

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE PUBLIC UTILITIES COMMISSION

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

**FINDINGS OF FACT,
CONCLUSIONS OF LAW,
AND RECOMMENDATIONS**

TABLE OF CONTENTS

STATEMENT OF ISSUE 2

SUMMARY OF RECOMMENDATIONS..... 2

FINDINGS OF FACT 2

 I. Applicant 2

 II. Site Permit Application and Related Procedural History 3

 III. Certificate of Need Exemption and Related Procedural Background..... 10

 IV. Description of the Project..... 11

 V. Site Location and Characteristics 14

 VI. Wind Resource Considerations 14

 VII. Wind Rights and Easement/Lease Agreements 15

 VIII. Project Schedule..... 16

 IX. Additional Issues Raised by AFCL..... 16

 A. Notice and Public Participation 16

 B. Transmission Route Permit..... 17

 C. MISO Queue 17

 D. Land Rights Free From Coercion 18

 X. Site Permit Criteria..... 19

 XI. Application of Siting Criteria to the Proposed Project 20

 A. Human Settlement 20

 B. Zoning and Land Use..... 21

 i. Zoning 21

 ii. Water Impacts 22

 iii. Wetland Setbacks 22

 iv. Other Setbacks..... 24

 C. Property Values..... 26

 D. Noise..... 32

 i. Concern for the Noise the Turbines ill Cause 32

ii.	Sound and Hearing	34
iii.	Minnesota Noise Regulations.....	37
iv.	Application of Noise Standards	38
v.	Limitations of Noise Standards.....	40
E.	Shadow Flicker.....	49
F.	Aesthetic Impacts.....	53
G.	Local Economy.....	54
H.	Public Health.....	55
i.	Public Health Benefits	55
ii.	Electric and Magnetic Field Risks.....	56
iii.	Public Health Risks	57
I.	Public Safety	63
J.	Public Service and Infrastructure	65
i.	Roads.....	65
ii.	Communications.....	66
a.	Concerns the Project Will Interfere with Communications.....	66
1.	Wind Farm Interference with Communications Signaling Systems.....	68
2.	Freeborn Wind’s Assessment of Potential Interference Issues	69
3.	Radio Interference.....	69
4.	Telephone Interference	71
5.	Interference with Radio Links and Microwave Beam Paths	72
6.	Over-the-Air Television Interference...	73
7.	KAAL–TV’s concerns	76
8.	Freeborn Wind’s Response to KAAL..	79
9.	DOC-EERA’s Analysis	80
10.	Freeborn Wind’s Proposed Mitigation Measures	81
11.	Analysis of KAAL’s Demand for a Pre- Construction Survey	82
12.	Analysis of KAAL’s Demand for Funds to be Reserved for a Translator	83
13.	Analysis of Freeborn Wind’s Mitigation Program	84
14.	Notice to “At Risk” Areas.....	87
15.	Permit Compliance Concerns.....	88
K.	Recreational Resources.....	89
L.	Land-Based Economics	90
M.	Archaeological and Historic Resources.....	91
N.	Aviation	92
O.	Wildlife	94
P.	Rare and Unique Natural Resources	99
Q.	Vegetation.....	100

R.	Soils, Geologic, and Groundwater Resources	102
S.	Surface Water and Wetlands	103
T.	Air and Water Emissions.....	105
U.	Solid and Hazardous Wastes.....	106
V.	Future Development and Expansion.....	107
W.	Decommissioning, Turbine Abandonment, and Restoration	107
XII.	Site Permit Conditions	114
CONCLUSIONS OF LAW		118
RECOMMENDATION		119

STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR PUBLIC UTILITIES COMMISSION

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

**FINDINGS OF FACT,
CONCLUSIONS OF LAW,
AND RECOMMENDATIONS**

This matter was assigned to Administrative Law Judge LauraSue Schlatter to conduct full contested case proceedings and a public hearing on Freeborn Wind Energy, LLC's (Freeborn Wind or Applicant) Application for a Large Wind Energy Conversion System Site Permit in Freeborn County (Application) (MPUC Docket No. 17-410). Freeborn Wind is seeking to construct an up to 84 megawatt (MW) large wind energy conversion system in Freeborn County, Minnesota (Project).

A public hearing on the Application for the Project was held on February 20, 2018, in Albert Lea, Minnesota.¹ Evidentiary hearings were held on February 21 and 22, 2018. The factual record remained open until March 15, 2018, for the receipt of written public comments.² Post-hearing submissions were filed by April 4, 2018.

Christina Brusven and Lisa Agrimonti, Fredrikson & Byron, P.A., appeared on behalf of Freeborn Wind.

Linda S. Jensen, Assistant Attorney General, represents the Minnesota Department of Commerce, Energy Environmental Review and Analysis (DOC-EERA).

Mike Kaluzniak and Bret Eknes appeared on behalf of the Minnesota Public Utilities Commission (Commission).

Richard Savelkoul, Martin & Squires, P.A., appeared on behalf of Intervenor KAAL-TV, LLC (KAAL).

Carol Overland, Legalectric, Inc. appeared on behalf of Intervenor Association of Freeborn County Landowners (AFCL).

¹ Summary of Public Hearing Comments at App. B.

² Summary of Public Comments on Draft Site Permit at App. C.

STATEMENT OF ISSUE

Has Freeborn Wind satisfied the requirements in Minnesota Statutes, chapter 216F and the criteria set forth in section 216E.03, subdivision 7, and Minnesota Rule 7854.0500 for a Site Permit for the proposed Project?

SUMMARY OF RECOMMENDATIONS

The Administrative Law Judge concludes that Freeborn Wind has failed to demonstrate that the proposed Project will meet the requirements of Minn. R. 7030.0040, the applicable Minnesota Noise Standards. Therefore, the Administrative Law Judge respectfully recommends that the Commission either deny Freeborn Wind's Application for a Site Permit, or in the alternative, provide Freeborn Wind 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.

Based on the evidence in the hearing record, the Administrative Law Judge makes the following:

FINDINGS OF FACT

I. Applicant

1. Freeborn Wind is an affiliate of Invenergy LLC (Invenergy). Invenergy is a large-scale energy developer headquartered in Chicago, Illinois.³

2. Invenergy has developed, built, owned, and operated many operating wind farms, natural gas facilities, solar projects, and battery storage projects throughout the United States, as well as in Japan, Poland, Scotland, and Uruguay.⁴ Invenergy has a development track record of 119 large-scale projects with 12,800 MW of wind energy and over 18,000 MW of total energy projects.⁵

3. Invenergy operates the Cannon Falls Energy Center (CFEC) in Cannon Falls, Minnesota. The CFEC is a 357 MW natural gas combustion turbine power plant that provides natural gas-fired power. All of the electricity generated by the CFEC is committed to Northern States Power Company, d/b/a Xcel Energy (Xcel Energy).⁶

4. Freeborn Wind and Invenergy do not own or operate and have no financial interest in any other large wind energy conversion systems (LWECS) in Minnesota.⁷

5. If approved, Freeborn Wind will develop, design, and permit the Project.⁸

³ Ex. FR-1 at 1 (Application).

⁴ *Id.*

⁵ See INVENERGY, WHAT WE DO, <https://invenergyllc.com/what-we-do/overview> (last visited May 11, 2018).

⁶ Ex. FR-1 at 1 (Application).

⁷ *Id.*

⁸ *Id.*

6. Freeborn Wind has entered into an agreement with Xcel Energy whereby Xcel Energy will acquire Freeborn Wind upon conclusion of all development activities and subsequently construct, own, and operate the Project.⁹ Xcel Energy will assume the obligations of Freeborn Wind, whether made by the company or imposed by the Commission.¹⁰

II. Site Permit Application and Related Procedural History

7. On June 15, 2017, Freeborn Wind filed its Application with the Commission for the Project.¹¹

8. The Commission issued a Notice of Comment Period on Site Permit Application Completeness on June 21, 2017.¹² The Notice requested comments on whether Freeborn Wind's Application was complete within the meaning of the Commission's rules; whether there were contested issues of fact with respect to the representations made in the Application; and whether the Application should be referred to the Office of Administrative Hearings (OAH) for a contested case proceeding.¹³

9. On July 6, 2017, DOC-EERA staff filed comments recommending that the Commission accept the Application as complete with the understanding that the permitting process will not progress to the preliminary determination on a draft site permit step pursuant to Minnesota Rule 7854.0800 until issues regarding compliance with certain Freeborn County Ordinance standards and general setback considerations were further developed between Freeborn Wind and Freeborn County staff.¹⁴ DOC-EERA staff also recommended that the Commission delay the decision on whether to refer the Project to the OAH for a contested case hearing until the draft Site Permit stage.¹⁵

10. On July 6, 2017, AFCL filed comments and a petition requesting that the matter be referred to the OAH for contested case proceedings.¹⁶

11. Freeborn Wind filed reply comments on the completeness of the Application and agreed to a contested case hearing on July 13, 2017.¹⁷

12. On August 2, 2017, Freeborn Wind filed revised pages to the Application.¹⁸

13. On August 10, 2017, the Commission met to consider whether to accept the Application as substantially complete, and to determine what procedural process to

⁹ Ex. FR-4 at 9 (Litchfield Direct).

¹⁰ *Id.*; see Tr. Vol. 2 at 96-100 (Litchfield).

¹¹ Ex. FR-1 (Application).

¹² Notice of Comment Period (June 21, 2017) (eDocket No. 20176-132986-01).

¹³ *Id.*; Summary of Initial Public Comments at App. A.

¹⁴ Ex. EERA-1 at 5 (Comments and Recommendations on Site Permit Application Completeness).

¹⁵ *Id.*

¹⁶ Comments and Petition for Contested Case and Referral to OAH (July 6, 2017) (eDocket No. 20177-133591-01).

¹⁷ Reply to Comments on Completeness (July 13, 2017) (eDocket No. 20177-133866-01).

¹⁸ Ex. FR-2 at 32, 34 (Revised Application).

authorize.¹⁹ The Commission decided to: accept the Application as substantially complete; refer the matter to the OAH for a contested case proceeding and public hearing to be conducted by an Administrative Law Judge; vary Minn. R. 7854.0600, subp. 1, and extend the 30-day time frame for the Commission decision on application completeness; vary Minnesota Rule 7854.0800, subp. 1, and extend the 45-day time frame for Commission decision on the issuance of draft site permit; and address various other administrative matters.²⁰

14. On August 31, 2017, the Commission incorporated its decision into its Order Finding Application Complete and Varying Time Limits.²¹ On September 6, 2017, the Commission issued an order correcting references to procedural rules.²²

15. On September 1, 2017, AFCL filed a Petition to Intervene.²³

16. On September 6, 2017, the Administrative Law Judge issued a Notice of Prehearing Conference to be held on September 14, 2017.²⁴

17. On September 8, 2017, DOC-EERA issued a Notice of Public Information Meeting scheduling a public information meeting on September 20, 2017, in Albert Lea, Minnesota, and announcing that written comments would be accepted through October 9, 2017.²⁵ The Notice was published in the Albert Lea Tribune on September 11, 2017.²⁶ The Notice requested comments on issues and facts that should be considered in the development of the Draft Site Permit.²⁷ During this comment period, written comments were received from members of the public and governmental agencies, including the Minnesota Department of Transportation (MnDOT),²⁸ Minnesota Department of Natural Resources (MDNR),²⁹ Shell Rock Township,³⁰ and the London Township Town Board.³¹

18. On September 12, 2017, the Administrative Law Judge granted AFCL's Petition to Intervene.³²

19. On September 14, 2017, the Administrative Law Judge held a prehearing conference.

¹⁹ Minutes – August 10, 2017 (Nov. 28, 2017) (eDocket No. 201711-137723-17).

²⁰ *Id.*

²¹ Order Finding Application Complete and Varying Time Limits (Aug. 31, 2017) (eDocket No. 20178-135140-01).

²² Erratum Notice (Sept. 6, 2017) (eDocket No. 20179-135278-01).

²³ Petition to Intervene (Sept. 1, 2017) (eDocket No. 20179-135229-01).

²⁴ Notice of Prehearing Conference (Sept. 6, 2017) (eDocket No. 20179-135289-01).

²⁵ Notice of Public Information Meeting (Sept. 8, 2017) (eDocket No. 20179-135365-01).

²⁶ Ex. EERA-2 (Notice of Public Information Meeting and Proof of Publication (Sept. 8, 2017)).

²⁷ *Id.*

²⁸ Comment by MnDOT (Oct. 6, 2017) (eDocket No. 201710-136205-01).

²⁹ Comment by MDNR (Oct. 6, 2017) (eDocket No. 201710-136200-01).

³⁰ Comment – Road Ordinance Passed by Shell Rock Township (Oct. 9, 2017) (eDocket No. 201710-136287-01).

³¹ Comment – Road Ordinance (Oct. 9, 2017) (eDocket No. 201710-136229-01).

³² Order Granting Intervention (Sept. 12, 2017) (eDocket No. 20179-135455-01).

20. On September 18, 2017, Freeborn Wind filed documentation confirming that it completed the notice requirements of Minn. R. 7854.0600 and 7829.0500, and provided direct mail notice and newspaper publications relating to the Site Permit Application, and that it placed copies of the Application in the Albert Lea Public Library, the public library closest to the proposed Project site.³³

21. On September 20, 2017, AFCL filed a Motion requesting that the Administrative Law Judge certify to the Commission its petition for appointment of both an advisory task force and a scientific advisory task force.³⁴

22. On September 20, 2017, the EERA held a public information meeting in Albert Lea, Minnesota, for comments on issues and facts to be considered in the development of the Draft Site Permit.³⁵

23. On September 25, 2017, the Administrative Law Judge issued the First Prehearing Order, wherein she established the procedural rules for the proceeding; set a December 11, 2017, deadline for intervention; and adopted a schedule for the proceedings.³⁶ The First Prehearing Order set the following due dates: direct testimony on December 5, 2017; rebuttal testimony on January 8, 2018; surrebuttal testimony on January 22, 2018; public hearing on January 29, 2018; and evidentiary hearing on February 6 and 7, 2018. The Administrative Law Judge re-served the Order on September 26, 2017.³⁷

24. On October 4, 2017, Freeborn Wind filed a Response opposing AFCL's Motion to Certify and Petition for Advisory and Scientific Task Forces.³⁸

25. On October 5, 2017, AFCL filed a Reply to Freeborn Wind's Response to AFCL's Motion to Certify and Petition for Advisory and Scientific Task Force.³⁹

26. On October 6, 2017, the Administrative Law Judge issued an Order certifying to the Commission the question of whether the Commission should appoint an advisory task force and/or a scientific advisory task force.⁴⁰

27. On October 12, 2017, the Administrative Law Judge issued a Protective Order setting procedures and guidelines for classifying and handling non-public information filed in this proceeding.⁴¹

³³ Ex. FR-3 (Application Notice Compliance filing).

³⁴ Motion for Certification and Petition for Advisory and Scientific Task Force (Sept. 20, 2017) (eDocket No. 20179-135694-01).

³⁵ Public Information Meeting Notes (Oct. 10, 2017) (eDocket No. 201710-136323-01).

³⁶ First Prehearing Order (Sept. 25, 2017) (eDocket No. 20179-135781-01).

³⁷ Re-Serve First Prehearing Order (Sept. 26, 2017) (eDocket No. 20179-135814-01).

³⁸ Response to Motion of AFCL (Oct. 4, 2017) (eDocket No. 201710-136128-02).

³⁹ Reply Comments (Oct. 5, 2017) (eDocket No. 201710-136142-01).

⁴⁰ Order on Motion for Certification (Oct. 6, 2017) (eDocket No. 201710-136186-01).

⁴¹ Protective Order (Oct. 12, 2017) (eDocket No. 201710-136426-01).

28. On October 13, 2017, KAAL filed a Petition to Intervene.⁴²
29. On October 13, 2017, the Commission issued a Notice of Commission Meeting scheduled on October 24, 2017, at which it would consider whether to establish an Advisory and/or Scientific Task Force.⁴³
30. On October 18, 2017, DOC-EERA filed Comments and Recommendations on the Motion and Petition for Advisory Task Forces.⁴⁴ DOC-EERA recommended that the Commission deny both the request to appoint an Advisory Task Force and the request to appoint a Scientific Advisory Task Force.⁴⁵
31. On October 20, 2017, the Minnesota Historical Society and State Historic Preservation Office (SHPO) filed comments on the Application.⁴⁶
32. On October 30, 2017, the Administrative Law Judge granted KAAL's Petition to Intervene.⁴⁷
33. On November 7, 2017, Freeborn Wind filed a letter requesting that its appraisal witness on property values, Michael MaRous, be excused from hearing attendance for good cause pursuant to Minn. R. 1405.2000.⁴⁸ Freeborn Wind requested that Mr. MaRous be allowed to be cross-examined by telephone. On November 21, 2017, the Administrative Law Judge issued an Order granting this request to excuse the witness' presence.⁴⁹
34. On November 27, 2017, the Administrative Law Judge issued the Second Prehearing Order, scheduling a telephone prehearing conference to be held on November 28, 2017, to review the scheduling of public and evidentiary hearings and the pre-hearing schedule.⁵⁰ The telephone prehearing conference was held on November 28, 2017.
35. On December 5, 2017, the Administrative Law Judge issued the Third Prehearing Order, amending the schedule for the proceedings, which included the rescheduling of the evidentiary hearing for February 21 and 22, 2018.⁵¹

⁴² Petition to Intervene (Oct. 13, 2017) (eDocket No. 201710-136471-02).

⁴³ Notice of Commission Meeting – October 24, 2017 (Oct. 13, 2017) (eDocket No. 201710-136456-01).

⁴⁴ Comments and Recommendations (Oct. 18, 2017) (eDocket No. 201710-136632-01).

⁴⁵ *Id.* at 2.

⁴⁶ SHPO Comment (Oct. 20, 2017) (eDocket No. 201710-136677-01).

⁴⁷ Order Granting Intervention (Oct. 30, 2017) (eDocket No. 201710-136957-01).

⁴⁸ Letter (Nov. 7, 2017) (eDocket No. 201711-137196-01). Mr. MaRous appeared in person when the hearings dates were rescheduled.

⁴⁹ Order Granting Request to Excuse Witness Presence (Nov. 21, 2017) (eDocket No. 201711-137569-01).

⁵⁰ Second Prehearing Order (Nov. 27, 2017) (eDocket No. 201711-137693-01).

⁵¹ Third Prehearing Order (Dec. 5, 2017) (eDocket No. 201712-137969-01).

36. On December 5, 2017, hearing subpoenas were issued for MDNR' staff members Kevin Mixon and Lisa Joyal.⁵² Subpoenas were also issued on December 5, 2017, to Louise Miltich of DOC-EERA, and for the production of documents by DOC-EERA.⁵³

37. On December 5, 2017, DOC-EERA filed Comments and Recommendations on issuance of a Draft Site Permit and a Preliminary Draft Site Permit.⁵⁴

38. On December 18, 2017, a subpoena was issued for the Minnesota Department of Health (MDH) Assistant Commissioner Paul Allwood.⁵⁵

39. On December 22, 2017, Freeborn Wind filed the Direct Testimony of the following witnesses: Dan Litchfield;⁵⁶ Mike Hankard;⁵⁷ Dr. Mark Roberts;⁵⁸ Dr. Jeff Ellenbogen;⁵⁹ Andrea Giampoli;⁶⁰ Michael MaRous;⁶¹ and Kevin Parzyck.⁶²

40. On December 22, 2017, KAAL filed Direct Testimony of David Harbert and Stephen Lockwood.⁶³ AFCL filed the Direct Testimony of Dorene Hansen.⁶⁴

41. On December 22, 2017, the Commission issued a Notice of Commission Meeting scheduled on January 4, 2018, at which the Commission would discuss whether it should issue a Draft Site Permit.⁶⁵

42. On December 29, 2017, AFCL filed a request for time at the January 4, 2018, Commission meeting to comment on the proposed Draft Site Permit.⁶⁶

43. On January 5, 2018, the Administrative Law Judge issued the Fourth Prehearing Order, canceling the telephone prehearing conference scheduled for January 9, 2018.⁶⁷

44. On January 16, 2018, DOC-EERA filed a Motion to Quash a Hearing Subpoena, issued at the request of AFCL, which was served upon Louise Miltich, an

⁵² Mem. in Support of Mot. to Quash Subpoena of Lisa Joyal (Feb. 9, 2018) (eDocket No. 20182-139915-02); Mem. in Support of Mot. to Quash Subpoena of Kevin Mixon (Feb. 9, 2018) (eDocket No. 20182-139916-02).

⁵³ Agreement of DOC-EERA and AFCL Regarding Subpoenas (Jan. 19, 2018) (eDocket No. 20181-139130-01).

⁵⁴ Ex. EERA-8 (Comments and Recommendations on a Preliminary Draft Site Permit).

⁵⁵ Ex. AFCL-16 (Stipulation and Affidavit – AFCL and MDH).

⁵⁶ Ex. FR-4 (Litchfield Direct).

⁵⁷ Ex. FR-5 (Hankard Direct).

⁵⁸ Ex. FR-6 (Roberts Direct).

⁵⁹ Ex. FR-7 (Corrected Ellenbogen Direct).

⁶⁰ Ex. FR-8 (Giampoli Direct).

⁶¹ Ex. FR-9 (MaRous Direct).

⁶² Ex. FR-10 (Parzyck Direct).

⁶³ Ex. KAAL-1 (Harbert Direct); Ex. KAAL-4 (Lockwood Direct).

⁶⁴ Ex. AFCL-1 (Hansen Direct).

⁶⁵ Notice of Commission Meeting – January 4, 2018 (Dec. 22, 2017) (eDocket No. 201712-138388-02).

⁶⁶ Request for Limited Comment Time (Dec. 20, 2017) (eDocket No. 201712-138504-01).

⁶⁷ Fourth Prehearing Order (Jan. 5, 2018) (eDocket No. 20181-138676-01).

employee of DOC-EERA. The subpoena required Ms. Miltich to testify at the evidentiary hearing regarding her knowledge of noise monitoring at the Bent Tree Wind Farm.⁶⁸

45. On January 19, 2018, DOC-EERA filed an Agreement between DOC-EERA and AFCL regarding the subpoenas.⁶⁹

46. On January 22, 2018, Freeborn Wind filed the Rebuttal Testimony of the following witnesses: Mr. Litchfield, Ms. Giampoli, Mr. MaRous, Dennis Jimeno, and Mr. Hankard.⁷⁰ AFCL filed the Rebuttal Testimony of Ms. Hansen.⁷¹ KAAL filed the Rebuttal Testimony of Mr. Harbert.⁷²

47. On January 26, 2018, Freeborn Wind filed a Motion to Strike certain portions of the Direct and Rebuttal Testimony of AFCL witness Ms. Hansen and Exhibits B, C, and D, attached to Ms. Hansen's Rebuttal Testimony.⁷³ On February 2, 2018, AFCL filed a Response to Freeborn Wind's Motion to Strike.⁷⁴

48. On January 26, 2018, DOC-EERA filed a Motion to Exclude documents regarding acoustic testing conducted for the Bent Tree Wind Farm.⁷⁵ On January 30, 2018, AFCL filed a Response to DOC-EERA's Motion to Exclude.⁷⁶

49. On January 30, 2018, the Commission issued an Order Issuing a Draft Site Permit.⁷⁷

50. On January 30, 2018, AFCL filed a letter to the Administrative Law Judge requesting that a time certain be established for MDNR witness testimony.⁷⁸

51. On January 31, 2018, AFCL and MDH filed a Stipulation for the Release of Assistant Commissioner Paul Allwood of the Subpoena Issued December 18, 2017.⁷⁹

52. On February 2, 2018, the Commission issued a Notice of Public Hearing and Draft Site Permit Availability.⁸⁰ The notice contained the location and times for the

⁶⁸ DOC-EERA Motion (Jan. 16, 2018) (eDocket No. 20181-139001-01).

⁶⁹ Agreement of DOC-EERA and AFCL Regarding Subpoenas (Jan. 19, 2018) (eDocket No. 20181-139130-01).

⁷⁰ Ex. FR-11 (Litchfield Rebuttal); Ex. FR-15 (Giampoli Rebuttal); Ex. FR-14 (MaRous Rebuttal); Ex. FR-12 (Jimeno Rebuttal); Ex. FR-13 (Hankard Rebuttal).

⁷¹ Ex. AFCL-15 (Hansen Rebuttal).

⁷² Ex. KAAL-2 (Harbert Rebuttal).

⁷³ Mot. to Strike Portions of the Testimony of Dorene Hansen (Jan. 26, 2018) (eDocket No. 20181-139400-02).

⁷⁴ Response to Mot. to Strike (Feb. 2, 2018) (eDocket No. 20182-139747-01).

⁷⁵ Mot. to Exclude Bent Tree Data (Jan. 26, 2018) (eDocket No. 20181-139379-01).

⁷⁶ Response to DOC-EERA Mot. to Exclude Bent Tree Data (Jan. 30, 2018) (eDocket No. 20181-139493-01).

⁷⁷ Order Issuing Draft Site Permit (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁸ Letter (Jan. 30, 2018) (eDocket No. 20181-139546-01).

⁷⁹ Ex. AFCL-16 (Stipulation and Affidavit – AFCL and MDH).

⁸⁰ Notice of Public Hr'g and Draft Site Permit Availability (Feb. 2, 2018) (eDocket No. 20182-139716-01).

public hearing scheduled on February 20, 2018, and the evidentiary hearing scheduled on February 21 and 22, 2018.

53. On February 5, 2018, Freeborn Wind filed the Surrebuttal Testimony of Dan Litchfield.⁸¹ Also on February 5, 2018, KAAL filed the Surrebuttal Testimony of David Harbert and Stephen Lockwood.⁸²

54. On February 7, 2018, DOC-EERA filed a comment letter dated October 4, 2017 from the Minnesota Pollution Control Agency (MPCA).⁸³

55. On February 9, 2018, the MDNR filed a Motion to Quash the hearing subpoena for Lisa Joyal and, in the alternative, Objection to Intervenor's hearing subpoena for Lisa Joyal, along with a supporting memorandum and affidavit.⁸⁴ The MDNR also filed a Motion to Quash the hearing subpoena for Kevin Mixon and, in the alternative, Objection to Intervenor's hearing subpoena for Kevin Mixon, along with a supporting memorandum and affidavit.⁸⁵

56. On February 12, 2018, the Administrative Law Judge issued an Order denying DOC-EERA's Motion to Exclude documents regarding acoustic testing conducted for the Bent Tree Wind Farm. The Administrative Law Judge received the Bent Tree documents for the limited purpose of understanding better "how noise problems have arisen in the past" and "the relevant factors to be considered in evaluating a site permit application."⁸⁶ In that same Order, the Administrative Law Judge granted in part and denied in part Freeborn Wind's Motion to Strike the testimony of Ms. Hansen.⁸⁷ The versions of Ms. Hansen's Direct and Rebuttal Testimony reflecting the portions stricken pursuant to the Administrative Law Judge's Order were filed on February 21, 2018.⁸⁸

57. On February 12, 2018, the Administrative Law Judge issued the Fifth Prehearing Order.⁸⁹

58. On February 12, 2018, AFCL filed a Response to MDNR's Motions to Quash the hearing subpoenas of Ms. Joyal and Mr. Mixon.⁹⁰

⁸¹ Ex. FR-16 (Corrected Litchfield Surrebuttal).

⁸² Ex. KAAL-3 (Harbert Surrebuttal); Ex. KAAL-5 (Lockwood Surrebuttal).

⁸³ DOC-EERA Comment - Letter from MPCA (Feb. 7, 2018) (eDocket No. 20182-139859-01).

⁸⁴ MDNR Mot. to Quash and Objection (Feb. 9, 2018) (eDocket No. 20182-139915-01); Mem. in Support of Mot. to Quash Subpoena of Lisa Joyal (Feb. 9, 2018) (eDocket No. 20182-139915-02); Affidavit of Lisa Joyal (Feb. 9, 2018) (eDocket No. 20182-139915-03).

⁸⁵ MDNR Mot. to Quash and Objection (Feb. 9, 2018) (eDocket No. 20182-139916-01); Mem. in Support of Mot. to Quash Subpoena of Kevin Mixon (Feb. 9, 2018) (eDocket No. 20182-139916-02); Aff. of Kevin Mixon (Feb. 9, 2018) (eDocket No. 20182-139916-03).

⁸⁶ Order on Mot. by DOC-EERA and Freeborn Wind to Exclude and Strike Testimony at 2, 5 (Feb. 12, 2018) (eDocket No. 20182-140011-01).

⁸⁷ *Id.* at 2.

⁸⁸ Ex. AFCL-1 (Hansen Direct); Ex. AFCL-15 (Hansen Rebuttal).

⁸⁹ Fifth Prehearing Order (Feb. 12, 2018) (eDocket No. 20182-140009-01).

⁹⁰ Reply Brief (Feb. 12, 2018) (eDocket No. 20182-140003-01).

59. On February 15, 2018, the Administrative Law Judge issued an Order denying the MDNR's Motions to Quash.⁹¹

60. A public hearing was held in Albert Lea, Minnesota, on February 20, 2018.

61. On February 21 and 22, 2018, an evidentiary hearing on the Application was held in Albert Lea, Minnesota. Commission staff, DOC-EERA staff, and representatives from Freeborn Wind, KAAL, and AFCL were present. The witnesses for the MDNR and KAAL witness Stephen Lockwood appeared by phone on February 22, 2018.

62. On March 1, 2018, Freeborn Wind filed the following exhibits pursuant to the Administrative Law Judge's request at the evidentiary hearing on February 22, 2018: the work papers and supporting affidavit of Mr. Jimeno; tables showing combined wind turbine noise and background noise and the supporting affidavit of Mr. Hankard; and the Freeborn Wind Easement Form and supporting affidavit of Mr. Litchfield.⁹²

63. On March 20, 2018, Freeborn Wind filed post hearing briefs⁹³ and proposed findings of fact, conclusions of law, and recommendations.⁹⁴

64. On March 20, 2018, AFCL filed an initial brief⁹⁵ and KAAL filed a post-hearing brief.⁹⁶

III. Certificate of Need Exemption and Related Procedural Background

65. On September 21, 2016, Freeborn Wind entered into a Purchase and Sale Agreement (PSA) with Xcel Energy and Invenergy Wind Development North America LLC. Under this PSA, Xcel Energy will purchase the ownership interest in Freeborn Wind following permitting and prior to construction, and will construct, own, and operate the Project.⁹⁷

66. On October 24, 2016, Xcel Energy filed an Initial Petition notifying the Commission of its selection of the PSA (the Initial Petition), along with several other wind energy projects Xcel Energy proposed to purchase and self-build.⁹⁸

⁹¹ Order Denying Mot. to Quash (Feb. 15, 2018) (eDocket No. 20182-140121-01).

