AFCL Initial Brief at 33-34 (March 20, 2018) (eDocket No. [20183-141225-02](#)).

²³ See Freeborn Wind Initial Brief at 17-19 (March 20, 2018) (eDocket No. [20183-141214-02](#)).

²⁴ See AFCL Initial Brief at 33-34 (March 20, 2018) (eDocket No. [20183-141225-02](#)).

²⁵ *State by Spannaus v. Northwestern Bell Telephone Co.*, 304 N.W.2d 872, 876 (Minn. 1981).

²⁶ See Minn. Stat. § 116.06, subd. 15 ("Noise" means any sound not occurring in the natural environment, including, but not limited to, sounds emanating from aircraft and highways, and industrial, commercial, and residential sources.").

²⁷ Evidentiary Hearing Tr. Vol. 1B at 121 (Feb. 21, 2018) (Hankard).

²⁸ See MPCA Guide at 12.

²⁹ Ex. EERA-9, Appendix A (2012 Noise Guidance).

AFCL EXHIBIT J

DOC-EERA.³⁰ These total noise numbers are relevant post-construction.³¹ Pre-construction, it is the conservative modeling Freeborn Wind conducted that is relevant for determining whether the Project will comply with the Noise Standards once operational. The record here demonstrates that Freeborn Wind included very conservative assumptions in its modeling and calibrated its modeling with real world data to ensure that modeled estimates are conservatively high and that the Project will comply with the Noise Standards once built.³²

C. Freeborn Wind has Analyzed Potential Impacts from Shadow Flicker and Proposed Appropriate Mitigation Measures.

AFCL's arguments regarding the Project's impacts from shadow flicker are based on a fundamental misunderstanding of the shadow flicker data and erroneous addition by a layperson.³³ Indeed, the source of the numbers listed in AFCL's argument is unclear. The ALJ should rely on the shadow flicker modeling contained in the Shadow Flicker Assessment in Appendix C of the Application and the additional shadow flicker assessment contained in Schedule 1 to Mr. Litchfield's Rebuttal Testimony as providing the best evidence in the record of shadow flicker levels for all residences affected by the Project.³⁴

Freeborn Wind thoroughly analyzed shadow flicker when siting wind turbines and has proposed appropriate mitigation measures to minimize impacts to all area residents.³⁵ Freeborn Wind's shadow flicker modeling is based on conservative assumptions and was performed utilizing the world's leading software tool for wind farm design and shadow flicker analysis.³⁶

³⁰ Ex. FR-1, Appendix B at 9, 14, 31-40 and 42-43 (Application); Ex. FR-18 at 5-9 (Affidavit of Mike Hankard and Noise Tables).

³¹ Ex. EERA-9, Appendix A (2012 Noise Guidance) and Evidentiary Hearing Tr. Vol. 2 at 184-185 (Feb. 22, 2018) (Davis).

³² See Evidentiary Hearing Tr. Vol. 1B at 111-112 (Feb. 21, 2018) (Hankard).

³³ See, e.g., AFCL Initial Brief at 43-44 (March 20, 2018) (eDocket No. [20183-141225-02](#)).

³⁴ See Ex. FR-1, Appendix C (Application) and Ex. FR-11, Sched. 1 (Litchfield Rebuttal).

³⁵ See Ex. FR-1 at 40 (Application); Ex. FR-1, Appendix C (Application).

³⁶ Ex. FR-1, Appendix C at 3 (Application).

AFFIDAVIT OF MIKE HANKARD

In the Matter of the Application of Freeborn Wind Energy LLC for a Large Wind Energy Conversion System Site Permit for the up to 84 MW Freeborn Wind Farm in Freeborn County

**MPUC Docket No. IP-6946/WS-17-410;
OAH Docket No. 80-2500-34633**

STATE OF WISCONSIN)
) SS.
COUNTY OF DANE)

MIKE HANKARD, being first duly sworn on oath, deposes and states as follows:

- 1. I am the president and principal of Hankard Environmental, Inc., and I make this affidavit on personal knowledge and records with which I am familiar.
- 2. I hereby affirm that the factual information contained in the following exhibit of the Applicant Freeborn Wind Energy LLC ("Freeborn Wind") is true and correct to the best of my knowledge:

Ex. FR-18

- 3. Freeborn Wind's exhibit Ex. FR-18 contains a true and correct calculation of total predicted noise based using the predicted wind turbine noise levels (FR-1 at 14 and Appendix C (Appendix B of the Site Permit Application, the "Noise Analysis")) and the observed nighttime ambient noise levels (FR-1 at 19 and Appendix D (Noise Analysis)).
- 4. In late March and early April 2017, Freeborn Wind measured ambient noise levels and found that ambient levels vary significantly in the Project Area, depending on many factors, such as the wind speed, prevailing atmospheric conditions, the time of day, other noise sources, etc. Table 4-2 of the Noise Analysis presents observed nighttime ambient noise levels at the measurement locations ranging from 29-51 dB(A) L₉₀ during conditions under which the turbines would have operated. The L₉₀ is the most commonly used metric used to quantify ambient noise levels, and is the metric recommended by the National Association of Regulatory Commissioners guidance document prepared for the Minnesota Public Utilities Commission. (*Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects*, October 2011.) It represents the noise level exceeded 90% of the measurement interval.
- 5. However, the State of Minnesota regulates noise using the one-hour L₅₀ and the one-hour L₁₀, which are the noise level exceeded 50% and 10% of the time during the measurement

interval, respectively. The average ambient L_{50} and L_{10} levels are shown in Table 1 of FR-18, and were calculated from the measured ambient noise levels using the same procedures followed to determine average L_{90} values. The average L_{50} levels range from 33 to 57 dB(A) under conditions during which the turbines would operate (“Critical” and “Full Power” turbine operations). The average L_{10} levels range from 37 to 60 dB(A) under conditions during which the turbines would operate (“Critical” and “Full Power” turbine operations). All of these values are for nighttime hours, per rule 7030.0040.

6. The one-hour L_{50} ambient levels were logarithmically added to the turbine-only noise levels to calculate the total noise levels that would be expected during turbine operations. This is an “apples to apples” comparison, as the turbine-only noise levels are equivalent to L_{50} levels. Table 2 of FR-18 lists the predicted total noise levels at each receptor included in the Noise Analysis, assuming the lowest ambient noise level (33 dB(A)), the highest ambient noise level (57 dB(A)), and three intermediate levels (40, 45, and 50 dB(A)). This calculation was not performed using the L_{10} ambient noise levels, as this would not be an “apples to apples” comparison given that turbine-only levels are, essentially, in terms of the L_{50} .
7. Consistent with Freeborn Wind’s conservative approach to noise modelling, for the purposes of the total noise calculations, Freeborn Wind added the wind turbine-related noise levels presented in Appendix C to the Noise Analysis to all ambient background levels. These predicted turbine noise levels are conservatively high because they assume all turbines were operating and produced maximum acoustic output, these emissions propagate out fully in all directions, and that atmospheric conditions will be relatively ideal for the propagation of sound. This analysis is additionally conservative because at the lower “Critical” wind speed levels, wind turbines can be expected to operate below full acoustic output. Yet, full acoustic output was assumed.
8. In addition to assuming full-acoustic output at all wind speeds, the predicted turbine-only noise levels continue to include the other conservative modelling inputs described in the Noise Analysis, including, for example, a ground factor of 0.0, air temperature of 10°C, and 70% relative humidity, resulting in the least amount of ground and atmospheric sound absorption and the highest levels of sound reaching the receivers.
9. FR-18 Table 3 is a summary of the total noise calculation results, and lists the predicted total noise level (the ambient noise level logarithmically added to the turbine-only noise level) for a range of turbine-only noise levels and a range of ambient noise levels. The turbine-only noise levels chosen represent the highest single predicted turbine-only noise level on the project (~49 dB(A)), the next highest predicted turbine-only noise level (47 dB(A)), a level 3 dB(A) below this (44 dB(A)), and 40 dB(A). The range of ambient levels chosen represent ~5 dB(A) increments between the highest and lowest ambient noise levels measured at the site during wind conditions in which the turbines would have operated.
10. As shown in Tables 2 and 3, when assuming ambient sound levels are 45 dB(A) or less, total sound levels are 50 dB(A) or less regardless of the turbine-only noise level. When ambient noise levels are in the 45 to 50 dB(A) range, turbines contribute to the total when turbine-only noise levels are about 44 dBA or greater. The degree of contribution (attribution) is

dependent on which level is greater, that of the turbines or that of all other ambient noise sources. Once ambient noise levels exceed 50 dB(A), the total noise level of course also exceeds 50 dB(A), but the turbines are not a significant contributor.