⁹² Ex. FR-17 (Jimeno Work Papers); Ex. FR-18 (Noise Tables); Ex. FR-19 (Freeborn Wind Easement Form).

⁹³ Freeborn Wind Post Hearing Brief (March 20, 2018) (eDocket No. 20183-141214-02).

⁹⁴ Freeborn Wind Proposed Findings of Fact, Conclusions of Law, and Recommendations (March 20, 2018) (eDocket No. 20183-141214-03).

⁹⁵ AFCL Initial Brief (March 20, 2018) (eDocket No. 20183-141225-02).

⁹⁶ KAAL Post-Hearing Brief (March 20, 2018) (eDocket No. 20183-141221-03).

⁹⁷ Ex. FR-4 at 9 (Litchfield Direct).

⁹⁸ *In re the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777, Xcel Energy's Petition (Oct. 24, 2016).

67. On March 15, 2017, Xcel Energy filed a Supplemental Wind Petition seeking approval of 1,550 MW of wind energy, 750 MW of self-build wind (including the Project), and 800 MW of wind energy power purchase agreements.⁹⁹

68. Xcel Energy utilized the resource acquisition process approved by the Commission as part of its approval of Xcel Energy's integrated resource plan.¹⁰⁰

69. On September 1, 2017, the Commission approved Xcel Energy's Supplemental Wind Petition, including the PSA, in MPUC Docket No. E002/M-16-777.¹⁰¹

70. The Project was selected through a Commission-approved bidding process. Therefore, under Minn. Stat. § 216B.2422 subd. 5, it is exempt from the Certificate of Need requirements.¹⁰²

IV. Description of the Project

71. The proposed Project is a large wind energy conversion systems (LWECS), as defined in the Wind Siting Act (Minn. Stat. ch. 216F) with a Project boundary of approximately 26,273 acres in Freeborn County, Minnesota (Project Area).¹⁰³

72. Freeborn Wind proposes to construct an up to 84 MW LWECS and associated facilities in Freeborn County, Minnesota.¹⁰⁴ The Project is part of an up to 200 MW wind farm in Freeborn County, Minnesota, and Worth County, Iowa (the Wind Farm).¹⁰⁵ The Project will consist of up to 42 turbine sites yielding a total nameplate wind energy capacity of up to 84 MW in Freeborn County, Minnesota.¹⁰⁶ The remaining turbines would be located in Worth County, Iowa.¹⁰⁷

73. Freeborn Wind is proposing to use two turbine types in the Project: the Vestas V116 and V110, both of which are rated at 2.0 MW of power production.¹⁰⁸ The

⁹⁹ *In re the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777, Xcel Energy's Supplemental Wind Petition (March 15, 2017).

¹⁰⁰ *Id.* at 3-12; see also *In re Xcel Energy's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/RP-15-21, Order Approving Plan with Modifications and Establishing Requirements for Future Resource Plan Filings at Ordering Point 5 (Jan. 11, 2017).

¹⁰¹ See *In re the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16- 777, Order Approving Petition, Granting Variance, and Requiring Compliance Filing at 8, 10-11 (Sept. 1, 2017).

¹⁰² See *In re the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16- 777, Order Approving Petition, Granting Variance, and Requiring Compliance Filing at 8, 11 (Sept. 1, 2017).

¹⁰³ Ex. FR-1 at 1 (Application).

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ Ex. FR-4 at 1 (Litchfield Direct).

¹⁰⁸ *Id.* at 7.

Vestas V110 is 443 feet tall, and the Vestas V116 is 453 feet tall.¹⁰⁹ Both turbine models have hub heights of 80 meters and rotor diameters ranging from 110 to 116 meters.¹¹⁰

74. The Project layout proposed by Freeborn Wind would be constructed with a combination of the two turbine types, with 33 V116 turbines and nine V110 turbines.¹¹¹ Freeborn Wind selected these turbines due to wind resource analysis, siting, setbacks, and availability for use in the Project. Some V110 locations were selected due to siting constraints, but the majority of the V110 locations were chosen for its two A-weighted decibel (dB(A)) sound advantage and the resulting reductions in predicted dB(A) levels at adjacent, non-participating homes.¹¹²

75. The wind turbines under consideration consist of a nacelle, blades, hub, tower, and foundation.¹¹³ The nacelle houses the generator, gear boxes, controller, shafts, brake, generator cabling, hoist, generator cooling, and other associated equipment.¹¹⁴ An anemometer and weather vane located on the top of the turbine nacelle continuously monitor wind speed and direction.¹¹⁵ The hub supports the blades and connecting rotor, yaw motors, mechanical braking system, and a power supply for emergency braking.¹¹⁶ The hub also contains an emergency power supply to allow the mechanical brakes to work if electric power from the grid is lost.¹¹⁷ Each turbine has three blades composed of carbon fiber, fiberglass, and internal supports to provide a lightweight but strong component.¹¹⁸ The tip of each blade is equipped with a lightning receptor to safely conduct lightning strikes to ground.¹¹⁹

76. The foundation and tower support the hub, blades, and nacelle.¹²⁰ Foundations for the towers are anticipated to be a spread footer design.¹²¹ The tubular towers will be painted a non-glare white.¹²² The tower houses electrical and communication cables and a control system located at the base of the tower.¹²³

77. Both proposed turbine models have Supervisory Control and Data Acquisition (SCADA) communication technology to control and monitor the Project.¹²⁴

¹⁰⁹ *Id.*

¹¹⁰ Ex. FR-1 at 13 (Application).

¹¹¹ Ex. FR-4 at 7 (Litchfield Direct).

¹¹² *Id.*

¹¹³ Ex. FR-1 at 12 (Application).

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.* at 14.

The SCADA communications systems permit automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines.¹²⁵

78. In addition to the wind turbines and associated equipment, the Project includes the following permanent and temporary associated facilities:¹²⁶

- Gravel access road and improvements to existing roads;
- Electric collection lines;
- Operation and maintenance (O&M) facility;
- Project substation;
- Fiber optic communication lines;
- Permanent meteorological tower and associated weather collection data system;
- Improvements to public and private roads for delivery of materials and equipment; and
- Temporary crane paths that will be routed and used during construction of the Project.¹²⁷

79. The temporary associated facilities for the Wind Farm in Iowa will also include staging areas for construction of the Project and a temporary batch plant area.¹²⁸

80. The Project will include a wind access buffer of five rotor diameters in the prevailing wind directions and three rotor diameters in the non-prevailing wind directions; a noise setback meeting the MPCA's Noise Standards found in Minn. R. ch. 7030 (the Noise Standards); and a minimum setback of 1,000 feet from residences and 250 feet from public roads and trails.¹²⁹

81. The Project's O&M facility and substation will require approximately 12 acres of land within the Project Area.¹³⁰ Freeborn Wind sited these facilities to avoid and/or minimize, to the extent practicable, disturbance from installation of the collection system and fiber-optic communication system.¹³¹

82. The total Wind Farm installed capital costs are estimated to be approximately \$300 million, including wind turbines, associated electrical and

¹²⁵ *Id.*

¹²⁶ *Id.* at 4.

¹²⁷ *Id.* at 15; Ex. FR-4 at 6-7 (Litchfield Direct).

¹²⁸ Ex. FR-1 at 4 (Application).

¹²⁹ *Id.* at 6-7.

¹³⁰ *Id.* at 15.

¹³¹ *Id.* at 15-16.

communication equipment and systems, and access roads.¹³² The Minnesota portion of the Project would be approximately \$126 million in capital costs.¹³³ Ongoing operations and maintenance costs and administrative costs are estimated to be approximately \$7 to \$8 million per year in total, and \$3 million per year for the Minnesota portion of the Project.¹³⁴

V. Site Location and Characteristics

83. The Project is located in Hayward, London, Oakland, and Shell Rock Townships in Freeborn County in southcentral Minnesota.¹³⁵

84. The Project Area contains approximately 26,273 acres, of which approximately 17,435 is currently leased for the Project.¹³⁶

85. The Project Area consists of approximately 91.6 percent cropland, 1.4 percent pasture/grassland, 0.5 percent aquatic/wetland/open water, 5.6 percent developed land, and 0.9 percent introduced and semi-natural vegetation.¹³⁷

86. The Project is located in a rural area.¹³⁸ Within the Project Area, the population density is between 8.7 and 12.3 people per square mile.¹³⁹

VI. Wind Resource Considerations

87. Predicted wind speeds near the Project Area at 80 meters above ground level are 6.0 to 8.8 meters per second (m/s).¹⁴⁰

88. Freeborn Wind has conducted detailed site wind characterization studies and analysis over the past seven years for the Project and had two temporary meteorological towers monitoring weather data in the Project Area.¹⁴¹ The mean annual wind speed at 80 meters above ground level is estimated to be 7.6 m/s.¹⁴² The months of November through May are expected to generally have the highest wind speeds, while the months of June through October are expected to have the lowest wind speeds.¹⁴³ On average, wind speeds are higher in the evening and nighttime hours, and lower in the morning.¹⁴⁴

¹³² *Id.* at 108.

¹³³ *Id.*

¹³⁴ Ex. FR-4 at 8 (Litchfield Direct).

¹³⁵ Ex. FR-1 at 19 (Application).

¹³⁶ *Id.* at 3.

¹³⁷ *Id.* at 4.

¹³⁸ *Id.* at 19.

¹³⁹ *Id.* at 20.

¹⁴⁰ *Id.* at 97.

¹⁴¹ *Id.* at 96.

¹⁴² *Id.* at 97.

¹⁴³ *Id.*

¹⁴⁴ *Id.* at 98.

89. The prevailing wind directions in the Project Area are generally from the south and the west-northwest.¹⁴⁵

90. Freeborn Wind estimates the Project will have a net capacity factor of between 45 to 52 percent and an average annual output of between approximately 788,000 and 911,000 megawatt hours (MWh).¹⁴⁶ The 84 MWs in Minnesota would generate between 331,000 and 382,000 MWh per year.¹⁴⁷ Annual energy production output will depend on final design, site specific features, and annual variability in the wind resource.¹⁴⁸

VII. Wind Rights and Easement/Lease Agreements

91. Freeborn Wind states it has all the voluntary private easements necessary to construct the Project, and it plans to acquire the applicable federal, state, and local permits.¹⁴⁹ All Project facilities will be on private easements or, in limited instances, in public road right-of-way (ROW) pursuant to local permits that will be obtained prior to construction.¹⁵⁰ Freeborn Wind reports it worked with landowners to secure sufficient land lease and wind easements/setback easement agreements to build the Project.¹⁵¹ Land rights secured from each landowner vary, and may include, but are not limited to, the rights to construct wind turbines and Project facilities, including access roads, collection lines, crane paths, rights to wind and buffer easements, transmission feeder lines in public road ROW and rights to additional land, as needed, to mitigate environmental impacts.¹⁵² Freeborn Wind maintains it currently leases 17,435 acres of the 26,273 acres within the Project Area (66 percent of the Project Area). The current leasehold is sufficient to accommodate the proposed facilities, required buffers, and turbine placement flexibility needed to avoid natural resources, homes, and other sensitive features.¹⁵³

92. According to Freeborn Wind, the Project's layout follows the wind energy conversion facility siting criteria outlined in the Commission's Order Establishing General Wind Permit Standards, MPUC Docket No. E,G999/M-07-1102 (Jan. 11, 2008), and Freeborn Wind's guidelines and best practices.¹⁵⁴ With one limited exception, the Project layout conforms to all applicable county ordinances.¹⁵⁵ Where state and local setbacks differ for the same feature, the most stringent setback distance is used.¹⁵⁶

¹⁴⁵ *Id.* at 9.

¹⁴⁶ *Id.* at 109.

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

¹⁴⁹ Ex. FR-11 at 3 (Litchfield Rebuttal); Ex. FR-4 at 8 (Litchfield Direct).

¹⁵⁰ Ex. FR-11 at 3 (Litchfield Rebuttal); Ex. FR-4 at 8 (Litchfield Direct).

¹⁵¹ Ex. FR-1 at 18 (Application).

¹⁵² See Ex. FR-19 (Litchfield Affidavit and Freeborn Wind Easement Form).

¹⁵³ Ex. FR-1 at 18 (Application).

¹⁵⁴ *Id.* at 6-12.

¹⁵⁵ *Id.*; see also *id.* at 27-28 (discussing limited variance from Freeborn County wetland setback ordinance).

¹⁵⁶ *Id.* at 6. One limited exception to Freeborn County's setback from wetlands is discussed in Section XI.B.

VIII. Project Schedule

93. In the Application, the anticipated construction start was May 2020, with commercial operations commencing in the fourth quarter of 2020.¹⁵⁷ However, Freeborn Wind reports that Xcel Energy intends to advance the construction timetable and start construction in the fall of 2019, with commercial operations still commencing in the fourth quarter of 2020.¹⁵⁸ The commercial operations date is dependent on several factors, including weather, permitting, and other development activities.¹⁵⁹

IX. Additional Issues Raised by AFCL

A. Notice and Public Participation

94. In its Petition, AFCL raised the issue of whether landowners and affected parties have received notice and have had an opportunity to participate in these proceedings.¹⁶⁰

95. Freeborn Wind complied with the notice requirements of Minn. R. 7854.0600 and 7829.0500 by providing direct mail notice and newspaper publications relating to the Site Permit Application, and by placing copies of the Application in the Albert Lea Public Library.¹⁶¹

96. On September 8, 2017, DOC-EERA issued a Notice of Public Information Meeting, which was published in the Albert Lea Tribune and mailed to landowners.¹⁶² The Notice alerted the public to the subsequent written comment period and public meeting, which provided an opportunity for landowners and other members of the public to raise concerns regarding the issues and facts to be considered in the development of the Draft Site Permit in these proceedings.¹⁶³

97. On September 12, 2017, the Administrative Law Judge granted AFCL's Petition to Intervene, thus allowing the direct participation of affected landowners in these proceedings.¹⁶⁴

98. On February 2, 2018, the Commission issued a Notice of Public Hearing and Draft Site Permit Availability, providing notice of the February 20, 2018, Public Hearing to be held in Albert Lea, Minnesota. The same Notice alerted the public to an

¹⁵⁷ Ex. FR-1 at 109 (Application).

¹⁵⁸ Ex. FR-4 at 7-8 (Litchfield Direct).

¹⁵⁹ *Id.*

¹⁶⁰ Petition for Contested Case at 3-4 (July 6, 2017) (eDocket No. 20177-133591-01).

¹⁶¹ Ex. FR-3 (Application Notice Compliance filing).

¹⁶² Notice of Public Information Meeting (Sept. 8, 2017) (eDocket No. 20179-135365-01).

¹⁶³ *Id.*

¹⁶⁴ Order Granting Intervention (Sept. 12, 2017) (eDocket No. 20179-135455-01).

additional comment period from February 1, 2018, through March 15, 2018. This Notice was served on landowners and other interested parties.¹⁶⁵

99. The Administrative Law Judge has accepted, reviewed, summarized, and considered comments from many members of the public.¹⁶⁶

100. The Administrative Law Judge finds that landowners, affected parties, and the public have received notice and had an opportunity to participate in these proceedings.

B. Transmission Route Permit

101. In its Petition, AFCL raised the issue of whether Freeborn Wind and/or Invenergy are public utilities and, if not, whether they would be able to obtain a transmission route permit.¹⁶⁷

102. AFCL did not pursue or develop a record regarding this argument at the evidentiary hearing or in its post-hearing briefs.

103. The issue of whether Freeborn Wind or Invenergy can obtain a transmission route permit is the subject of a separate MPUC docket.¹⁶⁸

104. DOC-EERA has not raised concerns about Freeborn Wind or Invenergy's ability to obtain a transmission route permit. DOC-EERA's proposed amendments to Freeborn Wind's proposed findings of fact demonstrate that DOC-EERA is aware of the separate transmission proceeding.¹⁶⁹ DOC-EERA's recommendation nonetheless concludes that "Freeborn Wind Project is a feasible LWECS project," and that "a Site Permit should be issued to Freeborn Wind LLC" for the Project.¹⁷⁰

105. The Administrative Law Judge finds that the issue of whether Freeborn Wind and/or Invenergy is able to obtain a transmission route permit is beyond the scope of this proceeding. The issue of whether Freeborn Wind and/or Invenergy is able to obtain a transmission route permit will properly be addressed in the Commission's route permit proceeding, where a record on the issue has been developed, and not in these proceedings, where no such record has been developed.

C. MISO Queue

¹⁶⁵ Notice of Public Hearing (Feb. 2, 2018) (eDocket No. 20182-139716-01); Affidavit of Publication (Feb. 12, 2018) (eDocket No. 20182-140016-02).

¹⁶⁶ Citation to comment appendix.

¹⁶⁷ Petition for Contested Case at 4-5 (July 6, 2017) (eDocket No. 20177-133591-01).

¹⁶⁸ PUC Docket IP-6946/TL-17-322.

¹⁶⁹ DOC-EERA Reply Brief at 3 (Apr. 4, 2018) (eDocket No. 20184-141695-01) (noting the removal of references to the transmission line in the proposed findings because the transmission line "is currently in the route permit process, eDocket #17-322, and will not be approved as associated infrastructure under the Site Permit process").

¹⁷⁰ DOC-EERA Reply Brief at 7 (Apr. 4, 2018) (eDocket No. 20184-141695-01).

106. In its Petition to Intervene, AFCL stated that the Midcontinent Independent System Operator (MISO) queue could only accept 150 MW of the proposed 200 MW capacity of the Freeborn Wind Project. In addition, AFCL raised the issue of whether the cost of network upgrades would increase the costs of electricity generated by the Project.¹⁷¹

107. AFCL failed to develop a record regarding this argument at the evidentiary hearing or in its post-hearing briefs.

108. Of the up to 200 MW proposed capacity of the overall project, only up to 84 MW will be sited in Minnesota and is, thus, at issue in this contested case proceeding.¹⁷²

109. The Administrative Law Judge finds that AFCL failed to demonstrate that MISO could only accept 150 MW of the proposed 200 MW capacity of the entire Freeborn Wind Project, because AFCL has not developed a record from which the Administrative Law Judge could make findings concerning the MISO queue's capacity.

110. Furthermore, the Administrative Law Judge Finds that AFCL failed to demonstrate that MISO intends to make network upgrades as a result of the Freeborn Wind project, or that any possible cost of network upgrades would increase the costs of electricity generated by the Freeborn Wind project.

D. Land Rights Free From Coercion

111. In its Petition, AFCL raised the issue of whether Freeborn Wind had secured its land rights in a manner free from coercion.¹⁷³

112. It is undisputed that a Freeborn Wind land agent made misrepresentations to certain landowners while securing land rights for Freeborn Wind.¹⁷⁴

113. At the evidentiary hearing, a representative of Freeborn Wind testified that he "[didn't] dispute that [the agent] was unprofessional."¹⁷⁵ Freeborn Wind also testified that the agent in question had been fired.¹⁷⁶ Freeborn Wind communicated with landowners whose "agreements are a necessary part of the project and then visited with those landowners to ensure that they are still comfortable with their participation in the project and they all are."¹⁷⁷

¹⁷¹ Petition for Contested Case at 6-7 (July 6, 2017) (eDocket No. 20177-133591-01).

¹⁷² Ex. FR-1 at 1 (Application).

¹⁷³ Petition for Contested Case at 11-13 (July 6, 2017) (eDocket No. 20177-133591-01) at 11-13.

¹⁷⁴ *Id.* at 12.

¹⁷⁵ Tr. Vol. 1A at 94 (cross-examination of Litchfield).

¹⁷⁶ Tr. Vol. 2 at 78 (cross-examination of Parczyk); see Ex. AFCL-34.

¹⁷⁷ Tr. Vol. 1A at 94 (cross-examination of Litchfield).

114. There was no testimony alleging that any person continued to be bound by the terms of an agreement based on misrepresentations of the fired agent.

115. AFCL proposed that any site permit contain a special condition requiring the Applicant to obtain new signatures on all the affected landowners' contracts.¹⁷⁸

116. The Administrative Law Judge finds that Freeborn Wind has secured its land rights in a manner free from coercion.

X. Site Permit Criteria

117. Wind energy projects are governed by Minn. Stat. Ch. 216F and Minn. R. ch. 7854. Minn. Stat. § 216F.01, subd. 2, defines a "large wind energy conversion system" as a combination of wind energy conversion systems with a combined nameplate capacity of five MW or more. Minnesota Statute chapter 216F.03 requires that a LWECS be sited in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources.

118. When deciding whether to issue a site permit for an LWECS, the Commission considers the factors set forth in Minn. Stat. § 216E.03, subd. 7, which specifies, in relevant part, that the Commission shall be guided by, but not limited to, the following considerations:

- 1) evaluation and research and investigations relating to the effects on land, water, and air resources or large electric power generating plants and high-voltage transmission lines and the effects of water and air discharges and electric and magnetic field resulting from such facilities on public health and welfare, vegetation, animals, materials and aesthetic values, including baseline studies, predictive modeling, and evaluation of new or improved methods for minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment;
- 2) environmental evaluation of sites . . . proposed for future development and expansion and their relationship to the land, water, air, and human resources of the state;
- 3) evaluation of the effects of new electric power generation . . . systems related to power plants designed to minimize adverse environmental effects;
- 4) evaluation of the potential for beneficial uses of waste energy from proposed large electric power generating plants;

¹⁷⁸ Comment by Carol Overland on behalf of AFCL at 13 (July 6, 2013) (eDocket No.20177-133591-01).

- 5) analysis of the direct and indirect economic impact of proposed sites . . . including, but not limited to, productive agricultural land lost or impaired;
- 6) evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site . . . be accepted;
- 7) evaluation of alternatives to the applicant's proposed site . . . ;
- 8) ***
- 9) evaluation of governmental survey lines and other natural division lines of agricultural land so as to minimize interference with agricultural operations;
- 10) ***
- 11) evaluation of irreversible and irretrievable commitments of resources should the proposed site . . . be approved; and
- 12) when appropriate, consideration of problems raised by other state and federal agencies and local entities.¹⁷⁹

119. The Commission must also consider whether the applicant has complied with all applicable procedural requirements.¹⁸⁰

120. The Commission's rules require the applicant to provide information regarding any potential impacts of the proposed project, potential mitigation measures, and any adverse effects that cannot be avoided as part of the application process.¹⁸¹ No separate environmental review document is required for an LWECS project.¹⁸²

XI. Application of Siting Criteria to the Proposed Project

A. Human Settlement

121. The Project is located in rural southcentral Minnesota. Population densities within the Project Area range from 8.7 people per square mile in London Township, to

¹⁷⁹ Minn. Stat. § 216E.03, subd. 7. Considerations (8) and (10) are omitted because they pertain only to proposed routes of high voltage transmission lines.

¹⁸⁰ Minn. R. 7854.1000, subp. 3.

¹⁸¹ Minn. R. 7854.0500, subp. 7.

¹⁸² *Id.* ("The analysis of the environmental impacts required by this subpart satisfies the environmental review requirements of chapter 4410, parts 7849.1000 to 7849.2100, and Minnesota Statutes, chapter 116D. No environmental assessment worksheet or environmental impact statement shall be required on a proposed LWECS project.").

12.3 people per square mile in Shell Rock Township.¹⁸³ There are already hundreds of commercial wind turbines operating within 20 miles of the Project Area.¹⁸⁴

122. The construction of the Project will not displace residents or change the demographics of the Project Area.¹⁸⁵

B. Zoning and Land Use

i. Zoning

123. The Project is located in Freeborn County in an area generally designated as an agricultural district.¹⁸⁶ The Project includes an O & M facility and substation which will require approximately 12 acres of land within the Project Area.¹⁸⁷

124. At the public hearing, Freeborn County Commissioner Dan Belshan testified that Freeborn Wind's O & M building is a commercial building in an area that is zoned for agricultural use. Commissioner Belshan stated that Freeborn County does

not usually allow in an agricultural zoning a commercial building built like that, and we have precedents for that. We did the wind farm into Hartland, and we made them go into the city limits of Hartland where they have water and sewer. There's a lot of reasons we don't want to see spot zoning out in an ag district. If you put up a small machine shop on a road. Pretty soon you've got them running on a township road. So there's a reason we want industrial things in industrial parks or next to cities that have that.¹⁸⁸

125. Freeborn County has adopted a Comprehensive Land Use Policy Plan, codified in the Freeborn County Code of Ordinances, which includes the Project Area.¹⁸⁹ The Freeborn County Zoning Ordinance (Ordinance or Freeborn County Ordinance) identifies commercial wind energy conversion systems and meteorological towers as conditionally permitted uses in an agricultural district.¹⁹⁰

126. The Ordinance defines "aggregated projects," which are projects developed and operated by multiple entities. The definition of "aggregated projects" specifies that "[a]ssociated infrastructure . . . are also included as part of the aggregated project."¹⁹¹

127. The Ordinance also includes regulations relating to, among other things, turbine setbacks, environmental mitigation, shadow flicker, and decommissioning.¹⁹² By

¹⁸³ Ex. FR-1 at 20 (Application).

¹⁸⁴ See *id.* at 102.

¹⁸⁵ *Id.* at 21.

¹⁸⁶ *Id.* at 23.

¹⁸⁷ *Id.* at 15.

¹⁸⁸ Public Hr'g Tr. at 158 (Belshan) (Feb. 20, 2018).

¹⁸⁹ Ex. FR-1 at 22-23 (Application).

¹⁹⁰ Freeborn County, Minn., Code of Ordinances § 26-41 (2015).

¹⁹¹ Freeborn County, Minn., Code of Ordinances § 26-24 (2015).

¹⁹² See, e.g., Freeborn County, Minn., Code of Ordinances §§ 26-51, 26-55 (2015).

its terms, the Ordinance applies only to systems that are not otherwise subject to siting and oversight by the Commission.¹⁹³ Similarly, Minn. Stat. § 216F.07 states, “A permit under this chapter is the only site approval required for the location of an LWECS. The site permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances adopted by regional, county, local, and special purpose governments.”

128. Because the Freeborn Wind project, including the O & M building, is subject to siting and oversight by the Commission, the Freeborn County Ordinance does not apply. Thus, the proposed use does not require separate permitting from Freeborn County.¹⁹⁴

ii. Water Impacts

129. Freeborn County has also adopted the Comprehensive Water Plan Amended to 2016. This plan identifies specific natural resources such as aquifers and surface waters, as well as, drainage, and soil and erosion, and implementation actions to address priority concerns. The Plan focuses on agricultural land uses because approximately 81 percent of productive land in Freeborn County is farmed or used for rotational animal pastures.¹⁹⁵

130. The Project is consistent with Freeborn County’s Comprehensive Plan and will not alter the land use or Comprehensive Water Plan designations of any parcel within the Project Area boundary.¹⁹⁶

131. Freeborn Wind identified one four acre Reinvest in Minnesota (RIM) easement within the Project Area. The Project will not impact this conservation easement.¹⁹⁷ Based on publicly available information, Freeborn Wind states there are no U.S. Fish and Wildlife Service (USFWS) wetland or grassland easements in the Project Area. USFWS Windom Wetland Management District also confirmed the absence of USFWS easements or fee-title properties in the Project Area. Similarly, there are no wetland bank easements in the Project Area.¹⁹⁸

iii. Wetland Setbacks

132. Under Minn. Stat. § 216F.081:

A county may adopt by ordinance standards for LWECS that are more stringent than standards in commission rules or in the commission's permit standards. The commission, in considering a permit application for LWECS

¹⁹³ See Freeborn County, Minn., Code of Ordinances § 26-20 (2015); see also Minn. Stat. § 216F.07 (“A permit under this chapter is the only site approval required for the location of an LWECS. The site permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances adopted by regional, county, local, and special purpose governments.”).

¹⁹⁴ Freeborn County, Minn., Code of Ordinances § 26-20.

¹⁹⁵ Ex. FR-1 at 25 (Application).

¹⁹⁶ *Id.* at 26.

¹⁹⁷ *Id.*

¹⁹⁸ *Id.* at 26-27.

in a county that has adopted more stringent standards, shall consider and apply those more stringent standards, unless the commission finds good cause not to apply the standards.¹⁹⁹

133. Freeborn Wind asserts it has designed the Project to generally comply with the Freeborn County Ordinance, with a limited wetland setback exception, anticipated shadow flicker setbacks, and required signed road agreements.²⁰⁰ Freeborn County's Ordinance includes setback requirements for LWECS that are more restrictive than the Commission's LWECS requirements. With one limited exception relating to wetland setbacks, the Project meets Freeborn County's more stringent setback requirements.²⁰¹

134. Freeborn County Ordinance Section 26-51 requires a three rotor diameter (RD) setback from USFWS Types III, IV, and V wetlands. With the exception of three stock ponds (created for agricultural feed lot operations at a nearby farm), none of the wetlands identified in close proximity to turbines within the Project Area were delineated as Types III, IV, or V.²⁰²

135. Three RD is 1,141 feet for the V116 turbine model.²⁰³ Freeborn Wind states that, due to other siting restrictions, Turbine 31, a V116 model, is sited 2.9 RD (1,086 feet) from three stock ponds classified as Type III wetlands.²⁰⁴ According to Freeborn Wind, a formal wetland delineation and classification conducted for the wetlands near Turbine 31 characterized them as a small man-made collection of stock ponds that would serve as very low-quality habitat for wildlife.²⁰⁵ Further, Freeborn Wind reports these stock ponds have not been actively used since 1985.²⁰⁶ Because wildlife would not be expected to be attracted to this pond, Freeborn Wind believes the proposed location of Turbine 31 is not expected to have an impact on wildlife.²⁰⁷ Accordingly, Freeborn Wind maintains Turbine 31's proposed 1,086-foot setback is adequate to protect the nearby wetlands and wildlife activities supported by the wetland from any potential adverse effects of the Project.²⁰⁸ Finally, Freeborn Wind argues that the Commission has specifically rejected imposing a 1,000-foot setback from wetlands, concluding there is insufficient justification for such a setback. In addition, Freeborn Wind argues that imposing a 1,000-foot setback from wetlands would take an unjustifiable amount of land out of wind energy production.²⁰⁹

¹⁹⁹ Minn. Stat. § 216F.081.

²⁰⁰ Ex. FR-1 at 23 (Application); Freeborn County, Minn., Code of Ordinances §§ 26-51, 26-56, 26-59(a) (2015).

²⁰¹ Ex. FR-4 at 16 (Litchfield Direct). Since Freeborn Wind's application was submitted, on July 11, 2017, the Freeborn County Board passed a statement in support of a 1,500 foot setback from residences. See Public Comment of Dorenne Hansen (July 12, 2017) (eDocket No. 20177-133792-01). However, that is not part of a County ordinance.

²⁰² Ex. FR-1 at 26 (Application).

²⁰³ *Id.* at 8, Table 5.1-2.

²⁰⁴ *Id.* at 27; Ex. FR-8 at 7 (Giampoli Direct).

²⁰⁵ Ex. FR-8 at 7-8 (Giampoli Direct); Ex. FR-1 at 27-28 (Application).

²⁰⁶ Ex. FR-8 at Schedule 4 at 2 (Giampoli Direct).

²⁰⁷ *Id.* at 8.

²⁰⁸ *Id.*

²⁰⁹ *In re Establishment of General Permit Standards for the Siting of Wind Generation Projects Less than 25 Megawatts*, MPUC Docket No. E,G999/M-07-1102, MPUC Order Establishing General Wind Permit Standards at 3-4 (Jan. 11, 2008) (eDocket No. 4897855).

Therefore, Freeborn Wind asserts, pursuant to Minn. Stat. § 216F.081, there is good cause not to apply Freeborn County's wetland setback to the proposed location of Turbine 31.²¹⁰

136. AFCL argues that the Commission should not find good cause to refuse to apply Freeborn County's wetland setback requirements, but does not say why.²¹¹

137. The Administrative Law Judge concludes that Freeborn Wind has demonstrated good cause for the Commission not to apply Freeborn County's wetland setback to the proposed location of Turbine 31.

iv. Other Setbacks

138. The Freeborn County Ordinance requires a setback of 1,000 feet from a dwelling.²¹² The Ordinance defines a "dwelling" as "a residential building or portion thereof intended for occupancy by a single-family, but not including hotels, motels, boarding or rooming houses, or tourist homes."²¹³

139. Freeborn Wind states that all turbines within the Project comply with the Freeborn County Ordinance's residential setback of 1,000 feet.²¹⁴ According to Freeborn Wind, the Project's average residential setback is 1,905 feet.²¹⁵ The turbine with the shortest setback (1,189 feet), Turbine 23, is located on a participating landowner's property, and the nearby residence in question belongs to that participating landowner.²¹⁶

140. Freeborn Wind acknowledges that one turbine is located 700 feet from a vacant house (identified as house No. 281) located on property owned by participating landowner Richard Carroll.²¹⁷ Freeborn Wind asserts that the house is not a dwelling within the meaning of the Ordinance because it is currently unoccupied, and the owner has no intention of renting the house in the future if the Project is approved. Further, Freeborn Wind maintains that Mr. Carroll has expressed his consent to the Project and its proximity to the house on his property, and that the house will remain unoccupied.²¹⁸

141. At the public hearing, Mr. Carroll expressed his support for wind energy, generally, and for the Project. Specifically, Mr. Carroll expressed concern that members of the community continue to treat one another with respect, despite their differences.²¹⁹

²¹⁰ See Ex. FR-8 at 8-9 (Giampoli Direct).

²¹¹ See AFCL Brief at 56-57 (Mar. 20, 2018); AFCL Reply Brief at 11-15 (Apr. 4, 2018).

²¹² Freeborn County, Minn., Code of Ordinances § 26-51.

²¹³ Freeborn County, Minn., Code of Ordinances § 26-24.

²¹⁴ Ex. FR-4 at 17 (Litchfield Direct).

²¹⁵ *Id.* at 18-19.

²¹⁶ *Id.* at 19. A participating landowner is a landowner who has entered into an agreement with Freeborn Wind. A non-participating landowner has not entered into an agreement with Freeborn Wind.

²¹⁷ *Id.* at 17; Ex. FR-4 (Errata).

²¹⁸ See Ex. FR-4 at Sched. 6, 17 (Litchfield Direct). Mr. Carroll also spoke in support of the Project at the public hearing. See Public H'rg Tr. at 106 (Feb. 20, 2018) (Carroll).

²¹⁹ Public H'rg. Tr. at 106-107 (Feb. 20, 2018).

142. Freeborn Wind argues that, even if the vacant house were considered a “dwelling” under the Ordinance, pursuant to Minn. Stat. § 216F.081, good cause exists for the Commission to not apply Freeborn County’s 1,000-foot setback to the vacant house.

143. AFCL disagrees, stating that, at a minimum, Mr. Carroll must commit in writing to leaving his house unoccupied.²²⁰

144. The Administrative Law Judge agrees that good cause exists for the Commission not to apply Freeborn County’s 1,000-foot setback to the vacant house on Mr. Carroll’s property. There is no evidence in the record that siting a wind turbine less than 1,000 feet from Mr. Carroll’s vacant house will affect any other landowner. In addition, Mr. Carroll was present and spoke at the public hearing, but gave no indication that he was displeased with the proposed turbine layout.

145. Public comments requesting increased residential setbacks have been submitted, and the Freeborn County Board of Commissioners submitted a comment requesting a 1,500-foot setback requirement.²²¹ The residential setback required by Section 26-51 of the Ordinance is 1,000 feet.²²²

146. The Freeborn County Ordinance also provides that shadow flicker may not exceed 30 hours per year at any receptor.²²³ To ensure that no landowner experiences more than 30 hours of shadow flicker per year, Freeborn Wind states that it plans to utilize Turbine Control Software programmed to shut down a specific turbine or turbines for an appropriate amount of time to reduce flicker to below 30 hours per year at each home.²²⁴ Freeborn Wind projects that, in this way, it can comply with the 30-hour per year shadow flicker limits of the Ordinance.

147. As discussed in detail in section X.E. of this Report, the Administrative Law Judge recommends that, if the Commission issues the Site Permit, Section 7.2 of the Draft Site Permit be modified to ensure that Freeborn Wind complies with Freeborn County’s shadow flicker limits.

148. Section 4.4 of the Draft Site Permit also requires that all wind turbines and meteorological towers be set back a minimum of 250 feet from the edge of the nearest public road ROW.²²⁵ The Freeborn County Ordinance requires turbines to be set back a minimum of 1.1 times the turbine height from the nearest public ROW.²²⁶ This is 487 feet

²²⁰ AFCL redline comments to Freeborn Wind Proposed Findings of Fact, Conclusions of Law, and Recommendation at 21 (Apr. 4, 2018).

²²¹ Freeborn Cnty. Bd. of Comm’rs Comment (July 13, 2017) (eDocket No. 20177-133824-01); see Attach. A at 7 (Summary of Initial Public Comments).

²²² See Ex. EERA-8 at 15 (Comments and Recommendations on a Preliminary Draft Site Permit) (stating that DOC-EERA “does not consider 1,300 feet, 1,500 feet, one-half mile, one mile, or 10 times the turbine tip height to be justified distances for turbine setbacks from residences.”); Ex. FR-4 at 21 (Litchfield Direct).

²²³ Freeborn County, Minn., Code of Ordinances § 26-56 (2015).

²²⁴ Tr. Vol. 1A at 33 (Litchfield); see also Ex. AFCL-19 at 2 (Freeborn Response to AFCL IR No. 7).

²²⁵ Draft Site Permit at 3-4 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

²²⁶ Freeborn County, Minn., Code of Ordinances § 26-51.

for the V110 model and 498 feet for the V116 model.²²⁷ DOC-EERA considered this setback and recommended that it not be adopted. DOC-EERA stated that a 1.1 times the total turbine height as a clear turbine fall zone is not necessary and results in additional siting constraints that are not justified.²²⁸ Within the proposed turbine layout, the turbines are located at least 499 feet from the nearest public roadway.²²⁹ Therefore, the proposed Project will comply with the Draft Site Permit conditions and the Freeborn County Ordinance.

149. None of the townships within the Project Area have adopted zoning regulations.²³⁰

150. Should the Commission grant a Site Permit, including the conditions preventing excessive shadow flicker, the Project would not conflict with the applicable zoning and/or comprehensive plan requirements.²³¹ The Project is not expected to have negative impacts on local zoning, comprehensive plans, and conservation easements. The record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to land use and local zoning.

C. Property Values

151. Freeborn Wind states that project facilities will be sited and constructed predominantly on leased agricultural lands owned by participating landowners. According to Freeborn Wind, these participating landowners will be compensated for the use of their property, yielding increased valuations on the farmland due to the harvest of electricity along with traditional agricultural products that underpin the value of the land.²³² Therefore, Freeborn Wind anticipates that there will be no unmitigated impacts to the property values of participating landowners.²³³

152. Michael MaRous is a certified Member Appraisal Institute appraiser with 30 years of experience evaluating the impact of wind turbines on property values. Mr. MaRous conducted a Market Analysis to evaluate the potential impact of the Project on the value of the surrounding properties and found no credible data indicating property values are adversely impacted due to proximity to wind farm developments.²³⁴ Mr. MaRous completed a Project-specific market analysis of properties in the Project Area and concluded that “[a]n analysis of agricultural land values in the area and in other areas of the state with wind farms did not support any finding that the agricultural land values are negatively impacted by the proximity to wind turbines.”²³⁵

²²⁷ Ex. FR-1 at 7 (Application).

²²⁸ Ex. EERA-8 at 28 (Comments and Recommendations on a Preliminary Draft Site Permit).

²²⁹ Ex. FR-1 at 42 (Application).

²³⁰ Ex. FR-1 at 26 (Application).

²³¹ *Id.* at 27.

²³² *Id.* at 67-68.

²³³ *Id.* at 67.

²³⁴ Ex. FR-9 at 4-5 (MaRous Direct); see also Ex. FR-1 at App. E (Application); Tr. Vol. 2 at 57 (MaRous).

²³⁵ Ex. FR-9 at 4 (MaRous Direct).

153. There were some public comments alleging that the proximity of wind turbines will negatively affect the value of nearby agricultural properties. One public comment reflected concerns several people had with the turbines' cement foundations:

For the land, the amount of cement that has to go in the ground is going to diminish the yield potential around them because of the secretion into the soil around it. Producers will have to spend more on fertilizer to bring that up to the needed nutrients for the plant to fully produce a crop. In seasons where it's already hard to start out farming and profits are hard to make, this added cost is only going to put another wrench in the mix for our young producers to come back to the area.²³⁶

154. There was conflicting testimony regarding the ability of agricultural pilots to conduct aerial spraying within the perimeter of a wind farm.²³⁷ AFCL provided no expert testimony regarding the impact of wind turbines on neighboring agricultural property or practices.

155. The Administrative Law Judge finds that the preponderance of the evidence is that the Project will not adversely affect agricultural land values.

156. The impact of the Project on residential property values was more strongly contested. Mr. MaRous concluded that "an analysis of recent residential sales proximate to existing wind farms did not support any finding that proximity to a wind turbine had a negative impact on property values."²³⁸ Mr. MaRous found no market evidence to support a negative impact on property values as a result of the development of and proximity to a wind farm.²³⁹ Mr. MaRous' initial analysis of the Project assumed a 1,500-foot setback from all residences, but he was aware that six turbines were proposed to be closer than 1,500 feet from the nearest house. The existence of these six closer turbines did not affect the conclusions of his analysis because all of his research "in Freeborn County and elsewhere has confirmed that where there is a setback of at least three times the turbine height, there is no impact on land values. All but one of the [six] closest residences meets that threshold."²⁴⁰

157. Mr. MaRous' research on residential property values considered a variety of data. To determine the extent to which the data supports his conclusion, each data source must be examined.

158. 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 owner of the property lives on property in Iowa with wind turbines and stated that he believes the turbine lease and location, as proposed, will not have a

²³⁶ Comment by Jennifer Johnson (July 13, 2017) (eDocket No. 20177-133824-01).

²³⁷ Public Hr'g Tr. at 77 (Rauenhorst), 90-91 (Thisius), 180-82 (Follmuth) (Feb. 20, 2018).

²³⁸ *Id.* at 4.

²³⁹ Ex. FR-9 at 4-5 (MaRous Direct); *see id.* at Schedules 2-3 (MaRous Direct).

²⁴⁰ *Id.* 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.

negative impact on the property value. Accordingly, Mr. MaRous concluded that the Project will not adversely affect the value of a property close to a turbine.²⁴¹

159. The Administrative Law Judge gives little weight to the opinion of an expert witness that rests in large part upon the opinion of a non-expert, non-resident, participating landowner who was not subject to cross-examination.

160. Mr. MaRous also used the “matched pair” method to examine the effect of proximity to a wind turbine on a property’s value. This method analyzes the impact of a single feature on a property’s value by finding the sale value of a nearly identical property but for the single feature.

161. While theoretically attractive, the Administrative Law Judge notes that the accuracy of the “matched pair” method obviously depends on the adequacy of the data to which it is applied. No two properties are exactly alike in every detail, and differences between the properties other than their proximity to wind turbines could share responsibility for any differences in the properties’ values. The greater the number of “matched pairs,” the more confidence can be placed in the conclusions drawn.

162. There were few recent sales of single-family homes in Freeborn County. Mr. MaRous acknowledges that it “is difficult to find properties that are identical except for proximity to a wind turbine, and which also occurred under substantially similar market conditions, especially in rural areas.”²⁴² He found only a single recent sale of a single-family residence near a wind turbine – a residence 2,375 feet from its nearest turbine in the Bent Tree Wind Farm. That distance is just 235 feet short of one-half mile and 25 percent further from the nearest turbine than the Project’s average planned setback of 1,905 feet.²⁴³ He compared that sale to the sale price of a property he judged to be quite similar but was not located near wind turbines. Based on a comparison of the properties, Mr. MaRous found no evidence that proximity to a wind turbine decreased the property’s value.²⁴⁴

163. This single matched pair is an exceedingly limited foundation upon which to base any conclusion about the effect of the Project on property values. Its relevance for properties 1,000 feet closer to a turbine is questionable. Both turbine-emitted noise, and its visual impacts decline with a receptor’s distance from the turbine. The Administrative Law Judge finds that while this observation is consistent with the testimony of the owner of the property closest to a Project turbine, the two observations together are not compelling evidence that proximity to wind turbines has no effect on the values of properties.

²⁴¹ *Id.* The owner of this residence, Paul Follmuth, expressed his strong support for the Project at the public hearing. See Public Hr’g Tr. at 180-83 (Follmuth) (Feb. 20, 2018).

²⁴² Ex. FR-4 at App. E at 9 (Market Impact Analysis).

²⁴³ *Id.* at 6, 8; see also Letter from Robert VanPelt to MPUC Commissioners (July 2, 2017) (eDocket No. 20177-133481-01)

²⁴⁴ Ex. FR-4 at App. E. at 12 (Market Impact Analysis).

164. Mr. MaRous provided additional support for his conclusion that property values were not affected by proximity to a wind farm by examining similarly matched pairs in three counties in Illinois. Mr. MaRous found three matched properties in Mclean County, two in LaSalle County, and one in Livingston County.²⁴⁵ The distances of the dwellings from the nearest wind turbine in feet were 1,865 feet, 2,210 feet, 1,573 feet, 3,160 feet, 2,325 feet, and 2,322 feet. There are just two matched pairs where the distance to the nearest turbine is less than the average distance for the Project Area. Mr. MaRous found no indication that proximity to a wind turbine lowered the value of non-participating properties.

165. While data from Minnesota transactions would be preferable, the Administrative Law Judge finds this data lends a degree of support to Mr. MaRous' conclusions with regard to residential properties. Somewhat more probative is Mr. MaRous' survey of assessors in the eight counties in Minnesota with large wind farms. County Assessors perform property valuations. Mr. MaRous found "[w]ith one exception, the interviewees reported that there was no market evidence to support a finding that there has been a negative impact upon residential property values as a result of the development of and the proximity to a wind farm facility."²⁴⁶ Mr. MaRous also supplied a similar survey his firm conducted in South Dakota with similar results.²⁴⁷ However, data from actual transactions involving resident owners of non-participating properties with known distances from wind farms would be far preferable to general statements of assessed values.

166. Lastly, Mr. MaRous submitted a number of empirical studies that found no effect of proximity to a wind turbine on a residential property's value.²⁴⁸ In particular, the 2009 and 2013 nation-wide studies conducted by Lawrence Berkeley National Laboratory (LBNL) analyzed thousands of sales of residential properties. The 2009 LBNL Study analyzed 7,489 sales within 10 miles of 11 wind farms and 125 post-construction sales within one mile of a turbine. The 2013 LBNL Study included 51,276 sales in nine states proximate to 67 wind farms and 376 post-construction sales within one mile of a turbine.²⁴⁹ Both studies found "no statistically significant evidence that wind turbines affect real estate sale prices."²⁵⁰

167. The 2009 LBNL Study categorized residences as within 3,000 feet of a turbine, between 3,000 feet and one mile, one mile to three miles, and three miles to five miles. The Study's results show a slight decline in value, but the difference was not statistically significant.²⁵¹ The lack of statistical significance could be due to the small

²⁴⁵ *Id.* at 13-30.

²⁴⁶ Ex. FR-9 at Schedule 1 at 1 (Minnesota Assessor's [sic] Survey).

²⁴⁷ *Id.* at Schedules 2-3 (Iowa and South Dakota Assessor Surveys). MaRous refers in his testimony to a survey of "County Assessors in all 18 Illinois counties in which wind farms are located" but did not supply that survey with his testimony. *Id.* at 5 (MaRous Direct).

²⁴⁸ *Id.* at 8-12.

²⁴⁹ *Id.* at 8.

²⁵⁰ *Id.* at 9-10.

²⁵¹ *Id.* at Schedule 4 at 31 (2009 LBNL Study).

number of homes within one mile of the nearest turbine. The slight decline in value could be due to the still smaller number of sales of homes within 1,500 or 2,000 feet of a turbine.

168. The 2013 LBNL Study also produced results indicating a slightly negative but statistically insignificant effect of proximity to turbines less than one mile distant.²⁵² Like the 2009 Study, the 2013 Study did not take a granular view of distance from a turbine. It grouped transactions no finer than one-half mile distant from a turbine. It also had relatively few sales transactions occurring within one-half mile (331 out of 51,276).²⁵³

169. The other studies Mr. MaRous included arrived at similar conclusions. All but one study suffered from a similar limitation in that they did not separately consider properties within 1,500 or 2,000 feet of a turbine. These studies review transactions occurring within larger distances. The 2012 and 2016 Ontario Assessment Studies and the 2013 Canada Study considered transactions within 1 kilometer (3,280 feet).²⁵⁴ The 2013 Rhode Island Study grouped transactions within one-half mile (2,640 feet).²⁵⁵ The 2014 Massachusetts Study, however, separately grouped transactions within one-quarter mile (1,320 feet) of a turbine.²⁵⁶ It also found no negative effect on property from proximity to a turbine. However, it concerned property values in urban settings only.

170. DOC-EERA cited several studies that found no impact on property values by nearby wind farms, including the 2009 and 2013 LBNL studies.²⁵⁷ It also noted that “[s]ix counties in southern Minnesota (Dodge, Jackson, Lincoln, Martin, Mower, and Murray Counties) with large wind energy conversion systems responded to a Stearns County survey asking about impacts on property values as a result of wind farms. That survey showed that neither properties hosting turbines, nor those adjacent to those properties in the counties listed, have been negatively impacted by the presence of wind farms.”²⁵⁸

171. However, the Stearns County Board was careful to note that the “collected data is insufficient to allow for a reasonable analysis of the effects of wind energy development on land values.”²⁵⁹

172. DOC-EERA concluded that:

[t]he studies and information cited previously [do] not suggest that the presence of wind turbines negatively impacts property values on a regular basis. The studies do identify additional data needs for future analysis, but a statement identifying additional data needs should not be viewed as a

²⁵² *Id.* at Schedule 5 at 32-33 (2013 LBNL Study).

²⁵³ *Id.* at Schedule 5 at Table 4 (2013 LBNL Study).

²⁵⁴ *Id.* at Schedules 6-7.

²⁵⁵ *Id.* at Schedule 8.

²⁵⁶ *Id.* at Schedule 9

²⁵⁷ Ex. EERA-8 at 12 (Comments and Recommendations on a Preliminary Draft Site Permit).

²⁵⁸ See *id.* at 13 (citing Stearns Cnty. Resolution #10-46 (June 15, 2010) (eDocket No. 20106-52067-01)).

²⁵⁹ Stearns Cnty. Resolution #10-46 at 4 (June 15, 2010) (eDocket No. 20106-52067-01).

reason to ignore the data and analysis provided in studies completed to date.²⁶⁰

173. Members of the public expressed their strong disagreement with Mr. MaRous' conclusions with respect to residential property. They provided comments and submitted documents into the record stating that proximity to wind farms did adversely affect the values of non-participating residential properties.²⁶¹ AFCL correctly pointed out that the studies Mr. MaRous performed, and those he included with his testimony, based their conclusions on data that included very few sales of homes within 1,500 or 2,000 feet of a wind turbine. Because of their close proximity to turbines, these properties are at greatest risk of the noise and visual impacts of turbines.²⁶²

174. The Administrative Law Judge finds it plausible that non-participating, residential properties within 2,000 feet of a wind turbine are less valuable because of that proximity. However, there was no expert testimony to rebut Mr. MaRous' conclusions or to explain and support the contrary evidence provided by AFCL and members of the public. The Administrative Law Judge did not find the evidence Mr. MaRous provided in support of the Project individually compelling, but collectively, the evidence supports Freeborn Wind's position that its Project will not harm property values. Despite the limitations of the various studies and analyses, the preponderance of the evidence is that proximity to a wind turbine does not negatively affect property values.

175. Several members of the public believe maintained that Freeborn Wind should be required to provide each non-participating landowner with a Property Value Guarantee (PVG) to ensure that they do not suffer losses in property values as a result of the Project.²⁶³

176. There is no evidence in the record that shows a PVG is warranted for the Project. First, the evidence demonstrates the Project will not negatively impact property values in the Project area. Second, neither DOC-EERA nor the Commission can efficiently or effectively administer a Site Permit condition that would require Freeborn

²⁶⁰ *Id.* at 13.

²⁶¹ See, e.g., Letter from McCann Appraisal, LLC to Ben Hoen, Ernest Orlando Lawrence, Berkeley National Laboratory (Dec. 14, 2009) (eDocket No. 20177-133481-02) (finding proximity to wind turbines has a negative effect on property values near a large wind farm in northern California); Letter from Robert VanPelt to MPUC Commissioners (July 2, 2017) (eDocket No. 20177-133481-01); Comment by Stephanie Richter (July 2, 2017) (eDocket No. 20177-133481-01) (the proximity to wind farms affects the values of both matched properties; study should have had Minnesota data rather than Illinois); Comment from Stephanie Richter (July 2, 2017) (eDocket No. 20177-133473-010) (providing property values from "Beacon-Schneider website" of properties within wind farm and five miles away showing declining property values since 2014 for properties within a wind farm and increasing property values for properties five miles away); Ex. EERA-3 (Comment from AFCL (Oct. 9, 2017)) (eDocket No. 201710-136324-01) (market impact study has no data for properties very close to wind farms because proximity prevents sales); Comment from Gregg Koch (Mar. 12, 2018) (eDocket No. 20183-141062-01) (concern for decreased property value).

²⁶² AFCL Reply Brief at 8.

²⁶³ Public Hr'g Tr. at 121-22 (Van Pelt), 166-67 (Szymeczek), 219-20 (Richter) (Feb. 20, 2018).

Wind to establish PVGs with homeowners. Finally, it would not be feasible to direct a local government department to implement and administer such a program.²⁶⁴

D. Noise

i. Concern for the Noise the Turbines will Cause

177. The most commonly voiced objection to the wind farm is the fear that it will produce bothersome noise.²⁶⁵ Many people expressed concern that there could be adverse effects even if the wind farm is fully compliant with Minnesota noise regulations.²⁶⁶ Numerous articles were placed into the record by members of the public and AFCL concerning the adverse effects of the noise produced by wind turbines.²⁶⁷

178. Freeborn Wind retained Hankard Environmental, Inc. to conduct a pre-construction noise analysis for the Project.²⁶⁸ Mike Hankard is the President and Principal of the firm.²⁶⁹ During the past eight years, Mr. Hankard's focus has been studying noise from utility-scale wind turbines and he has "been principally responsible for noise measurements, analysis, and control on over 500 projects."²⁷⁰

179. Freeborn Wind retained Hankard Environmental, Inc. to conduct a pre-construction noise analysis for the Project.²⁷¹ Mike Hankard is the President and Principal of the firm.²⁷² During the past eight years, Mr. Hankard's focus has been studying noise

²⁶⁴ See Ex. EERA-8 at 13 (Comments and Recommendations on a Preliminary Draft Site Permit).

²⁶⁵ Ex. FR-4 at 25 (Litchfield Direct): see, e.g., Ex. P-23 (Letter from Jacob Schumaker) (eDocket No.20183-140952-08); Ex. P-19 (email from Allie Olson to Administrative Law Judge LauraSue Schlatter with two attached peer reviewed studies linking wind turbine noise to adverse health effects (Feb. 20, 2018)) (eDocket No. 20183-140952-04); EERA-8 at 16 (Comments and Recommendations of Minnesota Department of Commerce Energy Environmental Review and Analysis Staff). Beyond bothersome noise, some record submissions contend that the low-frequency noise of wind turbines "lead to significant increases in suicide." Ex. P-19 (Eric Zou, *Wind Turbine Syndrome: The Impact of Wind Farms on Suicide*, (Oct. 2017) (abstract)) (eDocket No. 20183-140952-04).

²⁶⁶ Ex. P-23 (Bob Thorne, *The Problems With "Noise Numbers" for Wind Farm Noise Assessment*, Bulletin of Science, Technology & Society (2011)) (eDocket No. 20183-140952-08).

²⁶⁷ See, e.g., Ex. EERA-6 (Allec N Salt and Timothy E. Hullar, *Responses of the ear to low frequency sounds, infrasound and wind turbines* (June 16, 2010)) (eDocket No.201710-136011-01); Ex. EERA-6 (Mariana Alves-Pereira and Numo A.A. Castelo Branco, *Infrasound and low frequency noise dose responses: Contributions*, Inter-Noise 200 (Aug. 2007)) (eDocket No. 201710-136016-01); Ex. EERA-6 (Jerry Punch, PhD and Richard James, INCE, BME, *Negative Health Effects of Noise from Industrial Wind Turbines: Some Background*, Hearing Health & Technology Matters (Nov. 4, 2014)) (eDocket No. 201710-136056-01); Letter from Bridget Ellingson to Richard Davis (Oct. 7, 2017) (eDocket No. 201710-136285-01); Comment by Dorene Hansen (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015)) (eDocket No. 201710-136267-04).

²⁶⁸ Ex. FR-1 at 1 (Pre-Construction Noise Analysis for the Proposed Freeborn Wind Farm (June 5, 2017)) (Pre-Construction Noise Analysis).

²⁶⁹ Ex. FR-5 at 1 (Hankard Direct).

²⁷⁰ *Id.*

²⁷¹ Pre-Construction Noise Analysis at 1.

²⁷² Ex. FR-5 at 1 (Hankard Direct).

from utility-scale wind turbines and he has “been principally responsible for noise measurements, analysis, and control on over 500 projects.”²⁷³

180. AFCL provided no expert witness testimony on the subject of noise.

181. It is generally accepted that if a wind farm complies with Minnesota noise regulations, people living and working near its turbines will not suffer direct physical damage to their hearing.²⁷⁴ But, it is also believed that “*subaudible infrasound can be detected inside homes* near operating wind turbines, and that such sound can be identified from up to 10 kilometers distant.”²⁷⁵

182. While it has not been shown that wind turbines cause harm to human hearing, people’s reactions to wind turbine noise vary widely. Some people may not be bothered by the noise of the rotating turbines and some may only experience mild annoyance from time to time. But there may be others who are especially sensitive to the noise patterns and inaudible low frequency emissions of the turbines. Their reactions to wind turbines may include nausea, sleeplessness, headaches, chest pains, and high levels of stress.²⁷⁶

183. The Minnesota Department of Health recommends:

[r]ecognizing that it is unknown whether reported health impacts are direct health effects or indirect stress impacts from annoyance and/or lack of sleep resulting from turbine noise or shadow flicker, potential health impacts from wind turbine projects should be acknowledged, and provision should be made to mitigate these effects for residents within and near proposed project areas.²⁷⁷

184. This section concerns the Project’s compliance with Minnesota noise regulations and whether the Draft Site Permit’s provisions relating to noise are sufficient. The potential for the Project to cause adverse health effects more generally is discussed at section H of this Report.

²⁷³ *Id.*

²⁷⁴ *But see* Ex. EERA-5 (Alec N. Salt and Jeffery T. Lichtenhan, *Perception-based protection from low-frequency sounds may not be enough*, *inter.noise* (Aug. 2012) (study suggesting that the inaudible sounds generated by wind turbines can be harmful to people)) (eDocket No. 201710-136072-01).

²⁷⁵ Ex. EERA-6 at 6 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01).

²⁷⁶ Ex. AFCL-13 (Michael A Nissenbaum, Jeffery J. Aramini, & Christopher D. Hanning, *Effects of Industrial Wind Turbine Noise on Sleep and Health*, *Noise & Health* (2012)); Comment by Kristi Rosenquist (Mar. 14, 2018) (Letter to Dan Litchfield from Paul Allwood, Assistant Commissioner Minnesota Department of Health (May 2, 2017)) (eDocket No. 20183-141013-01) (Allwood Letter).

²⁷⁷ Allwood Letter at 3.

ii. Sound and Hearing

185. Wind turbines produce sound patterns which the ear and audio processing functions in the brain recognize.²⁷⁸ The equipment inside a wind turbine's nacelle produces some noise, but the more recent models of turbine nacelles produce very little noise. The main subject of noise complaints is the "broadband 'whooshing' sound produced by interaction of turbine blades with the wind."²⁷⁹ There is also a concern that wind turbines generate "[r]hythmic, low frequency pulsing of higher frequency noise (like the sound of an amplified heart beat) ... one type of sound that can be caused by wind turbine blades under some conditions."²⁸⁰ Another pattern is "a tonal signal of *sharply rising and falling pulses* in the infrasound range."²⁸¹

186. "Sound consists of small changes in air pressure that our ears detect."²⁸² Sound is carried through the air in electromagnetic compression waves. These waves can be measured and have specific frequencies and amplitude. Very low frequency sounds are deep, low notes. Higher frequency sound waves produce higher notes. A sound's frequency is also called its "pitch." The louder a sound, the greater is the amplitude of its wave.²⁸³

187. A sound's power level is the amount of acoustic energy emitted by the sound-making source. Sound power emissions produce pressure waves which emanate from the source outward. Sound pressure decreases with distance from the source as the medium through which the sound is traveling attenuates its energy to various degrees depending upon the medium and the sound's frequency. "Sound attenuation factors include meteorological conditions such as wind direction, temperature, and humidity; sound interaction with the ground; and atmospheric absorption 'terrain effects' diffraction of sound around objects and topographical features' and foliage."²⁸⁴ For example, a steadily operating chain saw will be very loud to the person holding it but much less loud

²⁷⁸ Ex. EERA-6 at 5 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01).