Dated this 1st day of March 2018



Mike Hankard

Subscribed and sworn to before me
this 1st day of March, 2018



Notary Public

**Notary Public
State of Wisconsin
Laura Brennan**

Table 1 Freeborn Wind Nighttime Ambient Noise Levels

Measurement Location	Measurement Period		Average 10-Min L ₅₀ (dBA)			Average 10-Min L ₅₀ (dBA)			Average 10-Min L ₁₀ (dBA)		
	Start	Stop	Cut-In	Critical	Full Power	Cut-In	Critical	Full Power	Cut-In	Critical	Full Power
M1	3/21/2018 17:00	4/5/2018 14:40	30	41	50	34	43	54	37	46	57
M2	3/22/2018 15:00	4/5/2018 18:00	25	36	47 [†]	27	38	48 [†]	33	43	50 [†]
M3	3/22/2018 11:00	4/6/2018 12:50	23	29	44	26	33	47	30	37	53
M4	3/22/2018 14:00	4/5/2018 16:50	29	36	50	30	40	57	34	46	60
M5	3/23/2018 10:00	4/5/2018 8:40	28	33	51	30	35	55	35	40	57

† 10 m/s @ 10 m not observed, fit from curve

AFCL EXHIBIT K

Table 2 Freeborn Wind Total Noise Levels, L₅₀

Receptor ID	Participation NAC	Status	UTM Zone 15		Total Noise Level (dBA, L ₅₀)						
			Easting (m)	Northing (m)	Ground Elevation (m ASL)	Turbine-Only Noise Level (dBA)	Ambient 33 dBA	Ambient 40 dBA	Ambient 45 dBA	Ambient 50 dBA	Ambient 57 dBA
							Plus Turbine Noise Level (dBA)				
R52	1	N	491123.1	4834254.3	388.8	31.5	35	41	45	50	57
R53	1	N	491241.9	4834213.1	387.5	31.3	35	41	45	50	57
R54	1	N	490749.6	4834865.8	388.9	30.5	35	40	45	50	57
R55	1	N	490708.0	4834734.0	389.0	31.1	35	41	45	50	57
R56	1	N	490414.4	4834881.4	387.9	31.3	35	41	45	50	57
R57	1	N	490353.8	4834700.9	387.5	32.2	36	41	45	50	57
R58	1	N	489695.4	4834897.6	386.5	33.1	36	41	45	50	57
R59	1	N	489611.0	4834901.8	385.5	33.3	36	41	45	50	57
R60	1	N	489297.7	4834976.7	386.3	33.3	36	41	45	50	57
R61	1	N	489201.0	4834880.8	384.2	34.0	37	41	45	50	57
R62	1	N	489095.3	4834878.0	384.5	34.1	37	41	45	50	57
R63	1	N	488872.7	4834743.0	385.1	35.1	37	41	45	50	57
R64	1	N	488547.0	4834785.4	384.6	34.4	37	41	45	50	57
R65	1	N	488402.7	4834903.0	384.9	33.4	36	41	45	50	57
R66	1	N	487727.7	4834885.5	384.1	32.4	36	41	45	50	57
R67	1	N	487110.6	4834670.4	386.7	32.6	36	41	45	50	57
R68	1	N	486699.9	4834669.5	390.6	31.9	35	41	45	50	57
R69	1	N	486453.7	4833834.6	384.6	35.7	38	41	45	50	57
R70	1	N	485711.7	4832179.7	380.6	38.1	39	42	46	50	57
R71	1	N	485736.6	4832667.1	381.9	36.5	38	42	46	50	57