²⁷⁹ Comment by Sean Gaston at 6 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03); Ex. EERA-6 at 6 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01).

²⁸⁰ Comment by Sean Gaston at 9 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

²⁸¹ Ex. EERA-6 at 5 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01).

²⁸² Ex. FR-5 at 4 (Hankard Direct).

²⁸³ *Id.* at 5; Comment by Sean Gaston at 8 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

²⁸⁴ Ex. AFCL-11 at 6 (*Bent Tree Wind Farm Post-Construction Noise Assessment*, DNV GL-Energy (Aug. 30, 2017)).

to the neighbor down the block. Thus, measurements of sound pressure levels will depend on where the measurements are made.

188. In humans, logarithmic increases in the intensity of sound cause an arithmetically increasing perception of the sound's loudness. In other words: "[l]oudness increases as the logarithm of air pressure."²⁸⁵

189. Human ears are not equally sensitive to all sound frequencies. "The human ear is sensitive primarily to the level (loudness) of a noise (sound), but also to its pitch (frequency)." The ear is more sensitive to frequencies in the 1,000 Hertz [Hz]²⁸⁶ to 4,000 Hz than it is to lower or higher frequencies.²⁸⁷

190. Individuals differ in their hearing acuity with significant variations in ability to hear very low and very high frequency sounds. The average range of human hearing is generally accepted to be 20 Hz to 20,000 Hz but the range declines with age. Sounds below 20 Hz are described as having an "infrasonic frequency."²⁸⁸ Low frequency sounds have frequencies between 20 to 250 Hz.²⁸⁹

191. 20 Hz is widely regarded as the threshold of human hearing. Air pressure changes in frequencies below 20 Hz are inaudible to most people.²⁹⁰ "Sounds" with frequencies below 20 Hz are referred to as Infrasound.²⁹¹ Low frequency sounds have very long wavelengths that are not decreased by most walls and windows. Inaudible low frequency "sounds" can cause vibrations in buildings which in turn can cause audible rumblings.²⁹²

192. Most available evidence suggests that reported health effects are related to inaudible (to most people) low frequency noise. Wind turbines generate a broad spectrum of low intensity noise.²⁹³

²⁸⁵ Comment by Sean Gaston at 6 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

²⁸⁶ Hz stands for "Hertz" a unit of frequency measuring cycles per second. *Merriam-Webster's Collegiate Dictionary*, (11th ed. 2011).

²⁸⁷ Ex. FR-5 at 4 (Hankard Direct).

²⁸⁸ Ex. P-23 (Bob Thorne, *The Problems With "Noise Numbers" for Wind Farm Noise Assessment*, Bulletin of Science, Technology & Society at 263 (2011)) (eDocket No. 20183-140952-08).

²⁸⁹ *Id.*

²⁹⁰ "Some individuals have extraordinary sensitivity at low frequencies, up to 25 dB more sensitive than the presumed thresholds at some low frequencies." Comment by Sean Gaston at 10 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

²⁹¹ *Id.* at 6.

²⁹² *Id.* at 9; Ex. EERA-6 at 11 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01).

²⁹³ Ex. EERA-6 (Jerry Punch, PhD and Richard James, INCE, BME, *Negative Health Effects of Noise from Industrial Wind Turbines: Some Background*, Hearing Health & Technology Matters (Nov. 4, 2014)) (eDocket No. 201710-136056-01); Ex. EERA-6 at 11 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01); compare Ex. P-23 at 263 (Bob Thorne, *The Problems*

193. A decibel is the unit in which the intensity of sound (sound pressure level) is typically measured. A barely audible sound (near total silence) is assigned a measure of 0 decibels (dB). The decibel is a logarithmic unit in base 10. A sound that is 10 dB is 10 times louder than the just barely audible 0 dB sound.²⁹⁴

194. Human ears are not equally sensitive to every sound frequency. A 10 dB, 1,000 Hz sound is perceived as louder than a 10 dB, 50 Hz sound. To measure noise in a way that corresponds to how the ear perceives loudness, a measuring device must attenuate the low frequencies and amplify higher frequencies. “A-weighting” describes a weighting scheme intended to emulate the perception of the human ear.²⁹⁵ A-weighted sound measurements are indicated as dB(A) with weights calibrated for a low level of loudness. The weighting of different frequencies is also described as filtering. Because the ear is not as sensitive to low frequencies, filtering or eliminating some of the low sound pressure of a given low frequency sound will replicate how the ear experiences its loudness.²⁹⁶ A-weighting gradually reduces the significance of frequencies below 1000Hz until at 10Hz, the attenuation is 70dB.²⁹⁷

195. An alternative to A-weighting is C-weighting. C-weighting does not filter out low frequency sound as the A-weighting does, making C-weighting better if the concern is to measure absolute sound pressure levels rather than loudness to the human ear.²⁹⁸ The C-weighting is flat to within 1dB down to about 50 Hz and then attenuation commences, but not as rapidly as with A-weighting.

196. Freeborn Wind and the wind energy industry generally supports the use of A-weighting for assessing wind turbine noise. The primary reason for this preference is that A-weighting reflects an aspect of human hearing – the perception of loudness.²⁹⁹ People concerned about the potential impacts of low frequency noise and infrasound contend that A-weighting should not be used for wind turbine noise. International Standards Organization (ISO) 1996-1 states, in part, “sounds with strong low-frequency content engender greater annoyance than is predicted by the A-weighted sound pressure level.”³⁰⁰

With “Noise Numbers” for Wind Farm Noise Assessment, Bulletin of Science, Technology & Society (2011)) (eDocket No. 20183-140952-08) with Ex. FR-5 at 8 (“Many measurements have demonstrated that wind turbine LFN is inaudible below about 40 Hz.”) (Hankard Direct).

²⁹⁴ Ex. FR-5 at 4 (Hankard Direct).

²⁹⁵ *Id.* at 4.

²⁹⁶ Comment by Sean Gaston at 10 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

²⁹⁷ *Id.* at 9.

²⁹⁸ Ex. EERA-6 at 12 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01); Ex. FR-5 at 5 (Hankard Direct).

²⁹⁹ Ex. FR-5 at 4-7 (Hankard Direct); Comment by Dorenne Hansen (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015)) (eDocket No. 201710-136267-04).

³⁰⁰ Comment by Dorenne Hansen at 10 (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015)) (eDocket No. 201710-136267-04).

197. Most sound is a mixture of frequencies. Sound meters add all of the sound pressure levels of the various frequencies across the audible spectrum to compute a single loudness metric. When you have two noise sources of equal strength, you add them together for a total noise level that is three dB greater than either one alone.³⁰¹ An increase of three dB in the total noise level will be noticeable to people, but just barely.³⁰²

198. Sounds from different sources can occur at the same time. If a 50 dB noise is added to an existing 50 dB noise, the resulting noise level is 53 dB, which is enough of an increase in sound pressure to be noticeable. Freeborn Wind provided the following rules of thumb for adding noise from a point source to ambient noise: when one source is 10 dB less than another, it is irrelevant. If a wind turbine is generating 50 dB and ambient noise is 45 dB, the total sound level is 51.³⁰³

iii. Minnesota Noise Regulations

199. Minnesota Rule 7030.0040 (2017) provides Minnesota's Noise Standards:

Subpart 1. **Scope** These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of public health and welfare. These standards are consistent with speech, sleep, annoyance, and hearing conservation requirements for receivers within areas grouped according to land activities by the noise area classification (NAC) system established in part 7030.0050. However, these standards do not, by themselves, identify the limiting levels of impulsive noise³⁰⁴ needed for the preservation of public health and welfare. *Noise standards in subpart 2 apply to all sources.*³⁰⁵

³⁰¹ Tr. Vol. 1B at 65 (Hankard).

³⁰² Comment by Dorenne Hansen (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015)) (eDocket No. 201710-136267-04).

³⁰³ Tr. Vol 1B at 108 (Hankard).

³⁰⁴ "Impulsive noise" means either a single sound pressure peak (with either a rise time less than 200 milliseconds or total duration less than 200 milliseconds) or multiple sound pressure peaks (with either rise times less than 200 milliseconds or total duration less than 200 milliseconds) spaced at least by 200 millisecond pauses." Minn. R. 7030.0020, subp. 6 (2017).

³⁰⁵ Emphasis added.

Subp. 2. Noise Standards

Noise Area Classification	Daytime		Nighttime	
	L ₅₀	L ₁₀	L ₅₀	L ₁₀
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

200. Minnesota’s primary noise limits are set by “noise area classifications” (NACs) based on the land use at the location of the person that hears the noise. They are also based on the sound level in decibels (dB(A)) over ten percent (L₁₀) (or six minutes), and fifty percent (L₅₀) (or thirty minutes) of an hour.³⁰⁶

201. For residential locations (NAC 1),³⁰⁷ the limits are L₁₀ = 65 dB(A) and L₅₀ = 60 dB(A) during the daytime (7:00 a.m. – 10:00 p.m.) and L₁₀ = 55 dB(A) and L₅₀ = 50 dB(A) during the nighttime (10:00 p.m.-7:00 a.m.).³⁰⁸ This means that during a one-hour period of monitoring, daytime noise levels at residences cannot exceed 65 dB(A) for more than 10 percent of the time (six minutes) and cannot exceed 60 dB(A) more than 50 percent of the time (30 minutes).³⁰⁹

iv. Application of Noise Standards

202. The Minnesota Pollution Control Agency (MPCA) enforces the state’s noise rules (Minn. R. Ch. 7030). Freeborn Wind looks to Minn. Stat. Ch. 116 (2016), the chapter that establishes the MPCA, for a definition of “noise.” That chapter defines “noise” to mean “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.”³¹⁰ Freeborn Wind contends that because “noise” is any sound not occurring in the natural environment, the noise limits in subpart 2 of Minn. R. 7030.0400 apply to wind turbine noise alone, and that the rule regulates only the noise emissions of non-natural sources considered individually, not the total amount of noise a receptor experiences.

203. At the evidentiary hearing and in public comment, there was discussion of the language in Appendix A of DOC’s “Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report.”³¹¹ The discussion focused specifically on the sentence under modeling that reads “Developers should not propose projects where total

³⁰⁶ Pre-Construction Noise Analysis at App. B at 2.

³⁰⁷ NAC 2 is the land use classification for businesses, stores, restaurants, and parks while NAC 3 is for industrial, manufacturing and mining. NAC4 applies to undeveloped and unused areas. Minn. R. 7030.0050, subp. 2 (2017).

³⁰⁸ Minn. R. 7030.0040.

³⁰⁹ Pre-Construction Noise Analysis at 2.

³¹⁰ Minn. Stat. § 116.06, subd. 15 (2016).

³¹¹ Ex. EERA-9 at 12.

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.”³¹²

204. AFCL’s and DOC-EERA’s position on the interpretation of Minn. R. 7030.0400 is that its noise limits apply to the “total ambient level of **sound** required to protect public health and welfare from noise pollution. The MPCA Noise standard regulates certain noise sources, including wind turbines, that contribute to this total ambient sound level.”³¹³

205. The MPCA’s interpretation of its rule is that, to estimate the effect of wind farm noise on total noise levels, the ambient level of noise must be known. In its Comment on the DOC’s Guidance for Large Wind Energy Conversion Systems Noise Protocol and Report, the MPCA noted:

Although the noise rules apply to total noise measured at a wind farm, the culpability of the wind turbines depends on attribution. If noise exceedances are recorded, it is necessary to determine the increment due to the turbine noise. Background noise information is very important to this effort. This is where background data might be “subtracted.” Compliance is based on the inclusion of background total noise, whereas attribution depends on the use of the background information to adjust the measured noise to the source (turbines).³¹⁴

206. The Administrative Law Judge agrees with DOC-EERA’s interpretation of the noise limits in Minn. R. 7030.0400 for a number of reasons. First, DOC-EERA’s interpretation is consistent with the MPCA’s interpretation of its own rule. Second, Freeborn Wind appears to equate the pre-construction environment with the “natural environment.” However, the Project Area has roads, vehicles, farm equipment, and other non-natural sources of sound and is not solely a “natural environment.” Third, subpart 1 explicitly provides that the standards in subpart 2 do not apply to impulsive noise. If the rule was intended not to apply to ambient noise, it would have similarly distinguished and excluded ambient noise. Fourth, the noise standards are “consistent with speech, sleep, annoyance, and hearing conservation requirements.” This implies a focus on the protecting the recipients of the noise and these goals are frustrated when total noise levels are exceeded. DOC-EERA’s analysis correctly identifies the total noise levels experienced by receptors when the wind turbines are operating as the regulated sound from “all sources.”

³¹² See, e.g., Tr. Vol. 2 at 185 (Davis); Comment by Kristi Rosenquist (March 14, 2019) (eDocket No. 20183-140988-01).

³¹³ EERA Reply Mem. at 4 (emphasizing the initial language of rule 7030.0040, subp. 1, which states: “These standards describe the limiting levels of sound . . .”); AFCL Initial Brief at 25.

³¹⁴ Ex. EERA-9 at App. A (MPCA Comments on the draft DOC EFP Guidance for LWECS Noise Study Protocol (Oct. 8, 2012)).³¹⁴

v. Limitations of Noise Standards

207. The Minnesota noise standards fail to regulate certain kinds of noise that are important to the well-being of people in or near the Project Area. People very sensitive to low frequency noises or infrasound may be affected even if they are not exposed to noise levels that violate the applicable noise standards.³¹⁵

208. Public comments also raised concerns regarding low-frequency noise (LFN) and infrasound.³¹⁶ The levels of infrasound produced by wind turbines are significantly below currently accepted thresholds of human hearing.³¹⁷ Low frequency sounds below 60 dB(C) have not been associated with adverse effects on people.³¹⁸ Between 60 and 75 dB(C), some people could experience noise disturbance from low-frequency sounds. The industry guideline for LFN is 75 dB(C).³¹⁹

209. While infrasound and LFN may not pose noise issues per se, that is an artifact of our hearing. Physically, infrasound and LFN are electromagnetic waves just like audible sounds, and they may have physical effects on humans, just like audible sounds. The Minnesota Department of Health found that wind turbine-related noise complaints “appear to rise with increasing outside noise levels above 35 dB(A)” and “[t]he Minnesota nighttime standard of 50 dB(A) not to be exceeded more than 50% of the time in a given hour, appears to underweight penetration of low frequency noise into dwellings.”³²⁰

210. In his direct testimony, Mr. Hankard predicted LFN from the Project to be 62 dB(C) at one residence and less than 60 dB(C) at all other residences. Thus, according to Mr. Hankard, wind turbine noise emissions are below commonly applied LFN limits, and generally below even the most stringent limits.³²¹ Mr. Hankard did not state whether, or to what extent, the increased total noise predictions would affect the LFN predictions.³²²

211. Mr. Hankard affirmed that the primary source of LFN and infrasound is ambient noise such as “wind blowing through vegetation and against buildings such as houses.”³²³ This is especially so when ground winds exceed 10 miles per hour, which is

³¹⁵ Ex. EERA-6 at 6 (Keith Stelling, *Infrasound Low frequency noise and Industrial Wind Turbines*, An information report prepared for the Multi-Municipal Wind Turbine Working Group (July 2015)) (eDocket No. 201710-136094-01); Comment by Sean Gaston at 15-18 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

³¹⁶ See, 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).

³¹⁷ Ex. FR-5 at 5-6 (Hankard Direct).

³¹⁸ Tr. Vol. 1B at 77 (Hankard).

³¹⁹ *Id.* at 74, 78.

³²⁰ Allwood Letter at 2-3.

³²¹ FR-5 at 8 (Hankard Direct).

³²² Ex. FR-18 (Aff. of Mike Hankard) (Mar. 1, 2018).

³²³ FR-5 at 8 (Hankard Direct).

when wind turbines tend to operate. Mr. Hankard stated that ambient levels of LFN in the Project area “range from about 45 to 80 dBC under windy conditions.”³²⁴

212. The Minnesota Department of Health advised that wind turbine noise assessments include the construction of isopleths in the event that sound level estimates were such that the difference between dB(C) and dB(A) exceeded 10 dB.³²⁵

213. Freeborn Wind did not follow this guidance “because the frequency spectrum of noise from wind turbines is relatively fixed, and once one part of the spectrum becomes limited, so does every other part of the audible spectrum.”³²⁶ The 50 dB(A) limit for receptors was attained by placing the wind turbines at certain distances from the receptors. For the Project, the 50 dB(A) limit at residences controls Project LFN levels to about 60 dB(C) or less at residences, and limits infrasound to levels orders of magnitude below the human hearing threshold.³²⁷

214. While the record evidence legitimates concerns over the Project’s potential to generate harmful LFN and infrasound, opponents of the Project are correct that Minnesota’s noise standards do not address them. DOC-EERA did not recommend the addition of any conditions or special conditions specific to infrasound or low frequency noise.³²⁸ While the Department of Health, the Department of Commerce, and the Pollution Control Agency all acknowledge public complaints concerning wind turbine generated infrasound and LFN merit concern, “the present knowledge of the potential health effects of infrasound does not lend itself to the development of an appropriate standard at this time.”³²⁹

215. The limitations of Minnesota noise standards as protective of human well-being in the context of wind farms has been acknowledged by regulatory authorities. The Minnesota Department of Commerce, the Minnesota Department of Health, and the Minnesota Pollution Control Agency stated:

The MPCA noise standard was not promulgated with wind turbine-like noise in mind; it addresses audible noise, not infrasound. As such, it is not a perfect measure to use for determining noise-related set-backs between wind turbines and residences. However, the agencies are currently unaware of a noise-related standard that could be used. Further, the

³²⁴ *Id.* at 9 (Hankard Direct).

³²⁵ Comment by Sean Gaston at 9 (July 5, 2017) (*Public Health Impacts of Wind Turbines*, Minnesota Department of Health Environmental Health Division (May 22, 2009)) (eDocket No. 20177-133511-03).

³²⁶ *Id.*

³²⁷ Ex. FR-5 at 5 (Hankard Direct).

³²⁸ Ex. EERA-8 at 16. EERA’s Reply Brief does not propose any measures be taken with regard to LFN and infrasound.

³²⁹ Ex. EERA-5 (Letter from Paul Allwood, Assistant Commissioner, Minnesota Department of Health; William Grant, Deputy Commissioner, Minnesota Department of Commerce; and J. David Thornton, Assistant Commissioner, Minnesota Pollution Control Agency to Kristi Rosenquist) (May 13, 2016)) (eDocket No. 201710-136098-01).

present knowledge of the potential health effects of infrasound does not lend itself to the development of an appropriate standard at this time.³³⁰

216. The Commission requires that the “Project must meet Minnesota Noise Standards, Minnesota Rules Chapter 7030, at all residential receivers (homes). Residential noise standard NAC 1, L₅₀ 50 dB(A) during overnight hours. Setback distance calculated based on site layout and turbine for each residential receiver.”³³¹ The Commission prescribed a minimum setback of “[t]ypically 750 – 1500 ft. is required to meet noise standards depending on turbine model, layout, site specific conditions.”³³²

217. Several opponents of the Project were critical of the Commission’s failure to address the shortcomings of Minnesota’s noise standards. Kristi Rosenquist is a member of the public who expressed concern over inadequacies of Minnesota’s regulation of wind farms. Ms. Rosenquist points out that the Commission’s 2008 Order establishing the Large Wind Energy Conversion system General Wind Turbine Permit Setbacks and Standards applies only to “permits issued by the Commission for LWECs with a combined nameplate capacity of less than 25,000 watts.”³³³ She provided a report to the Legislative Energy Commission on October 19, 2017. Ms. Rosenquist contends that Minnesota agency officials acknowledged that “[n]o science was used to inform the decisions and laws affecting wind energy in Minnesota.”³³⁴

218. Ms. Rosenquist further complains that the Commission has not developed rules for siting wind projects that adequately address the infrasound and low frequency emissions of wind turbines. She points out that European countries with more experience with wind farms and the problems they cause, have established setback distances “that are 10 times the height of the turbine to the blade tip at its highest point (5000 feet for large modern wind turbines).”³³⁵

219. Carol Overland requested that the MPCA develop rules governing wind turbine noise. In response, John Linc-Stine, Commissioner of the Minnesota Pollution Control Agency, stated: “After consulting with colleagues at the Minnesota Departments of Health and Commerce, I have concluded that the current understanding of wind turbine noise and its potential effects is insufficient to support rulemaking at this time.”³³⁶

³³⁰ *Id.*

³³¹ Ex. AFCL-8 (*In re Establishment of General Permit Standards for the Siting of Wind Generation Projects Less than 25 Megawatts*, MPUC Docket No. E,G-999/M-07-1102, Order Establishing General Wind Permit Standards at Ex. A (Jan. 11, 2008)) (eDocket No. 201712-138411-06).

³³² *Id.*

³³³ *Id.*

³³⁴ See Ex. P-22 at 3 (*Wind Turbine Siting in Minnesota*, A Report for the Legislative Energy Commission (Oct. 19, 2017) (referring to comments made by former Senator Ellen Anderson and Bill Grant, Deputy Commissioner of Commerce, in 2012 at a public forum on energy)) (eDocket No. 20183-140952-07).

³³⁵ See *id.* at 1.

³³⁶ *Id.* at 6 (referring to a letter from John Linc-Stine to Carol Overland (September 12, 2016) (eDocket No. 20169-124844-01)).

a. Pre-Construction Noise Analysis

220. The Department of Commerce, Energy Facility Permitting is the author of Guidance for Developing and e-Filing the LWECS Noise Study Protocol and Report Submittals to the Minnesota Public Utilities Commission (Oct. 8, 2012) [LWECS Noise Study Protocol].³³⁷ The document's purpose is:

to aid wind developers in the preparation and use of a noise study protocol that standardizes sound monitoring methodologies, analysis, and presentation. The purpose of the protocol and the resulting noise study report are to quantify sound generated by an operational Large Wind Energy Conversion System (LWECS) at receptors: sound that is present during the measurement, project-related and otherwise.³³⁸

221. The Department of Commerce recommends that sound measurements be taken at the same locations either pre-construction or with turbines off and with turbines on. The latter can only be done post-construction, when the turbines are in place and operational. The document provides guidance on when, where, and how to monitor noise, including wind speeds, atmospheric conditions, required equipment, and data to be recorded and reported to the Commission.³³⁹

222. The purpose of the pre-construction noise analysis is to inform the placement of wind turbines so as to comply with Minnesota noise regulations because, once built, a properly functioning wind turbine's noise output can only be changed by taking it out of service.

223. Mr. Hankard prepared the Pre-Construction Noise Analysis Report included in Freeborn Wind's Site Permit Application as Appendix B.³⁴⁰ He drew upon his familiarity with the noise emissions of Vestas wind turbines from previous work.³⁴¹ Hankard Environmental conducted an ambient noise measurement survey at the Project site in April 2016 and modeled noise emissions from the Project to assist in designing the turbine layout so as to comply with Minnesota's noise standards.³⁴²

224. Mr. Hankard used the International Organization for Standardization (ISO) standard 9613-2, Attenuation of Sound During Propagation Outdoors – Part 2: General

³³⁷ Ex. EERA-9 (LWECS Noise Protocol).

³³⁸ *Id.* at 4.

³³⁹ *Id.* at 4-9.

³⁴⁰ Ex. FR-1 at App. B.

³⁴¹ Ex. FR-5 at 3 (Hankard Direct).

³⁴² *Id.* The Pre-Construction Noise Analysis pointed out that the pre-existing environmental sound level should not be taken as the baseline for subsequent comparison with the post-construction operational noise level. "The background sound level varies dramatically with time, typically over a dynamic range of 30 dB(A) or more, depending not only on the wind speed but many other facts, such as the prevailing atmospheric conditions, the time of day, season of the year, etc., so the level measured one or two years earlier cannot be taken to accurately represent the background level present during an operational compliance test." Pre-Construction Noise Analysis at 4.

method of calculation modeling method.³⁴³ This method assumes “optimal acoustic propagation in all directions.”³⁴⁴

225. According to Mr. Hankard, microphones are placed at various locations to measure ambient levels of sound. A sound transmission model estimates noise levels at receptor locations that the wind turbines would generate at full acoustic output. The estimated turbine-generated noise could be added to the ambient noise measures to predict the total (ambient plus turbine-generated) noise level at receptor locations post-construction.

226. Mr. Hankard personally set up noise measurement equipment at residences he thought were representative of residences in the Project Area and analyzed the data to develop a noise emission model. The noise emission model was used in determining where to site the Project’s turbines.³⁴⁵ Noise levels were estimated for the locations of 251 NAC-1 receptors (249 residences and two churches) as well as three NAC-2 receptors (two businesses and a government facility).³⁴⁶

227. Mr. Hankard measured ambient noise at three wind speeds: the speed at which the blades “cut-in” and begin to generate power; the speed at which the turbines generate full acoustic output; and the speed at which full power is generated. It appears that the five measurement sites chosen were in the Project Area. At three of five measuring locations, full power produced ambient sound levels of 50 or 51 dB(A).³⁴⁷

228. The next part of the study was to estimate noise levels at receptor locations based on operating the turbines and assumed no ambient noise. The study also assumed the full operation of all 42 Project turbines in Minnesota and the northernmost 52 turbines in Iowa. Each turbine was represented as a point source located at its hub height (262 feet above ground), operating at its full acoustic output (wind speed of 12 meters per second measured at hub height), in normal operating mode, and fitted with standard blades.³⁴⁸

229. Mr. Hankard asserts that the model of wind turbine noise that he used is “calibrated to predict the very loudest wind turbine noise levels that are ever expected to regularly occur.”³⁴⁹ The turbines modeled are the Vestas V116-2.0 (V116) and the V110-2.0 (V110). The V110 has an overall sound power level that is 1.9 dB(A) lower than the V116.³⁵⁰ However, results of the modeling show that between 63 Hz and 250 Hz, the V110 is .9 to 2.4 dB louder than the V116.

³⁴³ *Id.* at 10.

³⁴⁴ *Id.*

³⁴⁵ *Id.*

³⁴⁶ *Id.* at 11.

³⁴⁷ *Id.* at 9.

³⁴⁸ *Id.* at 11. Kristi Rosenquist criticized this assumption because “noise is coming from the blade, which sticks out 190 feet.” Public Hr’g Tr. at 202 (Rosenquist) (Feb. 20, 2018).

³⁴⁹ Pre-Construction Noise Analysis at 2.

³⁵⁰ *Id.* at 11.

230. This modeling was conducted using conservative assumptions. The results of the modeling show the loudest one-hour levels expected to occur. To be most conservative, the modeling assumes all turbines are operating and producing maximum acoustic output, the emissions propagate out fully in all directions, and that atmospheric conditions will be relatively ideal for the propagation of sound.³⁵¹ In addition, the predicted turbine-only noise levels include the other conservative modeling inputs described in the Noise Analysis, resulting in the least amount of ground and atmospheric sound absorption and the highest levels of sound reaching the receivers.³⁵² Also, 52 of the northernmost turbines located in Iowa were included in the model.³⁵³ Accordingly, the results are the “loudest” one-hour levels expected to occur. Much of the time turbine noise levels would be expected to be less.³⁵⁴ Freeborn Wind’s acoustical expert verified these conservative assumptions through field measurements at other operating wind projects.³⁵⁵

231. 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.³⁵⁶ 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.³⁵⁷

232. Freeborn Wind submitted Mr. Hankard’s results to demonstrate that turbine-generated noise would not, by itself, exceed Minnesota’s noise standard at any non-participating receptor location at any time of day.³⁵⁸ The highest level of “wind turbine-noise-only” that a receptor is estimated to be exposed to is 48.9 dB(A).³⁵⁹ The Noise Analysis indicated 15 receptors would be exposed to “wind turbine-only-noise” between 45.0 and 50 dB(A), with all but one receptor at 47.2 dB(A) or less.³⁶⁰

233. Mr. Hankard predicts that the total nighttime noise standard (ambient plus wind turbine noise) L₅₀ will be exceeded at times when ambient noise levels are 50 dB(A) and above.³⁶¹ The average background noise L₅₀ levels, including both ambient and turbine noise, 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 L₁₀ levels range from 37 to 60 dB(A) under conditions during which the turbines would operate (“Critical” and “Full Power” turbine operations). This information was not provided with Freeborn Wind’s original Application. It was provided as a post-hearing exhibit following questioning by DOC-EERA during which it became apparent that

³⁵¹ *Id.* at 13; Ex. FR-18 at 2 (Hankard Affidavit and Noise Tables).

³⁵² Pre-Construction Noise Analysis at 12-13.

³⁵³ *Id.* at 11.

³⁵⁴ Ex. FR-5 at 11 (Hankard Direct); Pre-Construction Noise Analysis at 13.

³⁵⁵ Ex. FR-5 at 12 (Hankard Direct).

³⁵⁶ *Id.* at 9; Pre-Construction Noise Analysis.

³⁵⁷ Pre-Construction Noise Analysis at 4, 9.

³⁵⁸ *Id.* at 14.

³⁵⁹ *Id.*

³⁶⁰ *Id.*; Ex. FR-5 at 11 (Hankard Direct); see also Ex. FR-18 at 5-8, 9 (Hankard Affidavit and Noise Tables).

³⁶¹ Ex. FR-18 (Hankard Affidavit and Noise Tables).

Freeborn Wind interpreted Minn. R. 7030.0040 to require only the measurement of the proposed additional source of noise, not including ambient noise.³⁶²

234. The results of this post-hearing 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).³⁶³ Freeborn Wind asserts that, due to the conservative nature of the turbine-only noise modeled for the Project, it can confidently conclude that the Project will comply with the Noise Standards once operational.³⁶⁴ The confidence that Freeborn Wind has in reaching this conclusion derives from the conservative assumptions Mr. Hankard input into his model.

235. The Administrative Law Judge is not as confident as Freeborn Wind that the Project, when operational, will comply with Minnesota noise standards. Mr. Hankard's estimates are predictions generated from mathematical equations representing many assumptions and uncertainties. In addition, for the following reasons, Mr. Hankard's predictions are uncertain:

- Sound constantly changes in the way it travels from a source to a receiving point because of minor changes in the atmosphere between the source and the receiving point.
- The sound level one actually records at a receiving point takes the shape of a bell curve; and with a bell curve, half the data will be randomly above the design level and half the data will be randomly below.
- The random variation of the bell curve creates uncertainty.
- To ensure that nearly all of the data are below the criterion level, one subtracts a tolerance from the prediction. This tolerance is solely based on the parameters for the bell curve as fit to the data.³⁶⁵

³⁶² *Id.* at 2, 4; Tr. Vol. 1B at 98-124 (Hankard).