R72	1	N	487896.6	4832301.7	391.6	41.8	42	44	47	51	57
R73	1	N	487929.6	4832232.1	391.6	41.5	42	44	47	51	57
R74	1	N	487999.4	4833133.4	390.2	41.6	42	44	47	51	57
R75	1	N	488003.0	4833156.3	389.7	41.5	42	44	47	51	57
R76	1	P	487929.5	4833979.9	389.1	37.6	39	42	46	50	57
R77	1	P	488159.3	4833937.6	389.1	38.7	40	42	46	50	57
R78	1	N	487703.9	4832994.9	391.5	45.5	46	47	48	51	57
R79	1	N	490705.8	4834021.9	391.5	33.7	36	41	45	50	57
R80	1	N	490667.3	4833970.6	392.0	34.0	37	41	45	50	57
R81	1	P	491227.3	4833962.1	391.1	32.1	36	41	45	50	57
R82	1	N	491226.5	4833797.4	391.2	32.7	36	41	45	50	57
R83	1	N	491097.2	4833803.3	392.0	33.1	36	41	45	50	57
R84	1	P	491371.4	4832825.4	384.6	36.4	38	42	46	50	57
R85	1	P	490881.9	4832287.3	387.7	43.9	44	45	47	51	57
R86	1	P	490127.4	4832569.0	392.6	43.5	44	45	47	51	57
R87	1	P	489445.4	4832495.3	389.8	43.1	44	45	47	51	57
R88	1	P	489252.0	4832379.2	386.2	42.6	43	45	47	51	57
R89	1	N	488643.0	4832486.6	390.1	40.4	41	43	46	50	57
R90	1	P	487807.7	4831759.1	388.8	43.0	43	45	47	51	57
R91	1	P	488305.5	4831307.3	390.7	39.9	41	43	46	50	57
R92	1	P	488025.3	4830990.6	390.4	41.1	42	44	46	51	57
R93	1	P	488742.3	4830847.4	396.8	38.8	40	42	46	50	57
R94	1	P	489027.2	4830750.9	391.9	39.6	40	43	46	50	57
R95	1	N	489119.5	4830895.2	388.7	40.6	41	43	46	50	57
R96	1	P	489845.5	4830871.3	385.7	47.6	48	48	50	52	57
R97	1	N	491644.5	4830961.0	383.9	38.5	40	42	46	50	57
R98	1	N	491882.3	4830026.0	380.3	34.9	37	41	45	50	57
R104	1	N	491425.2	4829146.6	381.0	33.2	36	41	45	50	57
R105	1	N	490812.6	4829139.3	378.2	34.7	37	41	45	50	57
R106	1	N	490347.8	4829157.0	381.8	35.2	37	41	45	50	57
R107	1	N	489534.4	4829244.9	389.7	34.7	37	41	45	50	57
R108	1	N	489844.4	4828725.2	389.3	32.7	36	41	45	50	57
R109	1	N	489338.3	4829061.4	388.5	33.7	36	41	45	50	57
R110	1	N	488613.5	4829366.8	388.3	34.1	37	41	45	50	57
R111	1	P	487587.7	4829959.5	391.8	37.7	39	42	46	50	57
R112	1	P	488447.4	4830073.9	394.4	36.3	38	42	46	50	57
R113	1	N	487565.7	4830393.4	395.2	40.2	41	43	46	50	57
R114	1	P	487743.9	4830937.5	390.4	43.7	44	45	47	51	57
R115	1	N	486656.5	4830605.7	384.3	43.8	44	45	47	51	57
R116	1	P	486310.1	4829680.3	386.1	45.7	46	47	48	51	57
R117	1	N	486435.4	4829125.4	389.2	41.2	42	44	47	51	57

AFCL EXHIBIT K

Substantiated

R118	1	N	486678.0	4829278.0	387.9	40.0	41	43	46	50	57
R119	1	P	487527.4	4829082.7	389.6	35.1	37	41	45	50	57
R120	1	N	487871.0	4829342.9	386.3	34.9	37	41	45	50	57
R122	1	P	486409.1	4827770.0	387.3	34.8	37	41	45	50	57
R123	1	N	486379.9	4828148.2	384.0	36.0	38	41	46	50	57
R124	1	N	486125.4	4827902.8	388.9	36.1	38	41	46	50	57
R125	1	N	486064.3	4827547.2	392.3	35.6	38	41	45	50	57
R127	2	P	486310.4	4828379.9	387.1	37.3	39	42	46	50	57
R128	1	N	486394.8	4828457.4	385.7	37.3	39	42	46	50	57
R129	1	P	485993.1	4829249.9	388.0	46.8	47	48	49	52	57
R130	1	N	484448.1	4829649.1	385.1	42.2	43	44	47	51	57
R131	1	P	484601.6	4830442.8	381.9	47.0	47	48	49	52	57
R132	1	P	484706.5	4831066.2	382.3	43.7	44	45	47	51	57
R133	1	N	483497.8	4830757.1	381.1	44.5	45	46	48	51	57
R134	1	N	482567.2	4830728.8	381.2	34.3	37	41	45	50	57
R143	1	P	482881.7	4828998.7	381.3	33.9	36	41	45	50	57
R144	1	N	483316.0	4829217.5	381.8	35.9	38	41	46	50	57
R145	1	N	483455.0	4829144.6	383.9	36.3	38	42	46	50	57
R146	1	N	483580.4	4829459.2	383.4	37.7	39	42	46	50	57
R147	1	N	482672.0	4830086.0	383.7	34.7	37	41	45	50	57
R157	1	N	478805.8	4821087.5	370.1	40.3	41	43	46	50	57
R158	1	P	478664.4	4821178.4	370.5	39.5	40	43	46	50	57
R159	1	N	478647.1	4821112.6	370.8	39.0	40	43	46	50	57
R160	1	N	478269.4	4821160.6	371.3	35.9	38	41	46	50	57
R161	1	N	478097.7	4821320.2	371.0	34.9	37	41	45	50	57
R162	1	N	477938.8	4821351.6	371.7	33.8	36	41	45	50	57
R163	1	N	477446.5	4821472.3	377.4	30.9	35	41	45	50	57
R164	1	N	477497.1	4821175.8	373.3	31.1	35	41	45	50	57
R165	1	N	478205.3	4821084.6	371.3	35.2	37	41	45	50	57
R166	1	N	478270.2	4820910.2	371.3	35.2	37	41	45	50	57
R169	1	N	478677.6	4819587.5	371.9	33.0	36	41	45	50	57
R170	1	N	478722.3	4819550.9	371.7	33.0	36	41	45	50	57
R183	1	N	490036.5	4816332.4	368.7	43.4	44	45	47	51	57