³⁶³ Ex. FR-18 at 2-3, 9 (Hankard Affidavit and Noise Tables).

³⁶⁴ Tr. Vol. 1B at 112 (Hankard). The EERA, which provided an edited version of Freeborn Wind's Proposed Findings of Fact, edited out language asserting that turbines are not a significant contributor to total sound levels exceeding 50 dB(A). However, the EERA left the statement that the conservative nature of the turbine-only noise modeling leads to the conclusion that the Project will comply with the Noise Standards once operational. DOC-EERA Proposed Findings of Fact, Conclusions of Law, and Recommendations at 27 (Apr. 4, 2018) (eDocket No. 20184-141695-01). This implies that the EERA agrees with that statement, although the EERA never stated so directly.

³⁶⁵ Comment by Dorenne Hansen at 16-17 (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015)) (eDocket No. 201710-136267-04).

236. The methodology Mr. Hankard employed has a margin of error to its noise level measurements of plus or minus three dB.³⁶⁶ An increase of three dB corresponds to a doubling of sound power but only a slightly noticeable increase in loudness. Mr. Hankard contends that, by using the most conservative values for the model's parameters, the margin of error with respect to underestimating sound levels is much smaller than three dB.³⁶⁷

237. The three dB margin of error is not accepted by every acoustician. Kristi Rosenquist submitted an email exchange with Robert W. Rand, ASA, INCE, in which he stated:

To meet the '50 dBA total' not-to-exceed regulation standard under all conditions, the facility should be designed to prevent the total noise level exceeding 50 dBA for the worst case baseline condition, which would be the 50 dBA ambient background. Locations where the ambient background is 50 dBA and facility noise is 41 dBA or higher will result in a total noise level of 51 dBA or higher.

I have observed that facility design margins are universally omitted by wind industry sound prediction consultants. Whereas noise consultants who have designed other types of power generation facilities conservatively, use facility noise design margins to ensure compliance with regulations, typically 2-3 dB for steady continuous noise sources. Wind turbines have highly irregular noise output and exhibit amplitude modulation: larger facility design margins are recommended for such noise sources.³⁶⁸

238. Another cause for uncertainty is the absence of certain empirical data. That is, sound measurements are not made when one would expect the loudest levels to occur. As Mr. Hankard pointed out, the American National Standards Institute (ANSI) "discourages measurements when the local wind speed is 11 miles an hour or greater. And that's because what you're actually measuring at that point is distortion of the microphone and not actual sound in the air."³⁶⁹ Accordingly, Mr. Hankard did not include any noise monitoring results over 11 miles per hour. The average monthly wind speed in the Freeborn Project Area is greater than 11 miles per hour.³⁷⁰ While the wind speed at the hub height of a turbine may differ from the wind speed near ground level for a variety of reasons,³⁷¹ Freeborn Wind's Application stated that, at 80 meters above the ground,

³⁶⁶ Tr. Vol. 1B at 64-65, 115-16 (Hankard).

³⁶⁷ *Id.* at 113-15.

³⁶⁸ Comment by Kristi Rosenquist (Email from Robert Rand ASA, INCE, to Redacted (March 13, 2018 at 12:48 p.m.)) (eDocket No. 20183-140988-01); Comment by Dorene Hansen at 17 (Oct. 9, 2017) (presentation from Paul D. Schomer, Ph.D., P.E., *Effects of Wind Turbine Acoustic Emissions*) (June 23, 2015) (recommending 4-6 dB for a criterion of 39 dB)) (eDocket No. 201710-136267-04).

³⁶⁹ Tr. Vol. 1B at 66 (Hankard).

³⁷⁰ *Id.* at 65.

³⁷¹ *Id.* at 69.

predicted wind speeds near the Project Area are 6.0 to 8.8 meters per second.³⁷² At 8.8 meters per second, this is just under 20 miles per hour.

239. The Project Area is quite large and measurements were taken at five locations. In those five locations, 251 receptors were studied. The results for receptors could be quite sensitive to the locations of the measurements.

240. The turbines have yet to be built. One or more of the sound estimation model's assumptions or its data may be wrong. For example, the location of a turbine when finally erected could differ from its assumed location, or the location of a house could be incorrect. Or, post-construction measurements may not be made under identical atmospheric conditions as pre-construction measurements.

241. Table 2 in FR-18 shows that there are many instances where total noise will be quite close to, or exceed, 50 dB(A). There are approximately 254 homes in the Freeborn Wind Project footprint.³⁷³ According to Table 2, any time the ambient noise level is 50 dB(A), added wind turbine noise results in 53 homes experiencing levels of 51 dB(A) and 25 homes at levels of 52 dB(A), for a total of 78 homes experiencing more noise than permitted by Minn. R. 7030.0040.³⁷⁴ Two of the homes will experience 58 dB(A) if the ambient noise is 57 dB(A).³⁷⁵ None of these homes was predicted to experience wind turbine noise alone above 48.9 dB(A). Many were predicted to experience wind turbine noise alone in the very low-to-mid 40's range.³⁷⁶ Thus, the addition of ambient noise is significant in that it raises the predicted nighttime noise exposure of more than 30 percent of the homes in the footprint of the Project beyond what is allowed in Minn. R. 7030.0040.

242. For the reasons discussed above, despite Freeborn Wind's confidence that its conservative assumptions belie the numbers it has presented, the Administrative Law Judge concludes that Freeborn Wind has not demonstrated by a preponderance of the evidence that it will be able to comply with Minnesota noise standards. Therefore, the Administrative Law Judge cannot recommend that the Commission grant the Site Permit Application.

243. Should the Commission choose to do so, it could provide Freeborn Wind with an opportunity 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. The plan should include low-frequency noise measurements for evaluation in consultation with MDH.

244. The Administrative Law Judge further recommends that the plan be made available for public and agency comment. The Commission should then review and

³⁷² Ex. FR-1 at 97 (Application).

³⁷³ Ex. FR-18 at 5-8.

³⁷⁴ *Id.* at 5-8.

³⁷⁵ *Id.* at 6.

³⁷⁶ *Id.* at 5-8.

approve a pre-construction noise mitigation plan that best assures that turbine noise will not cause noise levels that exceed Minnesota's noise standards.³⁷⁷

245. Freeborn Wind cannot lawfully operate its turbines if their operation results in total noise at any receptor in excess of the standards in Minn. R. 7030.0400. If the Commission grants a Site Permit and post-construction measurements show that total noise levels exceed L₅₀ dB(A) for any receptor, Freeborn Wind must adjust its operations, including shutting down one or more turbines, if doing so will result in complying with the standards.

246. Site Permit Condition 7.4 requires the Permittee to file its post-construction noise study within 18 months of commencing commercial operation. The Administrative Law Judge finds this condition is insufficient in light of the many instances in which the operation of the Project may exceed what Minn. R. 7030.0040 allows, and the lack of analysis of infrasound in light of the combined ambient and turbine sound totals.

247. Because of the many potential sources of inaccuracy in the pre-construction noise level measurements and post-construction noise level predictions, should the Commission decide to grant Freeborn Wind's Site Permit Application, the Administrative Law Judge recommends a special permit condition requiring that post-construction noise level measurements be made during the first year of operation by an independent consultant selected by DOC-EERA at Freeborn Wind's expense. The measurements should be taken at multiple locations including locations near receptors that are predicted to experience the highest turbine noise levels. The consultant should be charged with ensuring that there are no receptors where levels of ambient noise plus turbine noise exceed L₅₀ 50 dB(A) during nighttime hours.

E. Shadow Flicker

248. 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.³⁷⁸

249. Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors, including sun angle and path, turbine and receptor locations, cloud cover and degree of visibility, wind direction, wind speed, obstacles, contrast, and local topography.³⁷⁹

³⁷⁷ "[A]s indicated in Condition 4.3 Noise of the attached Preliminary DSP, if operating turbines are found to be in violation of Minnesota Rules Chapter 7030 noise standards turbine operations must be modified or the turbine must be removed from service." Ex. EERA-8 at 15 (Comments on Preliminary Draft Site Permit).

³⁷⁸ Ex. FR-1 at App. C at 2-3 (Shadow Flicker Assessment).

³⁷⁹ *Id.*

250. 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.³⁸⁰

251. Shadow flicker from turbines is not harmful to the health of photosensitive individuals, including those with epilepsy.³⁸¹ 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 five Hz, usually substantially higher.³⁸² The frequency of any shadow flicker from wind turbines will be approximately 0.5 to 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.³⁸³ The maximum speed of the turbines will result in 14.88 blade revolutions per minute, which equates to 0.75 flickers per second.³⁸⁴ The Epilepsy Foundation has determined that flashing lights (which could mimic flicker) at a rate of five to 30 flashes per second may induce seizures.³⁸⁵

252. Many members of the public expressed concern about the shadow flicker the turbines would cause. In addition to finding the flicker irritating, people feared adverse health effects.³⁸⁶

253. The Commission has not adopted a standard for shadow flicker exposure from wind turbines. Freeborn County's Ordinance contains a requirement to conduct a flicker analysis and states that flicker at a receptor should not exceed 30 hours per year.³⁸⁷ DOC-EERA confirmed that no supporting scientific data has been provided to suggest that there is a link between shadow flicker in excess of 30 hours or more per year of exposure and negative human health impacts, but acknowledged that 30 hours or more of exposure is commonly used as a benchmark at which point mitigation is generally necessary.³⁸⁸

254. Freeborn Wind's consultant retained EAPC Wind Energy (EAPC) to provide estimates of the shadow flicker potential of the Project's proposed turbine layout. EAPC used wind modeling software, turbine coordinates and specifications, and the locations

³⁸⁰ Ex. EERA-8 at 18 (Comments and Recommendations on Preliminary Draft Site Permit); see also Ex. FR-6 at Schedule 2 at 6 (Roberts Direct), Schedule 5 at 8-9 (Roberts Direct), Schedule 16 at 127 (Roberts Direct), Schedule 25 at 4 (Roberts Direct), Schedule 26 at 16 (Roberts Direct).

³⁸¹ Ex. FR-7 at 5 (Corrected Ellenbogen Direct); see also Ex. FR-6 at Schedule 2 at 6 (Roberts Direct), Schedule 6 at 14 (Roberts Direct), Schedule 26 at 16 (Roberts Direct), Schedule 29 at 37 (Roberts Direct).

³⁸² Ex. FR-7 at 5 (Corrected Ellenbogen Direct).

³⁸³ *Id.*

³⁸⁴ Ex. FR-1 at 39 (Application).

³⁸⁵ *Id.*

³⁸⁶ Public Hr'g Tr. at 93-95 (amount of shadow flicker), 146-48 (effect on autistic child), 219-20 (health effects) (Feb. 20, 2018).

³⁸⁷ Freeborn County, Minn., Code of Ordinances § 26-56 (2015); Ex. EERA-8 at 29 (Comments and Recommendations on a Preliminary Draft Site Permit).

³⁸⁸ Ex. EERA-8 at 29 (Comments and Recommendations on a Preliminary Draft Site Permit); see also *id.* at 18 (Comments and Recommendations on a Preliminary Draft Site Permit) ("30 hours of flicker per year was a suggested standard in a couple of sources of information reviewed by EERA, but those sources do not provide supporting scientific data that would suggest there is a link between shadow flicker in excess of 30 hours per year of exposure and negative human health impacts.").

of 254 homes and businesses within two kilometers of any turbine. In addition, EAPC obtained monthly sunshine probabilities, wind speed and direction data, and a digital height contour map to generate a shadow flicker model. The model was then used to perform shadow flicker calculations for the area and evaluate the shadow flicker at all 254 buildings.³⁸⁹

The 254 dwellings were represented in the model by omni-directional shadow receptors that simulate a 1 m x 1 m window 1 m above ground level. Reductions based on turbine operational time, turbine operational direction, and sunshine probabilities were used to calculate a realistic number of hours of shadow flicker to be expected at each shadow receptor. No obstacles were used so that shadow flicker reductions due to interference from trees and structures were not included, meaning that the “realistic” estimates are still conservative.³⁹⁰

255. Freeborn Wind modeled shadow flicker frequency calculations for the Project at 254 residences, using both a worst-case scenario model and a more “realistic” model. Although the Project will utilize some Vestas V110 wind turbines, Freeborn Wind’s shadow flicker modeling assumed all turbines would be the Vestas V116 model. The Vesta 116 Model has a larger rotor diameter than the V110, thereby rendering results more conservative.³⁹¹ The “realistic” estimates are based on additional conservative assumptions, including that no credit was taken for the blocking effect of trees or buildings. The overall effect of using these conservative assumptions indicates that the number of hours of shadow flicker that would actually be observed will be less than those predicted.³⁹²

256. The results of the study indicate that, of the 254 receptors modeled, seven were predicted to realistically experience more than 30 hours of shadow flicker per year. Three of the seven receptors were at participating landowners’ occupied residences and would experience 40:28, 30:52, and 32:30 hours of shadow flicker. Four non-participating landowners’ occupied residences would experience 31:12, 34:35, 34.29, and 45.23 hours of shadow flicker.³⁹³

257. Freeborn Wind conducted an additional assessment of each of the non-participating residences where modeling indicated flicker could potentially exceed 30 hours per year. It concluded that there are a number of visual obstructions (e.g., trees and buildings) that would further diminish the potential for shadow flicker to occur at these locations.³⁹⁴

³⁸⁹ Ex. FR-1 at App. C at 1-4 (Shadow Flicker Assessment).

³⁹⁰ *Id.*

³⁹¹ *Id.* at 4-5.

³⁹² *Id.* at 7.

³⁹³ Ex. FR-1 at App. B (Shadow Receptor Coordinates & Realistic Shadow Hours).

³⁹⁴ Ex. FR-11 at 5, Schedule 1 (Litchfield Rebuttal).

258. EAPC mentions that the realistic shadow hour predictions assume an “availability factor of 100% which is very unlikely to be the case.”³⁹⁵ EAPC opines that an actual availability factor would be 95 to 98 percent.³⁹⁶ Although EAPC does not explicitly state what an “availability factor” is, the Administrative Law Judge assumes it refers to the percentage of time turbines are inoperable for maintenance or repair purposes. Applying an availability factor of 95 percent to the non-participating landowners estimated exposure time reduces the estimate for one participating and one non-participating landowner below 30 hours.³⁹⁷

259. Freeborn Wind has considered shadow flicker when siting wind turbines to minimize impacts to all area residents. Freeborn Wind has also identified a number of potential mitigation measures, which may include providing indoor or exterior screening that will be considered and implemented, based on individual circumstances of residences experiencing shadow flicker, and as a reasonable function of the amount of flicker experienced.³⁹⁸ In addition, Freeborn Wind has committed to use Turbine Control Software programmed to shut down a specific turbine or turbines for an appropriate amount of time to reduce flicker to below 30 hours per year at each home as necessary to comply with the 30 hour per year requirement in the Freeborn County Ordinance.³⁹⁹

260. The record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts from shadow flicker. However, the shadow flicker exposure predictions may be incorrect to a greater or lesser extent because data used in the model is incorrect. The shadow flicker exposure estimates, for example, are based in part on measurements of wind direction and speed taken from “temporary meteorological towers located within the Project.”⁴⁰⁰ To the extent that “temporary” measurements of wind direction and speed differ from their long run values, the shadow flicker exposure estimates will be wrong. Similarly, the estimates do not reflect the impact of any longer-term weather trends such as increased (or decreased) cloudiness.

261. The Administrative Law Judge finds Freeborn Wind has provided reasonable estimates for the hours landowners will be exposed to shadow flicker, but they are only estimates. With one modification, the Administrative Law Judge agrees with DOC-EERA’s recommendation to require post-construction measurements of shadow flicker. DOC-EERA recommends measuring shadow flicker “at receptor locations that were anticipated to receive over 30 hours of shadow flicker per year.” Because the exposure predications may be incorrect, it is possible that a location expected to receive under 30 hours of exposure, might receive over 30 hours. In particular, Shadow Receptors 303 and 401 are predicted to receive more than 27 hours of shadow flicker.⁴⁰¹

³⁹⁵ Ex. FR-1 at App. C at 6 (Shadow Flicker Assessment).

³⁹⁶ *Id.* at 4-5.

³⁹⁷ The calculation for the non-participating landowner is: 31 hours and 12 minutes equals 1,872 minutes, 95 percent of which is 1,778.4 minutes or 29 hours and 28 minutes. If the availability factor is 98 percent, the predicted exposure to shadow flicker exceeds 30 hours.

³⁹⁸ Ex. FR-1 at 40 (Application).

³⁹⁹ Tr. Vol. 1A at 33 (Litchfield); see *also* Ex. FR-1 at 40 (Application); Ex. AFCL-19 at 2 (Freeborn Wind Response to AFCL IR No. 7).

⁴⁰⁰ Ex. FR-1 at App. C at 28 (Shadow Flicker Assessment).

⁴⁰¹ Ex. FR-1 at App. B (Shadow Receptor Coordinates & Realistic Shadow Hours).

Because they are within 10 percent of exceeding the 30 hour limit, the Administrative Law Judge finds it reasonable to monitor their exposure as well. DOC-EERA proposed, and the Administrative Law Judge recommends that, if the Commission issues a Site Permit in this docket, section 7.2 of the Site Permit be revised as recommended by DOC-EERA, with one modification:

Shadow flicker detection systems will be utilized during project operations to monitor shadow flicker exposure at receptor locations that were anticipated to receive over ~~30~~ 27 hours of shadow flicker per year. The Permittee will submit a Shadow Flicker Monitoring and Management Plan at least 14 days prior to the pre-construction meeting. The Shadow Flicker Monitoring and Management Plan will detail the placement and use of any shadow flicker detection systems, how the monitoring data will be used to inform turbine operations, and a detailed plan of when and how turbine operations will be adjusted to mitigate shadow flicker exposure exceeding 30 hours per year at any one receptor. The results of shadow flicker monitoring and mitigation implementation will be reported by the Permittee in the Annual Project Energy Production Report identified in Section 10.8 of this Permit.

262. The condition in Section 7.2 of the Draft Site Permit, as modified, appropriately addresses shadow flicker. It would require the Permittee to provide the Commission with data on shadow flicker for each residence of non-participating landowners and participating landowners within and outside of the Project Area potentially subject to turbine shadow flicker exposure. The data would include the modeling results, assumptions made, and the anticipated level of exposure from turbine shadow flicker for each residence. Freeborn Wind would also be required to provide documentation on its efforts to avoid, minimize, and mitigate shadow flicker exposure.⁴⁰² Modified Section 7.2 of the Draft Site Permit would also identify shadow flicker monitoring, operational planning, and reporting requirements of the Permittee. With the adoption of the operational monitoring, mitigation measures, and reporting requirements, the Project would not be expected to result in significant impacts because of shadow flicker.

F. Aesthetic Impacts

263. The existing landscape in the Project Area is generally flat and agricultural with some windbreaks surrounding farmsteads and dwellings.⁴⁰³

⁴⁰² See Draft Site Permit at 15-16 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁴⁰³ Ex. FR-1 at 35 (Application).

264. Construction and operation of the Project will alter the viewshed within and proximate to the Project Area. The level of visual impact as either positive or negative will depend largely upon perceptions of observers.⁴⁰⁴ However, following construction activities, the presence of the facility will not alter the day-to-day human activity or traffic in the area. The Project Area will retain its overall rural character. The turbines are compatible with the rural agricultural heritage of the area that often includes other high-profile facilities such as grain elevators and communication towers.⁴⁰⁵

265. Freeborn Wind states it will also implement mitigation measures to minimize any potential aesthetic impacts. In the Application, Freeborn Wind identified nine mitigation measures, including, but not limited to: using existing roads to the greatest extent possible to limit the number of new roads that need to be constructed; limiting above ground electrical lines; and using a uniform turbine color.⁴⁰⁶

266. The record demonstrates that Freeborn Wind plans to take steps to avoid and minimize aesthetic impacts. With the mitigation measures discussed above, the Project is not anticipated to result in significant aesthetic impacts.

G. Local Economy

267. Freeborn Wind asserts the Project will create approximately 200 jobs during the construction phase and approximately ten permanent jobs during operation.⁴⁰⁷

268. According to Freeborn Wind, local contractors and suppliers will be used for portions of the construction, and total wages and salaries paid in Freeborn County will contribute to the total personal income of the region.⁴⁰⁸ Several commenters at the public hearing noted that the Project is expected to result in well-paying jobs in the area.⁴⁰⁹

269. Freeborn Wind asserts the Project will provide landowners and farmers with opportunities for higher agricultural profitability and a more diverse revenue stream. Landowners having turbines or other Project facilities on their land will receive a royalty or lease payment annually for the life of the Project.⁴¹⁰ Several commenters at the public hearing expressed support for the Project because of the long-term economic benefits it will provide to landowners and the region.⁴¹¹ Landowner royalties are estimated by Freeborn Wind to total \$800,000 per year in Freeborn County, with Freeborn County

⁴⁰⁴ Compare Public Hr'g Tr. at 52 (Hardison) ("To me, they're [wind turbines] very majestic."), 60-61 (Crane) ("It is my artistic opinion that these wind turbines are not only necessary for the viability of our energy future, but awe inspiringly beautiful in form and color."), 205 (Marin) ("And when I see a wind farm, I do see beauty.") (Feb. 20, 2018) with Public Hr'g Tr. at 66 (Olson) (referring to wind turbines as "monster structures."), 137 (Brandt) ("[T]hese eyesores could consume our once beautiful countryside.") (Feb. 20, 2018).

⁴⁰⁵ Ex. FR-1 at 35-36 (Application).

⁴⁰⁶ Id. at 39.

⁴⁰⁷ Ex. FR-4 at 11-12 (Litchfield Direct); Public Hr'g Tr. at 26 (Litchfield) (Feb. 20, 2018).

⁴⁰⁸ Ex. FR-4 at 11-12 (Litchfield Direct); Ex. FR-1 at 67 (Application).

⁴⁰⁹ E.g., Public Hr'g Tr. at 62 (Forman), 140 (Davidson) (Feb. 20, 2018).

⁴¹⁰ Ex. FR-4 at 12-13 (Litchfield Direct).

⁴¹¹ See Public Hr'g Tr. at 54 (Hardison), 60 (Crane), 116 (Hamersly), 164 (Schipper) (Feb. 20, 2018).

landowners receiving an estimated total of \$35 million over the 30-year life of the Project.⁴¹²

270. Freeborn Wind states the Project will also provide significant benefits for local tax revenue. The Project anticipates paying a Wind Energy Production Tax to the local units of government of \$1.20 per megawatt hour of electricity produced, resulting in an annual tax payment of approximately \$9,400 per turbine per year, or up to \$397,000 per year for all 42 turbines planned.⁴¹³ This would be allocated as follows: 80 percent to Freeborn County and 20 percent to the host township (meaning each township would receive approximately \$1,900 per turbine per year). Hayward Township has the potential for six turbines and approximately \$11,400 per year in new revenue. Oakland Township has the potential for eight turbines and approximately \$15,200 per year in new revenue. Shell Rock Township has the potential for 11 turbines and approximately \$20,900 per year in new revenue. London Township has the potential for 17 turbines and approximately \$32,300 per year in new revenue.⁴¹⁴

271. The record demonstrates that the Project, if built, will result in both short- and long-term benefits to the local economy.

H. Public Health

i. Public Health Benefits

272. Freeborn Wind maintains that wind farms benefit the environment and health of the regional community by reducing emissions from fossil fuels. Throughout their operational life-cycle, LWECS operations emit the smallest amount of greenhouse gasses (GHGs) compared to other energy generation methods. Wind energy does not emit sulphur oxides (SO_x), nitrogen oxides (NO_x), particulate matter (PM₁₀), or mercury, and drastically reduces water consumption.⁴¹⁵

273. The Minnesota Center for Environmental Advocacy (MCEA) commented that increased use “of wind and other renewable resources with near-zero life-cycle [greenhouse gas] emissions leads to a direct reduction in the use of fossil fuels like coal and natural gas.” The MCEA echoed Freeborn Wind’s assertion that using wind to generate energy reduces SO_x, mercury, NO_x, and particulate matter, while requiring virtually no water to operate.⁴¹⁶

274. The American Lung Association in Minnesota (ALA) submitted a letter in support of the Project, noting that the avoided air emissions from the Wind Farm “will benefit all Minnesotans, especially helping children with asthma, seniors with COPD, and

⁴¹² Ex. FR-4 at 12 (Litchfield Direct).

⁴¹³ *Id.* at 13.

⁴¹⁴ *Id.*

⁴¹⁵ Ex. FR-1 at 56 (Application).

⁴¹⁶ Comment by Carolyn Berninger on behalf of MCEA at 2 (Mar. 8, 2018) (eDocket No. 20183-140900-01).

others with respiratory conditions.”⁴¹⁷ A representative from the ALA also attended the public hearing and stated that “projects like this are important for avoiding the use of fossil fuels and helping protect the air quality we all breathe.”⁴¹⁸

275. The Administrative Law Judge concludes that the Freeborn Wind project would generally contribute to public health by helping to reduce the emission of GHG’s in Minnesota.

ii. Electric and Magnetic Field Risks

276. Electric and magnetic fields (EMFs) are present around electrical devices. Electric fields arise from the voltage or electrical charges, and magnetic fields arise from the flow of electricity or current through transmission lines, power collection (feeder) lines, substation transformers, distribution plant, service drop, house wiring, and electrical appliances.⁴¹⁹

277. The electrical fields around the underground electrical collection lines associated with wind turbines dissipate within 20 feet on either side of the installed cable. EMFs associated with the transformers within the nacelle dissipates within 500 feet, so the 1,000-foot turbine setback from residences will adequately avoid any EMF exposure to homes. Based on the most current research on electromagnetic fields, and the distance between any turbines or collector lines and houses, the Project will have no impact to public health and safety due to EMFs.⁴²⁰

278. Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Stray voltage is not fatal to humans or other animals, and is not related to ground current, EMFs, or Earth currents. Stray voltage is a particular concern for dairy farms because it can impact operations. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals.⁴²¹ Freeborn Wind states it “will design, construct and operate all electrical equipment and devices, including turbines . . . in accordance with applicable codes, manufacturer specifications and required setbacks.”⁴²²

279. Stray voltage impacts are not anticipated to occur as a result of the Project.⁴²³ Therefore, the Administrative Law Judge determines that neither stray voltage nor EMFs pose a risk in the Freeborn Wind project.

⁴¹⁷ Ex. FR-4 at Schedule 4 at 2 (Litchfield Direct).

⁴¹⁸ Public Hr’g Tr. at 129 (Hunter) (Feb. 20, 2018).

⁴¹⁹ Ex. FR-1 at 57 (Application).

⁴²⁰ *Id.* at 58.

⁴²¹ *Id.* at 57-58.

⁴²² FR-1 at 58 (Application).

⁴²³ Ex. EERA-8 at 30 (Comments and Recommendations on a Preliminary Draft Site Permit).

iii. Public Health Risks

280. A number of AFCL members and other members of the public raised concerns about threats that wind turbines pose to those who live close to them. One landowner worried about her son who has autism and gets dizzy watching other children play baseball. She worries about his response to seeing the turbines turning every day.⁴²⁴ Another landowner suffers from migraines, which she states are triggered by vibrations, and could be triggered by the whooshing and flicker of the turbines.⁴²⁵ Similar concerns were raised by AFCL witness Hansen, who is a cancer survivor, on daily chemotherapy which causes her to be sensitive to motion and other stimuli.⁴²⁶ A landowner who is a veteran with post-traumatic stress disorder and tinnitus wrote that the turbine noise and shadow flicker will trigger problems, both because of the noise and possible triggering of flashbacks.⁴²⁷

281. In its 2009 report, *Public Health Impacts of Wind Turbines*, the Minnesota Department of Health (MDH Report) reported, among other things, that:

The noise from multiple turbines similarly distant from a residence can be noticeably louder than a lone turbine simply through the addition of multiple noise sources. Under steady wind conditions noise from a wind turbine farm may be greater than noise from the nearest turbine due to synchrony between noise from more than one turbine (citation omitted). Furthermore, if the dominant frequencies (including aerodynamic modulation of different turbines vary by small amounts, an audible beat or dissonance may be heard when wind conditions are stable.⁴²⁸

282. The MDH Report also stated that “[r]hythmic light flicker from the blades of a wind turbine casting intermittent shadows has been reported to be annoying in many locations.”⁴²⁹ Based on its own modeling, the MDH recommended that turbines be set back at a distance of 10 rotational diameters (approximately 1,000 meters, or .6 miles) in directions that shadow flicker may occur.⁴³⁰ Shadow flicker can also be eliminated by placing turbines outside of the path of the sun in relation to areas of concern.⁴³¹

283. The MDH Report does not conclude that any illness or condition is caused or aggravated by the noise or shadow flicker produced by wind turbines or wind farms. However, it concludes that the low-frequency noise that may not be addressed by the typical setback requirements, is commonly associated with “annoyance or an impact on quality of life.”⁴³² The MDH Report further states:

⁴²⁴ Comment by Michelle Severtson (July 3, 2017) (eDocket No. 20177-133516-01).

⁴²⁵ Comment by Jennifer Johnson (Jul.13, 2017) (eDocket No. 20177-133824-01).

⁴²⁶ Ex. AFCL-1 at 17-19 (Hansen Direct).

⁴²⁷ Comment by Holly and Chuck Clarke (Jul. 4, 2017) (eDocket No. 20177-133515-01).

⁴²⁸ Ex. FR-6 at Att. 7 at 17 (Roberts Direct).

⁴²⁹ *Id.*

⁴³⁰ *Id.* (citing *Wind Energy Handbook* (Burton et al., 2001)).

⁴³¹ Ex. FR-6 at Att. 7 at 28 (Roberts Direct).