R186	1	N	489569.2	4816363.3	367.7	43.8	44	45	47	51	57
R188	1	P	488365.5	4816989.5	374.6	46.6	47	47	49	52	57
R189	1	P	487425.1	4816361.9	377.6	48.5	49	49	50	52	58
R190	1	N	486385.8	4816496.9	375.9	48.9	49	49	50	52	58
R194	1	P	482988.8	4816361.5	383.9	36.4	38	42	46	50	57
R197	1	N	481231.9	4817992.2	386.7	34.2	37	41	45	50	57
R198	1	P	480912.1	4817974.6	384.7	33.6	36	41	45	50	57
R199	1	P	480808.9	4817981.7	383.4	33.4	36	41	45	50	57
R202	1	P	479835.7	4818614.0	379.5	33.8	36	41	45	50	57
R203	1	N	479817.5	4819314.1	380.4	37.4	39	42	46	50	57
R204	1	N	479816.5	4819887.6	381.1	41.4	42	44	47	51	57
R205	1	P	481387.9	4819516.0	389.6	45.0	45	46	48	51	57
R206	1	N	481529.2	4818591.7	386.7	37.7	39	42	46	50	57
R207	1	P	481510.6	4819469.4	389.3	46.2	46	47	49	52	57
R208	1	N	479919.6	4818496.6	377.7	33.5	36	41	45	50	57
R209	1	P	480843.9	4819595.9	392.9	43.0	43	45	47	51	57
R210	1	N	482125.0	4817998.6	389.5	35.6	38	41	45	50	57
R211	1	N	482314.1	4817878.9	388.7	35.4	37	41	45	50	57
R212	1	P	482517.9	4817958.3	387.1	35.8	38	41	45	50	57
R213	1	N	483193.4	4816759.1	384.7	37.0	38	42	46	50	57
R214	1	P	483202.8	4817284.2	386.5	36.9	38	42	46	50	57
R215	1	N	483073.1	4818358.1	389.6	37.3	39	42	46	50	57
R216	1	N	483174.5	4818814.1	390.0	38.7	40	42	46	50	57
R217	1	P	483142.7	4820544.2	388.2	40.1	41	43	46	50	57
R218	1	N	481832.0	4821123.1	390.7	39.5	40	43	46	50	57
R219	1	N	481768.2	4821490.1	391.6	38.9	40	42	46	50	57
R220	1	N	481504.9	4820122.5	392.5	46.2	46	47	49	52	57
R221	1	N	480777.8	4821245.6	392.9	42.0	43	44	47	51	57
R222	1	N	480813.7	4820952.8	396.3	42.2	43	44	47	51	57
R223	1	P	479901.5	4821098.9	377.0	46.1	46	47	49	51	57
R224	1	P	479892.2	4820682.1	377.4	43.0	43	45	47	51	57
R225	1	N	479820.4	4820309.4	377.2	42.6	43	45	47	51	57
R227	1	P	479805.6	4821315.8	376.0	48.8	49	49	50	52	58
R228	1	N	479810.2	4821948.3	376.9	47.0	47	48	49	52	57

AFCL EXHIBIT K

R229	1	P	479879.7	4821931.5	379.7	46.9	47	48	49	52	57
R230	1	P	479903.6	4822170.6	380.8	43.6	44	45	47	51	57
R231	1	N	479813.7	4822791.9	374.0	37.3	39	42	46	50	57
R232	1	N	479887.7	4822797.4	374.4	37.2	39	42	46	50	57
R233	1	N	479820.9	4822863.2	373.8	36.7	38	42	46	50	57
R234	1	N	479896.0	4823328.3	380.0	33.8	36	41	45	50	57
R235	1	N	479376.2	4822736.5	374.2	37.6	39	42	46	50	57
R236	1	N	479221.0	4822953.7	375.1	35.5	37	41	45	50	57
R237	1	N	479140.5	4822922.4	369.8	35.6	38	41	45	50	57
R238	1	N	478974.6	4823097.9	372.0	34.0	37	41	45	50	57
R240	1	N	478768.6	4823419.7	371.9	31.7	35	41	45	50	57
R241	1	N	478715.5	4823342.3	371.3	32.0	36	41	45	50	57
R243	1	N	493118.8	4822721.2	372.4	33.8	36	41	45	50	57
R245	1	N	493967.3	4822719.0	368.9	35.1	37	41	45	50	57
R246	1	N	494170.6	4822801.1	368.4	34.7	37	41	45	50	57
R247	1	P	494342.8	4822622.4	368.8	35.9	38	41	46	50	57
R248	1	P	494430.7	4822653.9	368.1	35.7	38	41	45	50	57
R249	1	N	495170.5	4822718.5	363.8	34.0	37	41	45	50	57
R250	1	N	495302.6	4822811.4	363.6	33.1	36	41	45	50	57
R253	1	N	496467.4	4821141.0	362.8	32.4	36	41	45	50	57
R254	1	N	496563.2	4821118.9	364.1	32.1	36	41	45	50	57
R257	1	N	495436.8	4819575.3	363.4	34.6	37	41	45	50	57
R258	1	N	495394.4	4819572.5	363.4	34.7	37	41	45	50	57
R259	1	N	494975.1	4819281.5	364.1	35.1	37	41	45	50	57
R260	1	N	495026.9	4819307.0	363.9	35.0	37	41	45	50	57
R278	1	N	494446.3	4820117.2	367.4	40.6	41	43	46	50	57
R279	1	N	494361.2	4820178.3	367.2	41.5	42	44	47	51	57
R280	1	P	494443.0	4820713.4	364.1	46.5	47	47	49	52	57
R282	1	N	494338.6	4821604.0	367.1	46.9	47	48	49	52	57
R283	1	N	492743.9	4822125.5	369.9	35.5	37	41	45	50	57
R285	1	N	492707.1	4821448.8	370.9	37.9	39	42	46	50	57
R286	1	N	492732.2	4820638.3	371.8	39.1	40	43	46	50	57
R287	1	N	492724.4	4819671.7	369.1	37.1	39	42	46	50	57
R288	1	P	493023.4	4819573.9	368.5	37.0	38	42	46	50	57
R289	1	N	492805.0	4819213.6	370.3	36.5	38	42	46	50	57
R293	1	N	492137.9	4817869.9	371.3	38.4	40	42	46	50	57
R295	1	N	491784.8	4818080.6	372.9	39.2	40	43	46	50	57
R296	1	P	491095.6	4817515.6	375.2	40.8	41	43	46	50	57
R297	1	N	491102.7	4817161.4	373.9	41.0	42	44	46	51	57
R299	1	P	490398.8	4817681.6	373.3	43.6	44	45	47	51	57
R300	1	P	490744.2	4818140.1	374.7	45.6	46	47	48	51	57
R301	1	N	491180.1	4817942.1	373.6	41.6	42	44	47	51	57
R302	1	P	490763.4	4819365.9	377.5	47.3	47	48	49	52	57
R303	1	P	491127.9	4820087.2	377.5	46.6	47	47	49	52	57
R305	1	P	491061.4	4820555.1	377.9	44.3	45	46	48	51	57
R306	1	N	491257.9	4821420.4	375.2	36.5	38	42	46	50	57
R307	1	N	490183.6	4821121.2	379.7	39.2	40	43	46	50	57
R308	1	N	490451.5	4821641.2	379.8	36.1	38	41	46	50	57
R309	1	N	490086.1	4821979.5	382.4	34.6	37	41	45	50	57
R312	1	N	489503.5	4821705.4	378.8	35.6	38	41	45	50	57
R313	1	N	489079.5	4821180.1	376.4	37.9	39	42	46	50	57
R314	1	N	489306.4	4820961.0	376.5	38.9	40	42	46	50	57
R315	1	N	489484.4	4819590.8	375.4	46.6	47	47	49	52	57
R316	1	N	489606.3	4819098.8	376.8	46.6	47	47	49	52	57
R317	1	N	489398.6	4818872.7	376.4	47.2	47	48	49	52	57
R318	1	N	489543.4	4817818.3	375.3	45.0	45	46	48	51	57
R319	1	P	488944.7	4817952.7	372.8	46.5	47	47	49	52	57
R320	1	N	488304.4	4817959.3	373.7	46.4	47	47	49	52	57
R321	1	N	488451.0	4817336.9	371.4	44.0	44	45	48	51	57
R322	1	N	487887.8	4817759.0	372.5	44.5	45	46	48	51	57
R323	1	N	487707.5	4818164.1	373.2	47.2	47	48	49	52	57
R324	1	N	487989.0	4819491.1	372.6	44.6	45	46	48	51	57
R325	1	N	487904.3	4819630.0	373.0	44.8	45	46	48	51	57
R326	1	N	487959.5	4819851.5	374.1	46.7	47	48	49	52	57
R327	1	N	488005.2	4821349.0	375.6	39.5	40	43	46	50	57
R328	1	P	487868.1	4821914.0	379.0	36.1	38	41	46	50	57
R331	1	N	487112.2	4822314.3	382.9	34.1	37	41	45	50	57