⁴³² *Id.*

[s]leeplessness and headache are the most common health complaints and are highly correlated (but not perfectly correlated) with annoyance complaints. Complaints are more likely when turbines are visible or when shadow flicker occurs. Most available evidence suggests that reported health effects are related to audible low frequency noise. Complaints appear to rise with increasing outside noise levels above 35 dB(A).⁴³³

284. Before submitting its application to the Commission in this proceeding, Freeborn Wind invited comments from MDH about the proposed Freeborn Wind project. MDH Assistant Commission Paul Allwood replied with a letter to Applicant (2017 MDH Letter).⁴³⁴ Referring to the noise standards at Minn. R. 7030.0040, the MDH response warned “The MPCA nighttime standard for noise intensity of 50 dB(A), not to be exceeded more than 50% of the time in a given hour, appears to underestimate how much low frequency noise can enter into dwellings. Prior to site development, MDH recommends that low frequency noise and total noise from turbines be evaluated.”⁴³⁵ The MDH response repeated the setback recommendations it made for shadow flicker in 2009. The MDH comments closed with the following recommendations:

- Prior to development, low frequency noise and total noise from turbines should be evaluated by qualified acoustical engineers to determine measurable noise components from wind turbines that engender complaints and to assess noise impacts from proposed wind farms.
- Wind turbine noise estimates should include cumulative impacts (40-50 dB(A) isopleths) of all wind turbines.
- Isopleths for dB(C) – dB(A) greater than 10 dB should be determined to evaluate the low frequency noise component.
- The impacts of aerodynamic modulation noise and shadow flicker should be modeled and evaluated.
- Evaluations of turbine noise generation and shadow flicker should be incorporated into decisions when determining the appropriate setback distances of homes from wind turbines.
- Any noise criteria beyond current state standards used for placement of wind turbines should reflect priorities and attitudes of the community.
- Recognizing that it is unknown whether reported health impacts are direct health effects or indirect stress impacts from annoyance and/or lack of sleep resulting from turbine noise or shadow flicker, potential

⁴³³ *Id.*

⁴³⁴ Ex. AFCL-16 at Att. 2 (Stipulation and Affidavit – AFCL and MDH).

⁴³⁵ *Id.*

health impacts from wind turbine projects should be acknowledged, and provision should be made to mitigate these effects for residents within and near proposed project areas.

- The project should be designed so that exposure to residents is minimized and inclusion of all potential residents as compensated participants should be considered.⁴³⁶

285. Freeborn Wind's two independent medical experts, Dr. Mark Roberts and Dr. Jeff Ellenbogen, maintained that there is no scientifically-proven link between wind turbines and any adverse health effect. Dr. Roberts, a medical doctor and epidemiologist, studied the peer-reviewed scientific research involving health effects relating to noise.⁴³⁷ He concluded that "there is no peer-reviewed, scientific data to support a claim that wind turbines are causing disease or specific health conditions."⁴³⁸ Dr. Roberts determined that the evidence supports the conclusion that there are no potential adverse health effects from the sound produced by wind turbines, "because the levels of sound and infrasound from wind turbines are significantly lower than those that have been shown to cause harm."⁴³⁹

286. Dr. Ellenbogen, a sleep specialist, participated on a panel that conducted a Massachusetts health impact study regarding wind turbines and public health.⁴⁴⁰ The Massachusetts panel concluded that wind turbines do not pose a risk to human health.⁴⁴¹ Dr. Ellenbogen specifically evaluated the merits of "wind turbine syndrome" and "found no basis for a set of health effects from wind turbines."⁴⁴² He also evaluated four individuals claiming to suffer from "wind turbine syndrome" and found that the claims could not be substantiated and, in fact, prevented the individuals from seeking appropriate treatment. Dr. Ellenbogen testified: "In my opinion, the misapplied blame to wind turbines prevented these individuals from seeking and obtaining much-needed medical treatment for their underlying conditions."⁴⁴³

⁴³⁶ *Id.*

⁴³⁷ Ex. FR-6 at 15 (Roberts Direct).

⁴³⁸ *Id.* at 16 (Roberts Direct); *see also* Ex. FR-8 at 4, 6 (Corrected Ellenbogen Direct) (concluding that wind turbines do not pose a risk to human health, and noting that peer-reviewed scientific studies from numerous organizations and agencies across numerous countries around the world have found no association between wind turbines and adverse health effects).

⁴³⁹ Ex. FR-6 at 20 (Roberts Direct).

⁴⁴⁰ Ex. FR-7 at 4 (Corrected Ellenbogen Direct).

⁴⁴¹ *Id.*

⁴⁴² *Id.* at 5.

⁴⁴³ *Id.* at 5, 8; *see also* Ex. FR-6 at 16 (Roberts Direct) ("Neither wind turbine syndrome nor vibroacoustic disease has been recognized by organized medicine (professional societies or other professionally based societies) as a disease caused by wind turbine operations.").

287. Shadow flicker from wind turbines does not pose a risk for triggering seizures.⁴⁴⁴ 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 vulnerable to seizures as a result of flashes of light.⁴⁴⁵

288. The recommendations of MDH were brought up in public comments and by AFCL. Specifically, AFCL requested that, in considering the Project, the Commission act on the recommendations made by in the 2009 MDH Report and in the 2017 MDH Letter.⁴⁴⁶

289. Freeborn Wind and DOC-EERA maintained that “the research identified by MDH identified no consist[ent] pattern of health impacts related to wind turbines.”⁴⁴⁷ DOC-EERA further commented that “the conclusions and recommendations drawn in the 2009 [MDH Report] do not appear to be supported by the research and data that was available at the time” the report was written.⁴⁴⁸

290. Freeborn Wind asserts it has adequately addressed MDH’s concerns.⁴⁴⁹ It points out that Mr. Hankard, a qualified acoustical professional, addressed low and total noise from the proposed wind turbines in his Direct Testimony and in his Affidavit and Noise Tables.⁴⁵⁰ In addition, Freeborn Wind declares it evaluated noise and shadow flicker during the Project design,⁴⁵¹ and that Dr. Roberts and Dr. Ellenbogen provided robust testimony on potential health impacts from the Project.⁴⁵²

291. AFCL argued that much of Freeborn Wind’s witness testimony regarding the health effects of wind turbines was not relevant because causation is not an issue in this proceeding. AFCL reasons that causation is not an issue because Freeborn Wind is the applicant and bears the burden of proof.⁴⁵³

292. The Administrative Law Judge agrees that, as the Applicant, Freeborn Wind bears the burden of proof in this proceeding. However, causation and the burden of proof are two different concepts. Minn. Stat. § 216E.03, subd.7 (2016), lists some of the criteria

⁴⁴⁴ Ex. FR-7 at 5 (Corrected Ellenbogen Direct); see also Ex. EERA-8 at 29 (Comments and Recommendations on a Preliminary Draft Site Permit) (“there are no human health impacts known to be association with a person’s exposure to 30 or more hours of shadow flicker generated by a wind turbine.”), 18 (“30 hours of flicker per year was a suggested standard in a couple of sources of information reviewed by EERA, but those sources do not provide supporting scientific data that would suggest there is a link between shadow flicker in excess of 30 hours per year of exposure and negative human health impacts”).

⁴⁴⁵ Ex. FR-7 at 5 (Corrected Ellenbogen Direct).

⁴⁴⁶ See Ex. AFCL-1 at 16-19 (Hansen Direct).

⁴⁴⁷ Ex. EERA-8 at 20 (Comments and Recommendations on a Preliminary Draft Site Permit); see also Ex. FR-6 at 15 (Roberts Direct).

⁴⁴⁸ Ex. EERA-8 at 20 (Comments and Recommendations on a Preliminary Draft Site Permit); see also Ex. FR-6 at 15 (Roberts Direct).

⁴⁴⁹ See, e.g., Ex. FR-13 at Schedule 1 (Hankard Rebuttal).

⁴⁵⁰ See Ex. FR-5 at 4-5, 7-8 (Hankard Direct); Ex. FR-18 (Hankard Affidavit and Noise Tables).

⁴⁵¹ See, e.g., Ex. FR-1 at §§ 8.3, 8.4 (Application).

⁴⁵² See, e.g., Ex. FR-6 (Roberts Direct); Ex. FR-7 (Corrected Ellenbogen Direct).

⁴⁵³ Tr. V. 1B at 134-35 (Feb. 21, 2018) (Overland); AFCL Reply Brief at 16 (Apr. 4, 2018).

the Commission must consider in deciding whether to grant a site permit. The subdivision states, in relevant part:

(b) To facilitate the study, research, evaluation, and designation of sites and routes, the commission shall be guided by, but not limited to, the following considerations:

(1) evaluation of research and investigations relating to the effects on land, water and air resources of large electric power generating plants . . . and the effects of . . . electric and magnetic fields resulting from such facilities on public health and welfare⁴⁵⁴

This statutory language contemplates consideration of a causal relationship between large electric power generating plants and public health and welfare.

293. AFCL and other members of the public have asserted in this case that the proposed Freeborn Wind project will cause them to suffer a variety of physical and psychological harms. Freeborn Wind has the burden of proving that its proposed wind farm will not be the cause of such health effects. Freeborn Wind sought to meet its burden of proof by presenting testimony of expert witnesses who testified that wind turbines have not been proven to be the direct cause of health problems or disease.⁴⁵⁵ Thus, it was appropriate for Freeborn Wind's medical experts to testify regarding the question of whether or not wind turbines cause health problems in humans living near turbines.

294. AFCL did not present any expert medical testimony. Instead, it relied on anecdotal reports of people's negative responses to potentially living near wind turbines, along with articles by a variety of individuals, none of whom were presented to have their qualifications, methods, or conclusions subject to examination or cross-examination. Nor was expert witness foundation laid pursuant to Minn. R. Evid. 702 for any of the authors of the comments or articles.⁴⁵⁶ The majority of the comments from members of AFCL and the public came from people who have not yet experienced living near a wind turbine, but are anticipating being harmed by the experience.⁴⁵⁷

295. The 2009 MDH Report did not differ significantly from Dr. Roberts' and Dr. Ellenbogen's testimony in concluding that annoyance, with possible associated

⁴⁵⁴ Minn. Stat. § 216E.03, subd. 7(b)(1) (emphasis added).

⁴⁵⁵ Ex. FR-6 at 2-3 (Roberts Direct); Ex. FR-7 at 4-6 (Corrected Ellenbogen Direct).

⁴⁵⁶ See, e.g., Comment by Ted Hartke (July 6, 2013) (eDocket No. 20177-133562-03); Ex. P-19 (Eric Zou, *Wind Turbine Syndrome: The Impact of Wind Farms on Suicide*, (Oct. 2017) (abstract)) (eDocket No. 20183-140952-04)); Ex. EERA-6 (Allec N Salt and Timothy E. Hullar, *Responses of the ear to low frequency sounds, infrasound and wind turbines* (June 16, 2010)) (eDocket No.201710-136011-01); Ex. AFCL-13 (Michael A Nissenbaum, Jeffery J. Aramini, & Christopher D. Hanning, *Effects of Industrial Wind Turbine Noise on Sleep and Health*, Noise & Health (2012)).

⁴⁵⁷ See Attach. A at 3, 10-11(Summary of Initial Public Comments); Attach. B at 4-16 (Summary of Public Hearing); Attach. C at 5 (Summary of Public Comments on Draft Site Permit).

sleeplessness and headaches, are the impacts that have been demonstrated to occur in some people living near wind turbines.⁴⁵⁸

296. The preponderance of the evidence in the record demonstrates that current science supports a determination that people who live near wind turbines may experience annoyance, loss of sleep, and headaches. These symptoms are related to some combination of the presence of the turbines, the noise they make, and the attitudes of the people reporting the negative responses.⁴⁵⁹

297. The Administrative Law Judge further concludes that these adverse effects of wind turbines are mild, in the sense that there is no evidence to show that they will lead to more serious illnesses or death. However, chronic annoyance, sleeplessness, and headache can have significant impacts on the quality of the lives of the people who suffer from them.

298. The Administrative Law Judge finds that it is not in the best interest of the local community where a wind farm is being located, or of the wind energy industry generally, to locate wind turbines in a manner that angers and alienates the people whose lives are most directly affected by the turbines.

299. The Administrative Law Judge observes that the Project is predicted to exceed the 30-hour shadow flicker limit with regard to seven homes (three participating and four non-participating homeowners) under Freeborn County's Ordinance, a limit to which Freeborn Wind stated it would adhere.⁴⁶⁰ Based on these concerns, and on the public health concerns arising from evidence of chronic annoyance, sleeplessness, and headache, the Administrative Law Judge recommends that the Commission amend the Draft Site Permit regarding shadow flicker consistent with the recommendations made in Section XI.E. of this Report.

300. The Commission approved the Draft Site Permit based upon the noise analysis in Freeborn Wind's Application, which included a summary prediction of ambient noise, but no predictions of combined ambient and turbine noise.⁴⁶¹ As discussed in Section XI.D.v. of this Report, the total average background noise L₅₀ levels, including both ambient and turbine nighttime noise levels, exceed those permitted by Minn. R. 7030.0040.⁴⁶²

301. While Freeborn Wind's proposed project meets the setback requirements based on Freeborn County's ordinance, it is not clear that it meets the requirements of the Commission's 2008 Order Establishing General Wind Permit Standards.⁴⁶³ Those standards call for a setback distance of 750-1,500 feet, "depending on turbine model,

⁴⁵⁸ Ex. FR-6 at Att. 7 at 28 (Roberts Direct).

⁴⁵⁹ Tr. Vol. 2 at 66 (Ellenbogen).

⁴⁶⁰ Ex. FR-1 at App. C at 12-20 (Shadow Flicker Assessment).

⁴⁶¹ Ex. FR-1 at App. B at 30-31, 41-42 (Noise Analysis); Tr. Vol. 1B at 98-124 (Hankard).

⁴⁶² Ex. FR-18 at 2, 4 (Hankard Affidavit and Noise Tables).

⁴⁶³ Ex. AFCL-8 (Order Establishing General Standards, PUC Docket No. E,G-999/M-07-1102 (Jan.11, 2008)).

layout, and specific site conditions.”⁴⁶⁴ In addition, for homes, the required setback is “at least 500 feet plus the distance required to meet the state noise standard.”⁴⁶⁵

302. In light of the revised total noise predictions, and the lack of evidence that Freeborn Wind took the required 500 additional feet into account in establishing residential setbacks, the Administrative Law Judge recommends that, if the Commission issues a Site Permit in this docket, the Draft Site Permit conditions be amended to require Residential setbacks of 1500 feet for all non-participating landowners.⁴⁶⁶

303. The Administrative Law Judge further recommends that the Commission retain the current Draft Site Permit conditions requiring Freeborn Wind to monitor, minimize, and mitigate potential impacts.⁴⁶⁷

304. The Administrative Law Judge finds, should the Commission issue a Site Permit to Freeborn Wind, that the amended shadow flicker, noise, setback and monitoring, minimizing, and mitigating potential impacts site permit conditions will provide adequate public health protections, while still allowing for the public health benefits of the proposed Project.

I. Public Safety

305. Freeborn Wind maintained that current turbine technology, proactive maintenance, and regular facility inspections have significantly reduced safety risks.⁴⁶⁸ Plans for the Project include a number of safety-related measures, such as equipping all Project-related facilities with sufficient security measures during construction and operation of the Project. Freeborn Wind indicated it will utilize temporary or permanent fencing, warning signs, and secure locks on equipment and wind power facilities. Security gates and fences will be constructed at locations deemed necessary by Freeborn Wind at the request of landowners. Construction and operation staff will receive safety training. According to Freeborn Wind, regular maintenance and inspections will be conducted to assess potential blade failures and minimize the potential for blade throw.⁴⁶⁹

306. Freeborn Wind reported that it is coordinating with applicable emergency and non-emergency response staff in the area, such as regional air ambulance services, sheriff’s offices, and fire departments to develop a safety plan during construction and operation of the Project. Freeborn Wind planned to be in contact with local first responders to offer information about the Project.⁴⁷⁰

⁴⁶⁴ *Id.* at 8.

⁴⁶⁵ *Id.*

⁴⁶⁶ There are four non-participating landowners with setbacks of less than 1500 feet. Ex. FR-4 at 19 (Litchfield Direct).

⁴⁶⁷ See Draft Site Permit at 3, 15-16, 19-20 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁴⁶⁸ Ex. FR-1 at 60 (Application).

⁴⁶⁹ *Id.* at 61.

⁴⁷⁰ *Id.* at 60.

307. In the event that emergency services are needed at local residences during construction, Freeborn Wind pledged to halt and relocate construction activities so that emergency vehicles may have unfettered access to the emergency site.⁴⁷¹

308. Public commenters raised concerns regarding potential ice throw from the turbine blades in the winter. The commenters' concerns related primarily to turbine setback distances from public roads and the snowmobile trail located in the southern portion of the Project Area.⁴⁷² DOC-EERA claimed that the odds of ice throw occurring at the same time that someone would be snowmobiling in the adjacent portion of the trail, with optimal weather conditions, resulting in a snowmobiler being struck by ice fragments are "negligible, or almost non-existent."⁴⁷³

309. On February 22, 2018, the final day of the evidentiary hearing in this matter, a large piece of ice was thrown from a wind turbine on the Bent Tree Wind Farm, just to the northwest of Albert Lea. The ice struck and damaged a truck being driven on Highway 13 at the time. Freeborn County Commissioner Dan Belshan provided a public comment with information about the incident. Commissioner Belshan estimated that the ice traveled a distance of approximately 300 feet, based on the distance from the truck to the nearest wind turbine.⁴⁷⁴ He provided a document from GE Energy titled, "Ice Shedding and Ice Throw – Risk and Mitigation."⁴⁷⁵ The GE document recommends that turbines be sited a safe distance from occupied structures, roads, and public use areas to mitigate ice throw risk. Another mitigation suggestion is that turbines be deactivated when site personnel detect ice accumulation on the blades.⁴⁷⁶

310. Draft Site Permit Condition 4.4, which provides for a setback of 250 feet from public road ROW and designated public trails (such as the identified snowmobile trail), does not fully address this concern.⁴⁷⁷ The turbine closest to the snowmobile trail (turbine 20) is 538 feet away from the snowmobile trail, exceeding the minimum setback in the Draft Site Permit (250 feet), as well as the setback required by Section 26-51 of the Freeborn County Ordinance (1.1 times the turbine height), and the likely distance the ice was thrown from the turbine at the Bent Tree Wind farm on February 22, 2018.⁴⁷⁸

311. The Administrative Law Judge recommends that, if the Commission issues a Site Permit in this docket, the Site Permit Condition 5.2.25 be amended to require that

⁴⁷¹ *Id.*

⁴⁷² See, e.g., Comment by Sue Madson (Oct. 9, 2017) (eDocket No. 201710-136275-01); Comment by Lisa Hajek (Oct. 9, 2017) (eDocket No. 201710-136294-01); Comment by Dan Belshan (March 15, 2018) (eDocket No. 20183-140987-01); Comment by Bonita Belshan (Mar. 15, 2018) (eDocket No. 20183-141038-01).

⁴⁷³ Ex. EERA-8 at 15-16 (Comments and Recommendations on a Preliminary Draft Site Permit).

⁴⁷⁴ Comment by Dan Belshan (March 15, 2018) (eDocket No. 20183-140987-01).

⁴⁷⁵ *Id.* (GE Energy | GER-4262 (04/06)).

⁴⁷⁶ *Id.*

⁴⁷⁷ Draft Site Permit at 3-4 (Jan. 30, 2018) (eDocket No. 20181-139549-01); Ex. EERA-8 at 16 (Comments and Recommendations on a Preliminary Draft Site Permit).

⁴⁷⁸ See Ex. EERA-8 at 16 (Comments and Recommendations on a Preliminary Draft Site Permit); Ex. FR-1 at 7 (Application). 1.1 times the turbine height is 487 feet for the V110 model and 498 feet for the V116 model. Ex. FR-1 at 7 (Application).

site personnel inspect any turbines closer than 1200 feet to structures, roads or trails for ice when weather conditions are such that ice is likely to accumulate on turbine blades. To the extent that ice is accumulating on the blades of turbines located within 1200 feet of structures, roads, or trails, the turbines must be deactivated until such time as the turbine blades are free from ice.

312. Aside from the above concern, if the Project is built, construction and operation of the Project is not anticipated to have a significant impact to public safety. The record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to public safety. Further, the Draft Site Permit, with the recommended amendments, contains adequate conditions to monitor and mitigate the Project's potential impacts on public safety.⁴⁷⁹

J. Public Service and Infrastructure

i. Roads

313. The proposed Project is located in a sparsely populated, predominantly rural and agricultural area in southcentral Minnesota. Public services supporting rural residences and farmsteads within the Project Area include transportation/roadways, electric, and telephone/telecommunications.⁴⁸⁰

314. An established network of county and township roads exist in the Project Area. Various county and township roads provide access to the Project Area.⁴⁸¹

315. During construction, Freeborn Wind anticipates temporary impacts on some public roads within the Project Area. Roads will be affected by the normal use of vehicles employed to deliver Project components, construction materials and equipment to and from Project locations.⁴⁸² Specific routes may also be impacted by the temporary expansion of road widths and/or intersections to facilitate the safe and efficient delivery of Project facility components and associated construction equipment.⁴⁸³ Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Freeborn Wind plans to coordinate with local authorities to implement appropriate traffic control measures to ensure public health and safety is protected with respect to the Project.⁴⁸⁴

316. Several local units of government, local officials, and members of the public raised concerns regarding the potential for Project construction to damage local roads.⁴⁸⁵ Freeborn Wind states it is committed to repair all damage to local roads and to negotiate

⁴⁷⁹ Draft Site Permit at 3-4, 13-14, 23 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁴⁸⁰ Ex. FR-1 at 40 (Application).

⁴⁸¹ *Id.* at 41.

⁴⁸² *Id.* at 42.

⁴⁸³ *Id.*

⁴⁸⁴ *Id.*

⁴⁸⁵ See, e.g., Comment – Road Ordinance Passed by Shell Rock Township (Oct. 9, 2017) (eDocket No. 201710-136287-01); Comment – Road Ordinance (Oct. 9, 2017) (eDocket No. 201710-136229-01); Public Hr'g Tr. at 71 (Madson) (Feb. 20, 2018).

in good faith with Freeborn County and Hayward, London, Oakland, and Shell Rock Townships to develop an agreement that will address local concerns regarding development, road use, and drainage issues.⁴⁸⁶

317. The Draft Site Permit contains provisions that adequately address the use of public roads, the construction of turbine access roads, and private roads. For example, the Draft Site Permit requires Freeborn Wind to make satisfactory arrangements with the appropriate road authorities for use, maintenance and repair of the roads that may be subject to increased impacts due to transportation of equipment and Project components.⁴⁸⁷ While this requirement can be satisfied in a number of ways,⁴⁸⁸ Freeborn Wind reports it has begun meeting with local road authorities and offered to negotiate a road use agreement that establishes Freeborn Wind's responsibilities to maintain the roads in safe condition and repair roads and public drainage infrastructure damaged during construction.⁴⁸⁹

318. In addition, Freeborn Wind says it will construct the least number of turbine access roads necessary to safely and efficiently operate the Project and satisfy landowner requests; and access roads will be constructed in accordance with all applicable township, county, or state road requirements and permits. Further, Freeborn Wind promises to promptly repair private roads damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner.⁴⁹⁰

ii. Communications

a. Concerns the Project Will Interfere with Communications

319. After noise, the second most common concern brought to Freeborn Wind's attention concerning the Project is the fear that the wind turbines will adversely affect television and radio reception and possibly other communications services.⁴⁹¹

320. One public commenter, Gregory D. Jensen, is the owner of FM KQPR and AM KQAQ radio stations.⁴⁹² His FM radio tower is located within the Project Area.⁴⁹³ Jensen's attorney, Abby K. Leach, wrote on Mr. Jensen's behalf. She referenced a publication of the U.S. Department of Energy, Energy Efficiency & Renewable Energy, which concluded that:

⁴⁸⁶ Ex. FR-1 at 26 (Application); Tr. Vol 1A at 26 (Litchfield).

⁴⁸⁷ Draft Site Permit at 10 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁴⁸⁸ See Tr. Vol 1A at 26-28 (Feb. 21, 2018) (Litchfield); Ex. AFCL-18 (Freeborn Wind Response to AFCL IR No. 20).

⁴⁸⁹ Ex. FR-4 at 6, 26, Schedule 2 (Litchfield Direct).

⁴⁹⁰ See Draft Site Permit at 10-11 (Jan. 30, 2018) (eDocket No. 20181-139549-01) (Conditions 5.2.12, 5.2.13, 5.2.14).

⁴⁹¹ Ex. FR-4 at 25 (Litchfield Direct); see also AFCL Initial Brief at 54-55.

⁴⁹² Letter from Abby K Leach, Leach Law PLLC, on behalf of Gregory D. Jensen (July 6, 2017) (eDocket No. 20177-133586-01).

⁴⁹³ *Id.* at Ex. A (eDocket No. 20177-133586-02).

[w]ind turbines, like all structures, can interfere with communication or radar signals when these signals are interrupted by the turbine's tower or blades Relocating some of the planned turbines is one approach to mitigating signal interferences Wind turbines can cause electromagnetic interference and affect TV and radio reception. Electromagnetic interferences can be caused by near-field effects, diffraction, or reflection and scattering.⁴⁹⁴

321. Commenter Janice A. Helgeson wrote that the Project would cause her to lose reception of KAAL, an ABC affiliate broadcasting on Channel 6 with a coverage area that includes the Project Area as well as Albert Lea.⁴⁹⁵ Ms. Helgeson is concerned that the Project could also interfere with her reception of other TV and radio stations. She relies “on over-the-air (OTA) TV and radio” and wants interference issues resolved in advance of permitting rather than mitigated after construction.⁴⁹⁶

322. Roland and Rebecca Senne similarly wrote of their concern for the possible loss of the OTA signals for TV and radio. Although they have satellite TV, they state that, “whenever there’s a storm we have to switch to the OTA signal.”⁴⁹⁷

323. KAAL intervened in this proceeding because of its concern the Project could interfere with its microwave system and disrupt its OTA services to many of its viewers.⁴⁹⁸ Obstruction of the station’s signal would deprive its viewers not only of entertainment, but also “breaking weather announcements which can have an impact on the lives of those in the area if they are unable to receive emergency warnings.”⁴⁹⁹

324. Commenter Allie Olson advised the Commission that the 34.5 kV transmission lines that would transmit the power generated by the Project could cause interference with the underground copper cables of the Sleepy Eye Telephone Company.⁵⁰⁰ Commenter Kristi Rosenquist also expressed concern that the wind farm’s sporadic electricity transmissions over its power lines would interfere with landline service

⁴⁹⁴ *Id.* at Ex. B (U.S. Department of Energy, Energy Efficiency & Renewable Energy, WINDEXchange) (July 6, 2017)) (eDocket No. 20177-133586-03).

⁴⁹⁵ Letter from David Harbert, KAAL GM & VP, to Richard Davis, Environmental Review Manager, DOC-EERA (July 24, 2017) (eDocket No. 20177-134203-01).

⁴⁹⁶ Letter from Janice A. Helgeson to the attention of Richard Davis, Environmental Review Manager, DOC-EERA (Sept. 18, 2017) (eDocket No. 201710-136270-01). Tyler M. Nelson similarly objected to post-construction mitigation rather than planning to prevent problems prior to permitting the Project. Letter from Tyler M. Nelson to Richard Davis, Environmental Review Manager, DOC-EERA (Oct. 9, 2017) (eDocket No. 201710-136259-01).

⁴⁹⁷ Letter from Roland and Rebeca Senne to Richard Davis, Environmental Review Manager, DOC-EERA (Sept. 8, 2017) (eDocket No. 201710-136238-01).

⁴⁹⁸ Petition to Intervene from KAAL-TV, LLC at 2 (Oct. 13, 2017).

⁴⁹⁹ Ex. KAAL-1 at 3 (Harbert Direct).

⁵⁰⁰ Letter from Allie Olson to the Commission (July 6, 2017) (eDocket No. 20177-133592-01).

over copper cables.⁵⁰¹ Both Ms. Olson and Ms. Rosenquist refer to prior Commission proceedings where this issue has arisen.⁵⁰²

1. Wind Farm Interference with Communications Signaling Systems

325. No party disputes that the:

presence of a wind farm near telecommunications transmitters or receivers may introduce distortions on the transmitted signals. These distortions can cause different effects on radiocommunications services depending on several factors such as the frequency band, the modulation scheme and the discrimination of the radiation pattern of transmitter and receiver aeri-als.

. . . .

[A] wind turbine may cause a scattered signal of dynamic nature which is both amplitude and frequency modulated due to the rotating blades. The time and frequency characteristics of this scattering signal will depend on multiple factors. Some of them are fixed, such as the distance from the transmitter and the dimensions and materials of the wind turbine, while other are time-varying, such as the nacelle orientation and the rotation speed of the blades.⁵⁰³

326. Of the various types of radio communications services, the types most sensitive to the presence of wind turbines include fixed radio links and “broadcasting services (mainly analog television and digital television to a lesser extent).”⁵⁰⁴

327. The need for a detailed pre-wind farm construction assessment of potential interference issues is not disputed by the parties. As one article explains:

Although the critical interference cases are not common, if they occur when the wind farm is already installed, the posteriori corrective measurements are normally technically complex and/or cost prohibitive. By contrast, the prediction of the potential impact of a wind farm on the telecommunication services before its installation allows the planning of alternative solutions in order to assure the coexistence between the wind turbines and the telecommunication services. This potential impact must be analyzed in a case-by-case basis, taking into account the particular features of each

⁵⁰¹ Letter from Kristi Rosenquist to the Commission (eFiled Oct. 9, 2017) (eDocket No. 201710-136227-01).

⁵⁰² *In re AWA Goodhue Wind, LLC’s Application for a Certificate of Need for a 78 MW Wind Project and Associated Facilities in Goodhue County*, PUC Docket No. IP-6701/CN-09-1186; *Large Wind Energy Convers System Site In the Matter of the Application of AWA Goodhue Wind, LLC for a Site Permit for the 78 MW Goodhue Wind Farm in Goodhue County*, PUC Docket No. IP-6701/WS-08-1233.

⁵⁰³ Ex. KAAL-4 at Ex. D at 85-86 (I. Angulo et. al., *Impact analysis of wind farms on telecommunications services*, 32 RENEWABLE AND SUSTAINABLE ENERGY REVIEW 84 (2014) (footnote omitted)).

⁵⁰⁴ *Id.* (footnotes omitted).

installation and the involved services, such as the accurate location of the wind turbines and the telecommunications infrastructure, terrain altimetry and topography, telecommunication towers height, service frequency and modulation, radiating systems characteristics and reception conditions.