AFCL EXHIBIT K

R333	1	N	486328.8	4821619.1	373.8	35.5	37	41	45	50	57
R334	1	N	486420.7	4821571.0	375.4	36.0	38	41	46	50	57
R335	1	N	486766.0	4820261.5	376.1	42.2	43	44	47	51	57
R336	1	N	486358.1	4818672.9	378.7	45.4	46	47	48	51	57
R337	1	N	486275.2	4818132.2	379.5	45.3	46	46	48	51	57
R338	1	P	485063.4	4817982.7	381.2	46.7	47	48	49	52	57
R339	1	N	484302.3	4818132.0	383.8	43.4	44	45	47	51	57
R340	1	N	483562.4	4817886.0	386.9	38.2	39	42	46	50	57
R341	1	N	483529.2	4817963.4	386.7	38.0	39	42	46	50	57
R346	1	N	481696.4	4824377.1	384.7	33.1	36	41	45	50	57
R347	1	P	481492.4	4822446.4	388.7	36.6	38	42	46	50	57
R348	1	N	480817.4	4822885.5	379.4	35.3	37	41	45	50	57
R349	1	N	482052.3	4822841.4	385.4	37.3	39	42	46	50	57
R350	1	P	481497.8	4822891.8	383.0	35.4	37	41	45	50	57
R352	1	N	483051.4	4821347.9	385.3	43.5	44	45	47	51	57
R353	1	N	483783.3	4821199.5	384.8	37.8	39	42	46	50	57
R355	1	P	484240.3	4821199.5	382.8	36.0	38	41	46	50	57
R356	1	N	484341.7	4821205.2	382.9	35.7	38	41	45	50	57
R357	1	N	484639.2	4821202.9	382.6	35.1	37	41	45	50	57
R358	1	N	484870.3	4820492.5	387.1	35.6	38	41	45	50	57
R359	1	N	484746.3	4819871.7	389.1	37.2	39	42	46	50	57
R360	1	N	484675.7	4819574.2	384.4	38.5	40	42	46	50	57
R361	1	N	485426.8	4819567.4	385.6	38.7	40	42	46	50	57
R362	1	N	485631.6	4819217.8	384.6	40.3	41	43	46	50	57
R363	1	N	486054.8	4819497.9	381.1	39.5	40	43	46	50	57
R364	1	N	486289.1	4820776.0	377.4	38.0	39	42	46	50	57
R365	1	N	486384.8	4820713.8	377.7	38.7	40	42	46	50	57
R366	1	P	486273.6	4821385.3	375.7	36.1	38	41	46	50	57
R367	1	P	485609.1	4821242.8	384.1	35.0	37	41	45	50	57
R369	1	P	485572.7	4820956.7	386.9	35.3	37	41	45	50	57
R372	1	P	485095.1	4822716.5	377.7	35.3	37	41	45	50	57
R381	1	N	486120.9	4827025.8	386.7	34.4	37	41	45	50	57
R383	1	N	486019.4	4829077.4	385.4	44.2	45	46	48	51	57
R384	1	P	484438.6	4828506.7	384.7	41.2	42	44	47	51	57
R386	1	P	484976.6	4827525.0	386.3	44.6	45	46	48	51	57
R387	1	P	484713.3	4827322.2	389.9	47.5	48	48	49	52	57
R388	1	P	484712.2	4826536.9	391.8	41.8	42	44	47	51	57
R390	1	N	484698.5	4825637.6	390.7	35.7	38	41	45	50	57
R391	1	N	484836.4	4825292.3	390.5	35.4	37	41	45	50	57
R392	1	N	484918.4	4824485.5	389.3	37.9	39	42	46	50	57
R393	1	P	484991.3	4824354.0	388.2	37.8	39	42	46	50	57
R394	1	P	485129.3	4823556.0	382.0	37.1	39	42	46	50	57
R395	1	P	484461.4	4823382.1	383.9	42.4	43	44	47	51	57
R397	1	N	482937.0	4820708.0	386.6	40.4	41	43	46	50	57
R399	1	P	483455.0	4822750.8	382.4	40.9	42	43	46	51	57
R400	1	N	483632.8	4823089.2	383.5	43.5	44	45	47	51	57
R401	1	N	483134.8	4824113.8	387.5	44.9	45	46	48	51	57
R402	1	P	483657.9	4824353.2	388.6	46.7	47	48	49	52	57
R403	1	N	482658.3	4824464.8	384.0	37.8	39	42	46	50	57
R404	1	N	482544.4	4824393.0	385.1	37.3	39	42	46	50	57
R405	1	N	483168.9	4826001.9	383.6	34.9	37	41	45	50	57
R406	1	N	483085.7	4825693.5	385.1	34.6	37	41	45	50	57
R407	1	N	482726.4	4826582.5	381.0	33.9	36	41	45	50	57
R408	1	N	483180.3	4827734.7	381.9	37.1	39	42	46	50	57
R409	1	N	483516.6	4827733.6	381.7	39.9	41	43	46	50	57
R410	1	P	482870.3	4828502.9	381.0	34.0	37	41	45	50	57
R418	2	N	489526.1	4834877.3	384.7	33.6	36	41	45	50	57
R419	1	N	491131.3	4834199.2	388.7	31.6	35	41	45	50	57
R422	2	N	494847.5	4819356.5	364.0	35.5	37	41	45	50	57

Table 3 Summary of Freeborn Wind Total Noise Levels, L₅₀

Turbine-Only Noise Level (dBA)	Ambient 33 dBA Plus Turbine Noise Level (dBA)	Ambient 40 dBA Plus Turbine Noise Level (dBA)	Ambient 45 dBA Plus Turbine Noise Level (dBA)	Ambient 50 dBA Plus Turbine Noise Level (dBA)	Ambient 57 dBA Plus Turbine Noise Level (dBA)
48.9	49	49	50	52	58
47	47	48	49	52	57
44	44	45	48	51	57
40	41	43	46	50	57

AFCL EXHIBIT K