In the case of a potential problem being identified, preventive measurements can be taken in order to avoid it. These may include proposing safe-guarding zones, changing the location of a wind turbine in the preliminary design of a wind farm, choosing a model with different dimensions or selecting alternatives for the telecommunications services (new transmitter locations, different communications links, etc.) Whatever the case may be, the cost of preventive measure[ment]s is lower than the one of corrective measurements and prevents public opposition to wind energy development.⁵⁰⁵

2. Freeborn Wind's Assessment of Potential Interference Issues

328. Freeborn Wind retained Comsearch to analyze the Project's potential for interfering with AM and FM radio, communication towers, mobile phones, microwave beam paths and OTA TV reception.⁵⁰⁶ Comsearch provides engineering services including wireless communications and microwave planning, interference analysis, and spectrum management.⁵⁰⁷

329. Comsearch maintains databases on licensed communications providers' networks in the United States that provide, among other information, the three-dimensional physical locations of communications transmission towers, antennas, and microwave stations. In addition, Comsearch has access to data sources maintained by others. With this information, Comsearch can identify the particular transmission paths or coverage areas that intersect the Project Area for each mode of communications technology – microwave, radio, cell towers, and TV.⁵⁰⁸

330. Comsearch found 17 tower structures and 70 communication antennas in the Project Area used in the transmission of microwave, cellular, radio, TV and land mobile services.⁵⁰⁹ The report concluded that “[d]etailed impact assessments should be performed for these service types.”⁵¹⁰

3. Radio Interference

331. For its initial examination of the potential for interference with AM and FM radio, Comsearch located all radio stations within 30 kilometers of the Project Area.⁵¹¹

⁵⁰⁵ *Id.* at 86.

⁵⁰⁶ Ex. FR-1 at App. D.

⁵⁰⁷ Ex. FR-12 at 1 (Jimeno Rebuttal).

⁵⁰⁸ Ex. FR-4 at Schedule 8 at 3 (Litchfield Direct).

⁵⁰⁹ Ex. FR-1 at App. D at 7 (Wind Power GeoPlanner™ Communication Tower Study) (Dec. 8, 2016)).

⁵¹⁰ *Id.*

⁵¹¹ *Id.* at App. D at 1, 3 (Wind Power GeoPlanner™ AM and FM Radio Report (Dec. 6, 2016)).

Comsearch found five such AM stations but all were outside of the “exclusion distance,” the distance beyond which no interference from the Project would be expected.⁵¹² Consequently, Comsearch made no recommendations and proposed no mitigation measures for AM radio interference.

332. Comsearch identified five FM stations within the 30 kilometer radius that were potentially subject to interference from the Project. Comsearch concluded that the “effect of wind turbines on FM radio coverage and reception is expected to be minimal as long as the turbines are sited in the far-field region of the broadcast antennas and line-of-sight to the populations served by the FM stations is maintained.”⁵¹³

333. After Freeborn Wind developed siting plans for its turbines, Comsearch conducted a second study of the Project’s potential for interfering with AM and FM radio in May of 2017.⁵¹⁴ Comsearch found that three FM stations were so close to the proposed turbines that it used aerial imagery to verify their exact locations.⁵¹⁵ After determining the stations’ precise locations, Comsearch found that two of the three stations were within 500 meters of a turbine such that “radiation pattern distortion could become a factor” and “[s]ignal attenuation is also possible”⁵¹⁶ Specifically, wind Turbine 10 could interfere with station KNSE and Turbine 15 could interfere with station KAUS-FM.⁵¹⁷

334. The attorney for the owner of KQPR-FM and KQAQ-AM radio stations criticized Freeborn Wind’s radio interference study for only considering “the first three radio towers that are closest to the proposed wind turbines.”⁵¹⁸

335. According to Comsearch, KQPR-FM transmitter is 1.82 kilometers from the nearest turbine and the KQAQ transmitter is over 15 kilometers distant. The stations did not dispute these measurements.⁵¹⁹ The stations’ letter cited Comsearch’s study’s statement that “[a]t distances less than 500 meters, radiation pattern distortion could become a factor.”⁵²⁰ There is no specific evidence that any AM or FM radio transmitter will be within 500 meters of the nearest wind turbine, according to Freeborn Wind’s turbine siting layout.

336. DOC-EERA noted Comsearch’s finding of potential interference with KAUS-FM and KNSE by Turbines 10 and 15.⁵²¹ The agency pointed to Condition 5.2.16 in the

⁵¹² *Id.* at 1, 5.

⁵¹³ *Id.* at 5.

⁵¹⁴ Ex. FR-1 at App. D (Wind Power GeoPlanner™ AM and FM Radio Report (May 17, 2017)).

⁵¹⁵ *Id.* at 4.

⁵¹⁶ *Id.* at 8.

⁵¹⁷ *Id.* at 11.

⁵¹⁸ Letter from Abby K Leach, Leach Law PLLC, on behalf of Gregory D. Jensen at 1 (July 6, 2017) (eDocket No. 20177-133586-01).

⁵¹⁹ Ex. FR-1 at App. D at 1, 3 (Wind Power GeoPlanner™ AM and FM Radio Report (May 17, 2017)).

⁵²⁰ *Id.* at 8. In the report’s Figure 2, KQPR-FM’s transmitter is identified by the number 4 and does not appear to be very close to any turbine.

⁵²¹ Ex. EERA-8 at 23 (DOC-EERA Comments and Recommendations on a Preliminary Draft Site Permit) (Dec. 4, 2017)).

Draft Site Permit that would require Freeborn Wind to “avoid, minimize, and mitigate interference to radio signals when siting and operating turbines.”⁵²²

337. In response to concerns about the Project causing significant disturbance to radio stations KNSE and KAUS-FM, Freeborn Wind removed Turbines 10 and 15 from the Project.⁵²³ Comsearch’s study concluded that the wind farm’s remaining turbines would not interfere with stations KQPR-FM or KQAQ-AM.

338. The Administrative Law Judge concludes that there is no evidence to support the need for Freeborn Wind to relocate or remove additional turbines in order to minimize the potential for the Project to interfere with AM or FM radio reception. In the event that the Commission issues a Site Permit in this docket, the Administrative Law Judge recommends that Section 5.2.16 be amended to require Freeborn Wind to investigate concerns about radio interference caused by the Project. If the Project’s operations contribute to the interference, Freeborn Wind must undertake measures to mitigate the interference.

4. Telephone Interference

339. Comsearch also studied the potential impact of wind turbines on mobile phone operations in and near the Project Area.⁵²⁴ Comsearch did not anticipate any “significant harmful effect to mobile phone services in Freeborn.” The report noted that “[m]obile phone systems that are implemented in urban areas near large structures and buildings often have to combat even more problematic signal attenuation and reflection conditions than rural areas containing a wind energy turbine facility.”⁵²⁵

340. No party or member of the public disputed Comsearch’s conclusion that mobile phone service would not be disrupted by the Project. As noted previously, several members of the public raised the concern that Freeborn Wind’s power transmission lines could cause interference with landline telephone service.⁵²⁶

341. DOC-EERA commented that the “Applicant has been in direct communication with the landline provider in the Project Area. The local landline provider has not mentioned any concerns with regard to inductive interference as a result of the proposed Project.”

342. The Administrative Law Judge finds that the record contains no evidence that the Project, if built, would disrupt mobile or landline telephone service.

⁵²² *Id.*

⁵²³ Ex. FR-4 at 26 (Litchfield Direct). Freeborn Wind also encountered issues with acquiring the land rights necessary for turbine #15. EERA-8 at 9 (DOC-EERA Comments and Recommendations on a Preliminary Draft Site Permit) (Dec. 4, 2017)). Although the statement concerning land rights issue cites footnote 18 in support, there is no footnote 18 between footnotes 17 and 19 in EERA-8.

⁵²⁴ Ex. FR-1 at App. D (Wind Power GeoPlanner™ Mobile Phone Carrier Report (Dec. 8, 2016)).

⁵²⁵ *Id.* at 9.

⁵²⁶ See *supra* at ¶ 324.

5. Interference with Radio Links and Microwave Beam Paths

343. Microwave networks constitute the telecommunications backbone of the country and transport local and long distance calls, wireless calls, internet traffic, and video services.⁵²⁷ Microwave and radiowave systems are forms of radar systems that transmit at frequencies in the microwave or radio range respectively. According to information provided by KAAL, these systems direct beams at specific target receptors:

Because of the point-to-point nature of these links, and the frequency range they use, unobstructed line of sight between both ends of the links is intended. Diffraction effects occur in the forward scattering zone of the wind turbines, where the turbine obstructs the path between transmitter and receiver, located at the two end points of the link. Attenuation due to this mechanism will be of significance for high frequency [microwave] links with a turbine close to one of the antennas.⁵²⁸

344. MnDOT submitted a letter expressing concern about interference with MnDOT's Albert Lea-to-Oakland Woods Allied Radio Matrix of Emergency Response (ARMER) microwave paths.⁵²⁹ However, following a review of the Project with respect to that ARMER path, MnDOT "has no concerns about any turbine locations impacting its licensed ARMER microwave paths."⁵³⁰ No other state agency raised concerns about potential Project interference with microwave systems.

345. Comsearch conducted several studies to analyze potential interference with microwave beam paths. Comsearch's initial study was dated April 30, 2015. It was updated in December 2016 because Freeborn Wind expanded the Project to include an additional area. These studies sought to identify microwave beam paths crossing the Project Area to use in siting turbines to avoid them. The studies calculated the Fresnel Zones, the physical area of the beam path in which an obstruction can cause interference with the signal and disrupt its reception. Comsearch advised Freeborn Wind to site its turbines to avoid the Fresnel Zones they identified.⁵³¹ Freeborn Wind used these studies in developing its turbine layout.⁵³²

⁵²⁷ Ex. FR-1 at App. D (Wind Power GeoPlanner™ Microwave Study at 1 (Dec. 6, 2016)).

⁵²⁸ Ex. KAAL-4 at Ex. D at 94 (I. Angulo et. al., *Impact analysis of wind farms on telecommunications services*, 32 RENEWABLE AND SUSTAINABLE ENERGY REVIEW 84 (2014)).

⁵²⁹ MnDOT Comments (Oct. 6, 2017) (eDocket No. 201710-136205-01).

⁵³⁰ Ex. FR-4 at Schedule 7 (Litchfield Direct).

⁵³¹ *Id.* at Schedule 8 (Litchfield Direct) (Wind Power GeoPlanner™ Microwave Study at 9 (June 23, 2017)).

⁵³² *Id.* at 29 (Litchfield Direct). Only the December 6, 2016 and June 23, 2017 studies are in the record.

346. Comsearch conducted a third study in June 2017 to respond to KAAL's concerns.⁵³³ This study confirmed that the proposed turbine layout would not interfere with any of the 46 microwave beam paths crossing the Project Area, including KAAL's.⁵³⁴

347. KAAL agreed that microwave interference was not an issue based on the proposed Project design. KAAL's expert witness Steven Lockwood testified that Freeborn Wind analyzed the proposed turbine locations and correctly concluded that there would be no microwave interference.⁵³⁵

348. Accordingly, the Administrative Law Judge concludes that, if the Commission grants a Site Permit in this docket, Freeborn Wind's Project layout need not be modified to minimize potential microwave beam path interference.

6. Over-the-Air Television Interference

a) Wind Turbine Interference with OTA Television

349. Freeborn Wind acknowledges the "dozens of comments in the Docket expressing concerns about television interference."⁵³⁶ Freeborn Wind recognizes:

that with current television broadcast technologies, construction of wind turbines has the potential to impact TV reception as a result of an obstruction in the line of sight between residents relying on digital antennas for TV reception and the TV station transmitter. This is true of the Project and every other wind farm planned or operational in Minnesota or anywhere else in the world. Signal scattering could impact certain areas currently served by the TV stations, especially those that would have line-of-sight to at least one wind turbine but not to a respective station transmitter.⁵³⁷

350. "Scattering" occurs when TV signals are reflected off of the wind turbines which causes two or more versions of the same TV signal to reach the receiver at slightly different times. This creates the potential for multipath interference to develop and impede a receiver's ability to decode the TV signal.⁵³⁸ As wind turbine blades move through a signal, "they cause the signal to drop and then pop up again as the blade moves out of the path."⁵³⁹ This can cause reception to fail, especially for viewers on the edge of the coverage area or in a weak signal area. The potential for disruption due to such interference is much less now with digital broadcasts than it was with analog

⁵³³ Ex. FR-12 at 2 (Jimeno Rebuttal); Ex. FR-1 at App. D (Wind Power GeoPlanner™ Microwave Study (Dec. 6, 2016)); Ex. FR-4 at Schedule 8 (Litchfield Direct) (Wind Power GeoPlanner™ Microwave Study (June 23, 2017)).

⁵³⁴ Ex. FR-4 at Schedule 8 at 7-9 (Litchfield Direct) (Wind Power GeoPlanner™ Microwave Study (June 23, 2017)).

⁵³⁵ Ex. KAAL-4 at 3 (Lockwood Direct).

⁵³⁶ Ex. FR-4 at 27 (Litchfield Direct).

⁵³⁷ *Id.*

⁵³⁸ *Id.* at 5; Ex. KAAL-6 (KAAL Information Request No. 5).

⁵³⁹ Ex. FR-1 at App. D (Wind Power GeoPlanner™ TV Coverage Impact Study (May 22, 2017)).

broadcasts.⁵⁴⁰ Nonetheless, demodulating a digital TV signal requires the receiver's Automatic Gain Control to maintain signal amplitude. Receivers are generally more likely to fail to maintain the necessary amplitude the faster a wind turbine's blades turn.⁵⁴¹

351. Freeborn Wind asserts that the "complexity of identifying the exact antenna location at hundreds of potential private residents makes it impossible to avoid this impact upfront. However, we are diligently implementing a program to very promptly respond and mitigate any problems observed upon commencement of operations."⁵⁴²

b) Comsearch's OTA Television Interference Study

352. Dennis Jimeno is a telecommunications engineer III employed by Comsearch. Mr. Jimeno conducted the Comsearch studies for Freeborn Wind.⁵⁴³ Comsearch's study followed the recommendations provided in ITU-R BT.1893-1, "Assessment Methods of Impairment Caused to Digital Television Reception by Wind Turbines (ITU-R BT.1893-1)".⁵⁴⁴ This document states that "wind turbines may cause television reception problems at locations where there is no line-of-sight to the TV transmitter but there is line-of-sight to the wind turbines."⁵⁴⁵

353. Comsearch located 21 operating television stations within 100 kilometers of the Project Area providing coverage to the Project Area. Comsearch plotted the Federal Communications Commission (FCC) coverage contours for the 21 stations and found that six intersected with at least one wind turbine.⁵⁴⁶ Comsearch then identified the areas within and near the Project Area that would be "especially susceptible" to multipath interference due to the signal scattering effects of the turbines.⁵⁴⁷ The study concluded that these "at-risk" areas were those where the receiver antenna is within 10 kilometers and has line-of-sight to a wind turbine but no line-of-sight to the serving television station: "The severity of the interference at a given receiver in these areas is a function of the receiver itself, the type and configuration of the receiver antenna, the orientation of the wind turbine, and other signal propagation factors."⁵⁴⁸

⁵⁴⁰ Ex. KAAL-4 at Ex. D at 95 (I. Angulo et. al., *Impact analysis of wind farms on telecommunications services*, 32 RENEWABLE AND SUSTAINABLE ENERGY REVIEW 84 (2014)).

⁵⁴¹ *Id.* at 6.

⁵⁴² Ex. FR-4 at 27 (Litchfield Direct); see Attach. B at 3 (Summary of Public Hearing).

⁵⁴³ Ex. FR-12 at 1 (Jimeno Rebuttal).

⁵⁴⁴ *Id.* at 5. "ITU" stands for the International Telecommunications Union. ITU-R indicates the Radiocommunication Sector of the ITU. "BT" represents the ITU-R's recommendations concerning broadcasting service (or television). Ex. KAAL-4 at Ex. B (Lockwood Direct) (Recommendation ITU-R BT.1893-1, *Assessment methods of impairment caused to digital television reception by wind turbines*, BT Series Broadcasting service (television) (Oct. 2015)).

⁵⁴⁵ Ex. FR-12 at 5 (Jimeno Rebuttal) (apparently referring to ITU-R BT.1893-1 at 13).

⁵⁴⁶ *Id.* at 3; Ex. FR-1 at App. D at 6 (Wind Power GeoPlanner™ TV Coverage Impact Study (May 22, 2017)). It is not clear why Comsearch studied 47 potential turbine sites when "the Project will include up to 42 turbine sites" within Freeborn County.

⁵⁴⁷ Ex. FR-12 at 8 (Jimeno Rebuttal).

⁵⁴⁸ *Id.*; Ex. KAAL-6 (KAAL Information request No. 5).

354. To estimate the impact of potential TV interference with the 10-kilometer study area, Comsearch first determined that 411 census blocks were partially or fully within the “at risk” areas. Comsearch used other census data to determine the number of households in each potentially affected census block. For census blocks only partially within the “At-Risk” areas, Comsearch calculated the percentage of the census block’s area within the “At-Risk” areas and applied that to the number of households in the block to estimate the number of potentially affected households in that block. In this manner, Comsearch identified that 867 households were located in the “at risk” areas that are “especially susceptible” to wind farm interference.⁵⁴⁹

355. Not all of these 867 households were within the coverage contours of each of the six TV stations, but many were in more than one station’s coverage contour.⁵⁵⁰ Not every household however, uses OTA TV. Satellite TV is common and cable TV may be available to some. Comsearch relied upon a study from GfK, an independent research company, to estimate the portion of the 867 households using OTA TV. The GfK study found that 25 percent of households in the U.S. were without cable or satellite TV. On this basis, Comsearch assumed that only 25 percent of the “especially susceptible” households were subject to possible OTA signal disruption. Based on the 25 percent “especially susceptible” concept, Comsearch estimated that 735 households would be at risk of potentially losing OTA coverage from at least one of the six TV stations, if the Project is built.⁵⁵¹

356. Because KAAL is a party to this action, it is an appropriate example to use in considering Comsearch’s methodology. Comsearch determined the census blocks within KAAL’s coverage contour and used additional data to estimate that there are 254,447 households within it. The Comsearch assumes 25 percent of the 254,447 households (63,612 households) use OTA to receive KAAL TV. Comsearch’s next step was to determine the number of households that are both within KAAL’s coverage contour and also within an “at risk” area, finding 604 such households. Comsearch then again assumed 25 percent of these households (151 households) are potentially at risk of interference to their reception of KAAL via OTA TV. Comsearch divides 151 by 63,612 to estimate that 0.24 percent of KAAL’s OTA household viewers who may have their reception disrupted by the Project.⁵⁵²

357. Comsearch advises use of “a high-gain directional antenna, preferably outdoors, and oriented towards the television tower location” to mitigate interference caused by the wind farm.⁵⁵³ Alternatively, but at a much greater cost, interference problems could be resolved by installing low-power translator stations to re-broadcast an

⁵⁴⁹ Ex. KAAL-6 (KAAL Information request No. 5).

⁵⁵⁰ Ex. FR-4 at App. D at 15 (“Wind Power GeoPlanner™ TV Coverage Impact Study” (May 22, 2017)).

⁵⁵¹ Id.

⁵⁵² Ex. FR-17 at 1-2 (Jimeno Affidavit and Workpapers); Ex. FR-4 at App. D at 14-15 (“Wind Power GeoPlanner™ TV Coverage Impact Study” (May 22, 2017)).

⁵⁵³ Ex. FR-4 at App. D at 16 (“Wind Power GeoPlanner™ TV Coverage Impact Study” (May 22, 2017)).

affected station's programming in the areas with interference issues not remedied by a high-gain antenna.⁵⁵⁴

7. KAAL-TV's concerns

358. Freeborn Wind plans to place wind turbines near KAAL's microwave network installations and its broadcasting system equipment, "potentially causing harmful interference to those microwave system and broadcast operations. Moreover, homes and businesses which currently receive KAAL's over-the-air broadcast signal may experience interference caused by the wind turbine generators."⁵⁵⁵ David A. Harbert, vice president and general manager of KAAL,⁵⁵⁶ explained that, "[m]any homeowners in the path of the proposed windfarm could lose their KAAL signal, denying them breaking weather and news of immediate relevance to their well-being in addition to cutting them off from community, county and state news of great civic interest."⁵⁵⁷

359. As explained above, the Administrative Law Judge concludes that Freeborn Wind has demonstrated that its planned turbine layout will not obstruct any existing microwave beam paths, including those of KAAL. This subsection accordingly concerns only KAAL's fears of interference with its OTA TV signals.

360. Mr. Harbert submitted a document entitled "KAAL Field Testing Final Report" by Ray Conover that analyzed reception of the KAAL's signal in the Austin and Albert Lea areas in December 2010.⁵⁵⁸ One testing site was Freeborn, Minnesota, 52.5 miles from the KAAL transmitter. According to Mr. Conover:

This site was selected to examine the effects of the path passing through a wind farm. Spectrum analyzer video reveals that the signals passing through the wind farm fluctuated at a modest rate by as much as 10dB. While the axion receiver was not affected by the level variations, I expect that older version receivers may well have a great deal of difficulty with these signals. The analyzer video also revealed that signals not passing through the wind farm were stable. Signal margins to receiver threshold continued to be quite good.⁵⁵⁹

In all other locations tested, there was much less fluctuation.⁵⁶⁰

361. Mr. Conover's study does not evidence any reception issues for OTA KAAL-TV, but the station fears the wind farm will change that situation. To that end, KAAL

⁵⁵⁴ *Id.*; Ex. KAAL-1 at 7-8 (Harbert Direct).

⁵⁵⁵ Petition to Intervene from KAAL-TV, LLC (Oct. 13, 2017).

⁵⁵⁶ Ex. KAAL-1 at 2 (Harbert Direct).

⁵⁵⁷ *Id.* at 2-3.

⁵⁵⁸ *Id.* at Ex. A (KAAL Field Testing Final Report) (Oct. 2011)).

⁵⁵⁹ *Id.* at 11-12.

⁵⁶⁰ *Id.*

retained Steven S. Lockwood, senior engineer and president of Hatfield & Dawson Consulting Engineers, to review filings and testify in this proceeding.⁵⁶¹

362. Mr. Lockwood cited Recommendation ITU-R BT.1893-1 as an authoritative source for quantifying, predicting, and measuring wind farm caused “scattering” of TV signals.⁵⁶² He stated that wind turbines can cause reception problems when a TV signal passes through wind turbines as well as when signals are reflected or obstructed by the turbines. According to Mr. Lockwood, “As turbine blades move through the signal, they cause the signal to drop then pop up again as the blade moves out of the path.”⁵⁶³ This gives rise to two problems for TV reception: 1) if the signal drops below the receiver’s threshold, reception fails; and 2) the faster turbine blades move, the more likely it is that some receivers’ Automatic Gain Control (AGC) will fail.⁵⁶⁴

363. Mr. Lockwood contends that the Comsearch study underestimated the effects of wind turbines on OTA TV reception because it only considered households within 10 kilometers of the Project, and within that subset, only those households with line-of-sight to the turbine but not line-of-sight to the TV transmitter. Other households that receive signals that pass through the wind farm were not included in the study. In addition, Mr. Lockwood questioned the assumption that only 25 percent of households affected relied on OTA TV. He also noted that many viewers would not have outdoor elevated antennas.⁵⁶⁵

364. Mr. Lockwood disagreed that ITU-R BT.1893-1 methods produced a conservative estimate of households that would experience signal disruption. He claimed that the European Digital Video Broadcasting – Terrestrial (DVB-T) standard performs better in multipath signal environments than Advanced Television Systems Committee (ATSC), which is the United States standard.⁵⁶⁶ The implication of this statement is that the signal scattering interference in an ATSC standard based system is underestimated by using the ITU-R BT.1893-1 methods. Mr. Lockwood noted that the superior guide to methods for determining areas most susceptible to interference is ITU-R BT.2142. That reference includes a study finding scattering occurring at least 13.5 kilometers from the wind farm.⁵⁶⁷

365. KAAL’s data indicates far more homes will be affected than Comsearch’s study, but KAAL did not submit this data or a summary of it into the record.⁵⁶⁸ KAAL urged that Freeborn Wind be required “to perform accurate impact studies and, if appropriate, construct a new translator tower.”⁵⁶⁹ KAAL proposed that a survey be

⁵⁶¹ Ex. KAAL-4 at 1 (Lockwood Direct).

⁵⁶² *Id.* at Ex. B (Recommendation ITU-R BT.1893-1, *Assessment methods of impairment caused to digital television reception by wind turbines*, BT Series Broadcasting service (television) (Oct. 2015)). ITU is the International Telecommunications Union.

⁵⁶³ *Id.* at 5.

⁵⁶⁴ *Id.* at 5-6.

⁵⁶⁵ *Id.* at 6-7.

⁵⁶⁶ Ex. KAAL-5 at 1 (Lockwood Surrebuttal).

⁵⁶⁷ *Id.* at 2.

⁵⁶⁸ *Id.*

⁵⁶⁹ *Id.* at 5.

conducted to determine the “current method of reception of local news and weather information, especially during weather and/or headline alerts.”⁵⁷⁰ KAAL recommended that DOC-EERA retain a company, at Freeborn Wind’s expense, to conduct this door-to-door survey of all residents within 20 kilometers of any turbine. The survey would be repeated 90 days after operations commenced, as well as, after any change in turbine equipment specifications.⁵⁷¹ According to KAAL, having a Freeborn Wind consultant visit viewers post-operation is inadequate because many people will not report problems, and not every problem that is reported will be resolved.⁵⁷²

366. KAAL proposed that “[u]nserved’ or ‘failure’ for purposes of the post-construction survey shall mean a drop in reception of Over-the-Air KAAL-TV signal such that blocking artifacts or pixilation remains.”⁵⁷³ Ultimately, if household antenna adjustments, replacements, or satellite service do not resolve reception issues, KAAL wants Freeborn Wind to be responsible for the financial and legal costs of establishing translators to reinforce its OTA signals so that every household that enjoyed KAAL OTA TV service before the wind farm commences operation, will receive it after operations commence.⁵⁷⁴ This includes any viewers who have satellite service but also use OTA TV, particularly during periods of inclement weather that disrupts satellite service.⁵⁷⁵ One purpose of the survey is, thus, to identify the households that rely on OTA TV only occasionally.

367. Mr. Harbert initially proposed that if 10 or more households experience blocking artifacts or pixilation, Freeborn Wind should compensate KAAL for its costs of applying for a frequency allocation and translator antenna to provide service to affected households, install a translator antenna to provide KAAL-TV reception, and set aside funds to cover these expenses as well as subsequent operations and maintenance costs. In response to an information request, KAAL subsequently retracted its threshold of 10, and proposed that one household “is too many and must require full mitigation measures, because that one (1) household is a family and not one child should be injured due the loss of the breaking weather or information alert provided them over-the-air by KAAL-TV.”⁵⁷⁶ Mr. Harbert affirmed this position in his surrebuttal testimony.⁵⁷⁷

368. Translators range from \$60,000 to \$175,000, depending upon the power required for the service area. In addition, engineering, legal fees, and installation costs could result in capital costs of \$450,000, assuming the translator could be located on KAAL’s existing tower.⁵⁷⁸ If a new tower were required, costs could triple.⁵⁷⁹ Consequently, KAAL requests that Freeborn Wind be ordered to reserve a minimum of \$450,000, plus annual maintenance costs for the life of the wind power purchase

⁵⁷⁰ Ex. KAAL-1 at 5 (Harbert Direct).

⁵⁷¹ *Id.* at 5-6.

⁵⁷² *Id.*

⁵⁷³ *Id.* at 6.

⁵⁷⁴ *Id.*

⁵⁷⁵ *Id.*

⁵⁷⁶ Ex. FR-16 at Schedule 1 at 15 (Corrected Litchfield Surrebuttal).

⁵⁷⁷ Ex. KAAL-3 at 3 (Harbert Surrebuttal).

⁵⁷⁸ *Id.* at 7.

⁵⁷⁹ *Id.* at 8.

agreement, to fund the construction of a translator if the survey finds more than 10 households experience disruptions.⁵⁸⁰

8. Freeborn Wind's Response to KAAL

369. Mr. Jimeno responded to Mr. Lockwood's criticisms by first noting that ITU-R BT.1893-1 states, "it is unlikely necessary to extend the investigation area to more than about 10 km."⁵⁸¹ The guidance also emphasizes that interference is more likely when the receiving antenna is within two kilometers of a wind turbine.⁵⁸² Second, Mr. Jimeno contends that the study did consider households using signals passing through wind turbines "well beyond 2 km from the wind turbines."⁵⁸³

370. The ITU-R BT.1893-1 study assumes turbines with metal blades of a particular configuration. Mr. Jimeno explains that the Project's blades are fiberglass and less obstructive of TV signals than metal blades, rendering the results of the study more conservative.⁵⁸⁴ Mr. Lockwood counters that the blades are made of "carbon fiber pultrusions" and have a "down conduction" made of metal.⁵⁸⁵ The implication of the parties' competing expert testimony is that the Project's blades will cause less OTA TV signal distortion than metal blades but more than pure fiber glass blades.⁵⁸⁶

371. The ITU-R BT.1893-1 model assumes the European DVB-T digital signaling system. Mr. Lockwood contends that the U.S. ATSC standard is more susceptible to multipath interference. Mr. Jimeno responds that receivers using the U.S. ATSC standard are able "to handle strong multipath distortions."⁵⁸⁷

372. Freeborn Wind dismisses Mr. Lockwood's criticism of Comsearch's 10-kilometer study area because it "relies on one instance where signal scattering was

⁵⁸⁰ *Id.*

⁵⁸¹ Ex. FR-12 at 6 (Jimeno Rebuttal) (citing KAAL-4 at Ex B at 4 (Lockwood Direct)).

⁵⁸² *Id.* (citing KAAL-4 at Ex. B at 12 (Lockwood Direct)).

⁵⁸³ *Id.*

⁵⁸⁴ *Id.* at 7.

⁵⁸⁵ Ex. KAAL-5 at 2.

⁵⁸⁶ Authors of the article *Impact analysis of wind farms on telecommunications services* conclude that

all these models have proved to not accurately characterize signal scattering from wind turbines, due to several reasons. For example, they are merely based on the signal scattered by the blades, thus, they do not consider the contribution of the mast to the scattered signal. Nevertheless, despite being based on the scattering by the blades, they do not model the signal scattering variation due to rotations, which may be of importance for the assessment of reception quality of the new telecommunications services in the UHF band. Moreover, they do not consider the scattering pattern variation in the vertical plane, and thus obviate the situation where a wind farm is located at a higher height than the potential viewers.

Ex. KAAL-4 at Ex. D at 96-97.

⁵⁸⁷ Ex. FR-12 at 8 (Jimeno Rebuttal) (quoting KAAL-4 at Ex. D at 95 (Lockwood Direct)). The quotation continues: "However, if signal level variations due to a wind farm make the signal level to be below the operational threshold, the video will be affected." *Id.*

allegedly observed at 13.5 [kilometers].”⁵⁸⁸ Further, signal scattering does not always result in interfering with OTA reception, as shown by KAAL’s own field testing.⁵⁸⁹ Finally, Freeborn Wind argues that Lockwood provides no support for his proposed 20-kilometer study area.⁵⁹⁰

9. DOC-EERA’s Analysis

373. DOC-EERA took note of KAAL’s concerns and committed to work with KAAL if it identified areas of potential concern or turbine locations that may cause signal interference.⁵⁹¹ However, there is no report in the record of KAAL identifying specific areas or turbines of concern.

374. DOC-EERA does not support KAAL’s demands for pre-construction household surveys or its request to set aside funds for a translator. Nor does DOC-EERA propose any special conditions in the Draft Site Permit related to OTA signal interference. DOC-EERA did not express any concerns with Freeborn Wind’s OTA TV interference mitigation commitments. DOC-EERA concurs with Comsearch’s study results: relatively few households are likely to experience interference with their OTA TV reception. According to DOC-EERA, households that do experience reception problems are protected by section 5.2.16 of the Site Permit, by Freeborn Wind’s proposed mitigation measures, and ultimately, by the Commission through the complaint process.

375. Richard Davis, author of the Draft Site permit for DOC-EERA, was not aware of any unresolved OTA TV complaints of Minnesota wind farms.⁵⁹² He acknowledged DOC-EERA did not receive copies of complaints involving TV interference and that the public might be unaware that wind farms could interfere with OTA TV.⁵⁹³

376. DOC-EERA concludes, in paragraphs 199 and 200 of its proposed Findings of Fact, that the conditions in section 5.2.16 of the Draft Site Permit are an adequate response to potential OTA TV interference problems. Section 5.2.16 requires:

Freeborn Wind to submit to the Commission, prior to the pre-construction meeting, an assessment of television and radio signal reception, microwave signal patterns, and telecommunications in the project area and also requires Freeborn Wind to be responsible for alleviating any disruption or interference of these services caused by the turbines or any associated facilities.⁵⁹⁴

⁵⁸⁸ Freeborn Wind Reply Brief at 23.

⁵⁸⁹ *Id.* (citing KAAL-1 at Ex. A at 11 (Harbert Direct) (KAAL Field Testing Final Report) (Oct. 2011)).

⁵⁹⁰ *Id.* at 24 (citing Tr. Vol. 2 at 162-63 (Lockwood)).

⁵⁹¹ Ex. EERA-7 at 23 (Comments and Recommendations of the Minnesota Department of Commerce Energy and Environmental Review and Analysis Staff (Dec. 4, 2017)).

⁵⁹² Tr. Vol 2 at 166 (Davis).

⁵⁹³ *Id.* at 181-82.

⁵⁹⁴ Draft Site Permit at 11-12 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

377. To address KAAL's concern that "at risk" viewers may not be aware of this mitigation, Freeborn Wind agreed to expand the list for the notice required under Draft Site Permit Condition 5.1. The expanded notice would include those in "at risk" areas identified on Figure 7 of the TV Coverage Impact Study included in Appendix D to the Application.⁵⁹⁵

10. Freeborn Wind's Proposed Mitigation Measures

378. Freeborn Wind retained Dave Veldman of Veldman Antenna, a local television and satellite installation business, to respond to OTA TV interference complaints.⁵⁹⁶ Freeborn Wind contends that post-construction mitigation efforts are a much superior alternative to pre-construction survey efforts: "while our Project might temporarily limit TV reception for some viewers, we will work with them to promptly restore service. The complexity of identifying the exact antenna location at hundreds of potential private residences makes it impossible to avoid this impact upfront."⁵⁹⁷

379. If a resident complains of ongoing TV reception interference, Freeborn Wind proposed to do the following:

- a. It will review the Comsearch report to assess whether the impacts are likely Project-related.
- b. If Freeborn Wind believes the impacts are likely projected-related, it will send Mr. Veldman to visit the landowner and determine the current status of TV equipment and reception.
- c. If project-related interference is found, Freeborn Wind will give the landowner an option between having Freeborn Wind install a high gain antenna and/or a low-noise amplifier, or, providing monetary compensation "equal to the cost of comparable satellite TV services at the residence."
- d. If the new equipment restores reception to pre-wind farm operations, the matter will be closed.
- e. If interference remains an issue, Freeborn Wind will offer monetary compensation equal to the cost of comparable satellite TV service.
- f. If the landowner and Freeborn Wind cannot agree to resolve interference issues, Freeborn Wind will report the issue to the Commission's dispute resolution process.⁵⁹⁸

⁵⁹⁵ Tr. Vol. 2 at 76, 81-82 (Parzyck).

⁵⁹⁶ Ex. FR-16 at 3 (Corrected Litchfield Surrebuttal).

⁵⁹⁷ Ex. FR-4 at 27 (Litchfield Direct).

⁵⁹⁸ *Id.* at 28.

11. Analysis of KAAL's Demand for a Pre-Construction Survey

380. As an initial matter, there is uncertainty as to the number of OTA TV-using households potentially affected by the Project. KAAL asserts that “[a]ccording to our [KAAL’s] data in the zip codes impacted, far more homes are impacted than what Comsearch asserted. . . . Not only does KAAL-TV record extremely high OTA viewing within the view zip codes, but the overwhelming share of news viewing by hour on a Monday – Friday basis which determine ratings.”⁵⁹⁹ However, KAAL chose not to submit this data into the record.⁶⁰⁰

381. Mr. Harbert testified that 34.3 percent of KAAL’s viewers use satellite, 46.4 percent use cable, and 19 to 20 percent use OTA TV.⁶⁰¹ But he also testified that the percentage of OTA viewers is higher in rural areas that lack cable TV service, varies substantially from county to county, and could range from 18 to 28 percent.⁶⁰²

382. The Administrative Law Judge concludes that Comsearch’s use of 25 percent as the percentage of viewers who use OTA TV is not an unreasonable approximation of the percentage of OTA viewers in its service area as a whole, and may be a reasonable estimate for most counties within that area. However, the "at risk" areas do not correspond to counties. The actual percentage of OTA TV viewers in the "at risk" areas could be higher or lower than 25 percent.

383. The Administrative Law Judge concludes that KAAL’s demand for Freeborn Wind to fund a pre-construction survey of homes within 20 kilometers of a Project turbine would involve a disproportionately large expense for information of limited value. The furthest estimated distance of wind turbine interference with OTA TV is 13.5 kilometers in one study. But as noted previously, that study involved Europe’s broadcast standards and receivers which differ from U.S. standards and receivers.⁶⁰³ While the European standard is less susceptible to multipath interference according to Lockwood, U.S. receivers have Automatic Gain Control and can handle strong multi-path distortions

⁵⁹⁹ Ex. KAAL-1 at 4 (Harbert Direct).

⁶⁰⁰ KAAL explains that viewing data is subject to a non-disclosure agreement with the Neilson rating organization. However, the data can be released by court order and KAAL chose not to seek such an order. Tr. Vol 2 at 114-16 (Harbert). Freeborn Wind could also have sought an order from the Administrative Law Judge and chose not to do so.

⁶⁰¹ *Id.* at 153-54 (Harbert).

⁶⁰² *Id.* at 154.

⁶⁰³ Ex. KAAL-5 at Ex. A at 55 (Lockwood Surrebuttal) (Report ITU-R BT.2142-2, *The effect of the scattering of digital television signals from wind turbines*, BT Series Broadcasting Service (television) (July 2015)).

according to Mr. Jimeno. The record contains only minimal evidence of households that have had unresolved OTA TV interference caused by wind farms.⁶⁰⁴ Of the six television stations potentially affected, only one has expressed concern.

384. Although, as KAAL asserts, some households whose OTA TV reception is disrupted may not complain for a variety of reasons, the Administrative Law Judge finds that requiring a door-to-door survey to locate indifferent viewers is a poor use of resources. The KAAL Field Test Report found that its signal was adequate even after passing through an existing wind farm.⁶⁰⁵ The Administrative Law Judge agrees with Freeborn Wind and DOC-EERA that the pre-construction survey urged by KAAL should not be a condition of a permit, if the Commission issues a Site Permit in this docket.

385. The Administrative Law Judge does not entirely rule out the possibility that, if the Commission issues a Site Permit in this docket, significant numbers of households could experience OTA TV reception interference from the wind farm and concludes that all potentially affected households should receive notice of the wind farm, its potential effects on OTA TV service, Freeborn Wind's mitigation commitment, and a copy of the site permit and complaint procedure. After receiving adequate notice, viewers who experience interference can either initiate the complaint and mitigation procedures, or accept the interference as inconsequential.

12. Analysis of KAAL's Demand for Funds to be Reserved for a Translator

386. Given KAAL's estimated translator costs of up to \$450,000, and up to three times that amount if a new tower is required,⁶⁰⁶ its demand for Freeborn Wind to incur these costs if a single household is not satisfied by antenna or receiver adjustments, replacements, or by satellite service, is unreasonable. KAAL's insistence that its OTA TV reception is a matter of life and death because it provides news of weather and other emergencies is overstated. The record demonstrates no problems with AM or FM radio service which can provide emergency weather information to households whose OTA TV and satellite service are both disrupted, one by the Project and the other by the weather.

⁶⁰⁴ Bernie and Cheryl Hagen wrote about the TV interference they suffered when the Bent Tree windfarm went into service: "We experienced television reception problems early on – when they were testing the turbines prior to them going online. We taped and reported the bad transmission to Bent Tree and they did come to our home to witness the tv disruption. They waited six weeks and then mailed us a Release Claim which will in fact result in an easement on your property and prevent you from ever complaining about noise, tv or any RF interference again. In exchange for the \$24 monthly allocation, you forfeit your constitutional rights." Letter from Bernie and Cheryl Hagen to Richard Davis (Oct. 8, 2017) (eDocket No. 201710-136219-01). The Administrative Law Judge has no reason to doubt the Hagens' experience, but we do not know whether the Hagens utilized the complaint process to involve the Commission in resolving the reception issues nor do we have the wind farm's view of the matter. In addition, Bent Tree is owned by a different company, whose possible lack of responsiveness cannot be attributed to Freeborn Wind.

⁶⁰⁵ Ex. KAAL-3 at Ex. A at 11 (Harbert Direct).

⁶⁰⁶ Ex. KAAL-1 at 8 (Harbert Surrebuttal).

387. Whether a translator will be needed is speculative. The only time a translator may become necessary would be if there are households whose OTA TV is disrupted and cannot be remedied by reasonable efforts to adjust or replace the receiving antenna or receiver, and for whom substitute satellite service is unsatisfactory. The record does not evidence significant disruption of OTA TV service by wind farms. The Administrative Law Judge does not rule out the possibility that a translator could be proven necessary to meet Freeborn Wind's obligations under the Site Permit, but the preponderance of the evidence is that the need for a translator is highly speculative. Therefore, there is no basis to require Freeborn Wind to reserve \$450,000 to cover the cost of a translator.

13. Analysis of Freeborn Wind's Mitigation Program

a) The Number of "At Risk" Households

388. The adequacy of Freeborn Wind's mitigation program depends upon two factors. First, whether Comsearch's study accurately identifies the number of OTA TV viewing households likely to suffer interference. Second, how adequately Freeborn Wind's local communications technician can remedy any reception issues that may arise. If hundreds of households complain of loss of service, fully implementing mitigation measures for them could take months or years to complete.

389. With regard to the households at risk of losing OTA reception, the study's estimate depends heavily upon assumptions, some of which have little support. On cross examination, Mr. Jimeno admitted that Comsearch did not have actual household locations.⁶⁰⁷ Without actual physical locations for households in the census blocks most likely to be affected, it is not evident how Comsearch could make an accurate estimate of the households that had line-of-sight to a turbine but not line-of-sight to a transmitter.

390. Comsearch's study assumes that KAAL serves 25 percent of the households in its service territory with OTA signals. Such an assumption is not unreasonable for KAAL's entire service area, but it may be unreasonable for any particular sub-area. The record is unclear as to how the number of households in each census block were determined.⁶⁰⁸ Mr. Jimeno states that census block data does not directly identify the number of households in each census block, but that other data allows the number of households in each census block to be derived.⁶⁰⁹

391. Mr. Jimeno notes that, in rural areas, a single census block may be a square mile in area.⁶¹⁰ The Comsearch study models signaling interference based upon assumed household locations. The principal interference problems occur when a wind turbine is between a TV transmitter and the household's antenna. Not knowing household

⁶⁰⁷ Tr. Vol. 2 at 22-27 (Jimeno).

⁶⁰⁸ *Id.* at 22.

⁶⁰⁹ *Id.*

⁶¹⁰ Ex. FR-17 at ¶ 4 (Jimeno Aff.).

locations is a substantial limitation on the survey's predictive accuracy in identifying "at risk" areas.

392. Comsearch assumes that 25 percent of the households in "at risk" areas rely on OTA TV. Comsearch supported the 25 percent estimate solely with reference to an article by an independent research company, GfK, in July 2016. A press release referring to the article is in the record.⁶¹¹ The press release states that 3,009 US households were included in the study "including representative levels of non-TV, non-internet, cell-phone-only, and Spanish dominant homes."⁶¹² There is no particular reason to believe that the Project area mirrors the demographics of the GfK study.⁶¹³ Mr. Jimeno acknowledged that he did not know whether OTA usage is higher or lower in rural or smaller communities than it is in urban areas or nationally.⁶¹⁴ Comsearch makes the same assumption as to the percent of OTA viewers for each of the six local stations.⁶¹⁵

393. The Administrative Law Judge concludes that the Comsearch's estimates of the number of households in "at risk" areas could significantly understate, or overstate, the actual number.

b) The 10-Kilometer Limit to "At Risk" Areas

394. The ITU-R BT.1893-1 Recommendation does not explain why interference beyond 10 kilometers is unlikely. Despite this fact, both Comsearch and KAAL cite it in support of their opposed positions. Comsearch relies on the statement that interference is "unlikely" to occur at a distance greater than 10 kilometers.⁶¹⁶ Mr. Lockwood contends that "unlikely" does not rule out interference problems occurring at greater distances.⁶¹⁷

395. The ITU-R BT.1893-1 Recommendation recognizes that identifying "at risk" areas is "more complicated if there are multiple wind turbines on a given site as there are then several possible sources of impairment at each receiving location." The recommendation refers to Report ITU-R BT.2142 for example predictions for large wind farms.⁶¹⁸ It is this second ITU-R report where a study of a wind farm in Spain finds OTA TV interference occurring 13.5 kilometers from the wind farm.

⁶¹¹ Ex. KAAL-7.

⁶¹² *Id.*

⁶¹³ In his rebuttal, Jimeno says Comsearch "used household viewing data based on census blocks." Ex. FR-12 at 6-7 (Jimeno Rebuttal). It is not clear what this means. Comsearch used the 25% figure from a GfK study for the US. They used census block household counts to determine the number of viewers, but I don't see where it says the GfK study had viewer data at the census block level.

⁶¹⁴ Tr. Vol. 2 at 15 (Jimeno).

⁶¹⁵ Ex. FR-1 at App. D at 15 (Wind Power GeoPlanner™ TV Coverage Impact Study (May 22, 2017)). The report indicates that there should be, but there is not, a footnote 3 explaining the column headed "Number of Potentially At-Risk Households." It is Comsearch's estimate of the number of households in census blocks and portions of census blocks in "At-Risk" areas.

⁶¹⁶ Ex. FR-12 at 6 (Jimeno Rebuttal) (citing KAAL-4 at Ex. B at 4 (Lockwood Direct)).

⁶¹⁷ Ex. KAAL-5 at 1 (Lockwood Surrebuttal).

⁶¹⁸ Ex. KAAL-4 at Ex. B (Lockwood Direct) (Recommendation ITU-R BT.1893-1, *Assessment methods of impairment caused to digital television reception by wind turbines*, BT Series Broadcasting service (television) (Oct. 2015)).

396. ITU-R BT.1893-1 also allows for the possibility of interference at a greater distance than 10 kilometers:

It is unlikely to be necessary to extend the investigation area to more than about 10 km from the proposed wind turbine site (or sites, if there are multiple turbines). However, if there are special circumstances, for example buildings which are screened from the wanted transmitter but which are line-of-site [sic] to the wind turbine, then the area may need to be extended.⁶¹⁹

397. The record does not indicate, however, that any special circumstances apply.

398. For the ITU-R BT.1893-1-based estimates of the "at risk" areas to be correct, it must not matter that the Project will use turbine blades of a different composition and configuration than those assumed for the estimates, or that the ancillary Project facilities that will obstruct and reflect signals are not taken into account. In addition, it must not matter that the U.S. uses a different TV signaling protocol and that the results must not be sensitive to the differences between the assumed antenna locations, the actual location, and types of receiving antennas and receivers. Consequently, the record does not indicate how the "at risk" areas would be affected by the differences between the guidance's assumptions and the actual Project data.

399. Comsearch separately estimated the areas "at risk" of OTA TV disruption for each of the six TV stations serving the Project Area. The "at risk" areas are the shaded areas in Figures 4 through 9, on pages 9 through 14, of Comsearch's "Wind Power GeoPlanner™ TV Coverage Impact Study." The shaded areas do not appear to include most of Albert Lea. It is not clear from the Figures whether the shaded areas include all of the following towns: Northwood, Silver Lake, Gordonsville, Glenville, Hayward, and Moscow. In addition, there is no indication of whether the shaded areas include population centers. Finally, there is no Figure that aggregates all of the shaded areas.

400. The shaded areas for all six TV stations share a similar curvature at similar locations on their western and northern edges. The Administrative Law Judge assumes that these curved boundaries of the shaded areas result from Comsearch's assumption that OTA TV reception issues are "unlikely" to occur further than 10 kilometers from a turbine, an assumption that KAAL disputes.

401. The same complexity that renders pre-construction identification of OTA TV reception problems impossible also makes the determination of "at risk" areas uncertain. The Administrative Law Judge concludes that although the 10 kilometer boundaries of the "At Risk" areas are uncertain, Mr. Lockwood offers no support for his contention the "at risk" areas should extend to 20 kilometers.

⁶¹⁹ *Id.*

14. Notice to “At Risk” Areas

402. Freeborn Wind observes that, although the study area for OTA TV interference is the area within 10 kilometers of a wind turbine, it remains responsible for mitigating wind farm OTA TV interference wherever it occurs. In an effort to reassure KAAL, Freeborn Wind agreed at the hearing to provide notice of the site permit complaint process to the landowners in any “at risk” areas identified by Figure 7 of Comsearch’s TV interference study.⁶²⁰ This notice would be in addition to the notice required in Section 5.2 of the Draft Site Permit, which requires that a copy of the permit and the complaint procedures be sent to all “affected landowners.”⁶²¹

403. Under the Freeborn Wind’s proposal, KAAL’s “at risk” viewers would receive this notice, but “at risk” viewers of other stations would not.

404. The Administrative Law Judge is concerned that Freeborn Wind’s proposal for additional notice is inadequate for three reasons. First, notice should be given to all “at risk” households, not just those in KAAL’s “at risk” areas. Second, the additional notice should be given to households in the “at risk” areas and not to the owners of those areas who may not reside there. Third, because the boundaries of the “at risk” areas are uncertain, they should be supplemented to include all households in the communities that are partially within any “at risk” area.

405. The Administrative Law Judge recommends that, if the Commission issues a Site Permit in this docket, Section 5.2 of the Draft Site Permit should be amended to require that notice must be provided to all households in “at risk” areas identified for all six television stations. In addition, the Administrative Law Judge recommends that Freeborn Wind be required to provide the same notice to every household in communities of Albert Lea, Northwood, Silver Lake, Gordonsville, Glenville, Hayward, and Moscow. The notice should include a description of the Project’s potential to interfere with OTA TV service, Freeborn Wind’s mitigation program, and copies of the Site Permit and Complaint Procedure.

406. The Administrative Law Judge further recommends that, upon receiving a complaint from a household within the notice area, Freeborn Wind should evaluate the complaint to determine whether its operations are the likely cause of the interference. In the event that the wind farm is determined to be the likely cause of interference, Freeborn Wind should offer the mitigation measures it has proposed as listed in paragraph 378 of this Report.

⁶²⁰ Tr. Vol 2 at 76, 82 (Parzyck); Ex. FR-4 at App. D at 9-14 (Wind Power GeoPlanner™ TV Coverage Impact Study (May 22, 2017)).

⁶²¹ Order Issuing Draft Site Permit, Draft Site Permit ¶ 5.2 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

15. Permit Compliance Concerns

407. The Draft Site Permit⁶²² provides the following:

5.2.16 Interference

At least 14 days prior to the pre-construction meeting, the Permittee shall submit to the Commission, an assessment of television and radio signal reception, microwave signal patterns, and telecommunications in the project area. The assessment shall be designed to provide data that can be used in the future to determine whether the turbines and associated facilities are the cause of disruption or interference of television or radio reception, microwave patterns, or telecommunications in the event residents should complain about such disruption or interference after the turbines are placed in operation. The Permittee shall be responsible for alleviating any disruption or interference of these services caused by the turbines or any associated facilities.

The Permittee shall not operate the project so as to cause microwave, television, radio, telecommunications, or navigation interference in violation of Federal Communications Commission regulations or other law. In the event the project or its operations cause such interference, the Permittee shall take timely measures to correct the problem.

408. The Draft Site Permit requires the interference assessment be submitted prior to the pre-construction meeting. Presumably, Freeborn Wind's assessment will include the Comsearch studies and their "at risk" areas for OTA TV interference.

409. In its reply brief, Freeborn Wind commits that "[i]f OTA reception is affected by the Project beyond [10 kilometers] distance, Freeborn Wind will address those issues as required by the conditions set forth in the Site Permit."⁶²³ However, if Freeborn Wind's required assessment submission are the Comsearch studies which contend that interference beyond 10 kilometers is unlikely, Freeborn Wind could reasonably deny any complaint from a more distant household. More distant households without notice of the Project and the complaint procedure, might not even make complaints.

410. The Draft Site Permit does not set out how a complainant establishes the Project has caused interference nor how Freeborn Wind can demonstrate that its turbines are not the cause. Unlike turbine-originated noise concerns where Freeborn Wind can rely upon DOC-EERA's Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report to establish monitoring protocols for assessing noise

⁶²² *Id.*

⁶²³ Freeborn Wind Reply Brief at 24-25 (citing Draft Site Permit at 11-12 (Jan. 30, 2018)) (eDocket No. 20181-139549-01) (Condition 5.2.16); see *also* Freeborn Wind Initial Brief at 38-42, 69 (Mar. 20, 2018) (eDocket No. 20183-141214-02).

problems, the record has no authoritative guidance on how to identify wind farm OTA TV interference post-construction.⁶²⁴

411. The Administrative Law Judge concludes that Freeborn Wind may not dismiss a complaint as unrelated to its wind turbines simply because the complaint arises at a location more than 10 kilometers from the nearest turbine.

412. In addition, should the Commission decide to approve Freeborn Wind's Application for a Site Permit, the Administrative Law Judge recommends the following special conditions:

- Freeborn Wind shall investigate any non-frivolous claims of OTA TV interference.
- Freeborn Wind shall not dismiss a complaint on the basis that it arises from a location further than 10 kilometers distant from any turbine, or because its location is not within an "at risk" area.
- Freeborn Wind will report promptly, at the beginning of each month, the results of the previous month's investigations of TV interference complaints, including the role of the wind farm in causing the interference, and whether Freeborn Wind's remedial measures resolved the interference issues.
- Freeborn Wind will maintain and submit with its monthly report, a map showing the location of the complainant households, their distance to the nearest turbine, and their locations in relation to the "at risk" areas. Freeborn Wind will report the date of each complaint, its response, and the date the complaint is closed.

413. These requirements are intended to provide the Commission with accurate information regarding whether there is a significant problem with OTA TA inference from the wind turbines, and whether it should investigate Freeborn Wind's compliance with condition 5.2.16. These reports should be publicly available so that a complainant, a member of the public, or the Commission may make an assessment of whether Freeborn Wind is "taking timely measure to correct the problem[s]" as required by condition 5.2.16.

K. Recreational Resources

414. Recreational opportunities in Freeborn County include hiking, biking, boating, fishing, camping, swimming, cross country skiing, snowmobiling, hunting, and nature viewing.⁶²⁵

⁶²⁴ Ex. EERA-9 (Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report (Oct. 8, 2012)).

⁶²⁵ Ex. FR-1 at 53 (Application).

415. There are Wildlife Management Areas (WMA) and Waterfowl Protection Areas (WPA) within ten miles of the Project Area. The Shell Rock WMA is located adjacent to the Project Area.⁶²⁶

416. Freeborn Wind states the Project will avoid all Aquatic Management Areas (AMA), Scientific and Natural Areas (SNA), WMAs, WPAs, and state trails. Project turbines and facilities will not be located within public parks, trails, WMAs, AMAs, or WPAs.⁶²⁷ USFWS Windom Wetland Management District also confirmed the absence of USFWS easements or fee-title properties in the Project Area.⁶²⁸

417. Recreational impacts will generally be visual in nature, affecting individuals using public lands near the Project Area for recreation.⁶²⁹ Turbines will be set back from these public lands a minimum of the three RD by five RD setbacks from all non-leased properties per the Commission's siting guidelines.⁶³⁰

418. Based on the record, no anticipated adverse impacts to recreational resources have been established as a result of the Project.

L. Land-Based Economics

419. The majority of the Project Area is in agricultural cropland. Cultivated land comprises approximately 24,058.7 acres (91.6 percent) of the Project Area. Pasture land comprises approximately 95.3 acres (0.4 percent) of the Project Area.⁶³¹

420. Freeborn Wind anticipates that small portions of land will be taken out of agricultural production at turbine locations and along access roads (less than one acre per turbine). Approximately 0.1 percent of the Project Area will be converted to non-agricultural use. Landowners may continue to plant crops near and graze livestock up to the turbine pads. In some instances, agricultural practices may be impacted by creating altered maneuvering routes for agricultural equipment around the turbine structures and access roads.⁶³² Fewer than 35 acres of land will be permanently removed from agricultural production.⁶³³

421. Freeborn Wind plans to discuss turbine and facility siting with property owners to identify features which should be avoided on their property, such as drain tile, among others.⁶³⁴

422. In the event that there is damage to agricultural drain tile as a result of the Project, the tile will be repaired according to the agreement between Freeborn Wind and

⁶²⁶ See *id.* at 53-55.

⁶²⁷ *Id.* at 55.

⁶²⁸ *Id.* at 26-27.

⁶²⁹ *Id.* at 55.

⁶³⁰ *Id.*

⁶³¹ *Id.* at 62.

⁶³² *Id.* at 63.

⁶³³ *Id.* at 72.

⁶³⁴ *Id.* at 63.

the landowner.⁶³⁵ Freeborn Wind has committed to repairing all agricultural tile damage that occurs during the construction phase of the Project.⁶³⁶ Additionally, the Draft Site Permit contains conditions adequate to address drain tile damage. The conditions require Freeborn Wind to “avoid, promptly repair or replace all tile lines broken or damaged during all phases of the Project,” and to fairly restore or compensate landowners for damage to drain tile during construction.⁶³⁷

423. Freeborn Wind states that it will avoid or minimize impacts to Conservation Reserve Program (“CRP”) land, and avoid all impacts to RIM lands. If CRP land is impacted, Freeborn Wind will work with the landowners and the United States Department of Agriculture’s Natural Resource Conservation Service to remove the impacted portion of the enrolled parcel from the CRP program.⁶³⁸

424. The Draft Site Permit includes multiple provisions related to agriculture. For example, Section 5.2.4 requires Freeborn Wind to implement measures to protect and segregate topsoil from subsoil on all lands unless otherwise negotiated with landowners.⁶³⁹ Section 5.2.17 requires Freeborn Wind to take precautions to protect livestock during all phases of the Project’s life.⁶⁴⁰

425. The evidence in the record does not establish that the presence of the Project will significantly impact the agricultural land use or general character of the area. As demonstrated by other wind energy projects in the Midwest, agricultural practices continue during construction and operations. In addition, the evidence in the record does not establish that there will be significant impacts to forestry, mining, or tourism as a result of the Project.⁶⁴¹

M. Archaeological and Historic Resources

426. Freeborn Wind initiated coordination with the State Historical Preservation Office (SHPO) and the Office of the State Archaeologist (OSA) in March 2017. Cultural resource specialist staff at Merjent, Inc., on behalf of Freeborn Wind, conducted a literature review based on the Project Area and a one-mile buffer. The literature review revealed that no previously-documented archaeological sites are located within the Project Area. One previously documented archaeological site was identified within the surrounding one-mile buffer.⁶⁴²

⁶³⁵ *Id.*; see also Comment by Dave Olson (Batch 3) (March 6, 2018) (eDocket No. 20183-140801-01) (“The easement I signed ensures that our significant investment in the drain tile in our fields will be protected.”).

⁶³⁶ See Ex. FR-11 at 7 (Litchfield Rebuttal).

⁶³⁷ Draft Site Permit at 12, 13 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁶³⁸ Ex. FR-1 at 64 (Application).

⁶³⁹ Draft Site Permit at 8 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁶⁴⁰ *Id.* at 12.

⁶⁴¹ Ex. FR-1 at 64, 65-66 (Application).

⁶⁴² *Id.* at 48-49.

427. Seventeen previously reported architecture inventory resources are present within the one-mile study area. Four of these are located within the Project Area.⁶⁴³

428. The Project Area has potential to contain archaeological resources. Freeborn Wind state that it will conduct a Phase I archaeological resources inventory and work cooperatively with SHPO and OSA prior to construction. According to Freeborn Wind, the inventory will focus on areas proposed for Project construction, including wind turbine locations, associated access roads, electrical cable routes, and other construction elements, and will be conducted by a professional archaeologist. If archaeological resources are identified during the survey, an archaeologist will identify the location and record Universal Transverse Mercator coordinates so that Project construction layout can consider the location and adjust construction plans. Freeborn Wind states that, if plans cannot be adjusted, further investigation may be needed and further coordination with SHPO and possibly OSA will be required.⁶⁴⁴

429. The Administrative Law Judge finds that, if the Commission issues a Site Permit in this docket, Section 5.2.15 of the Draft Site Permit adequately addresses archeological and historical resources. It requires Freeborn Wind to avoid impacts to identified archaeological and historic resources. According to Section 5.2.15, if a resource is encountered, Freeborn Wind shall contact and consult with SHPO and OSA. Where feasible, avoidance of the resource is required. Where not feasible, mitigation must include an effort to minimize Project impacts consistent with SHPO and OSA requirements. In addition, before construction, workers shall be trained about the need to avoid cultural properties, how to identify cultural properties, and procedures to follow if undocumented cultural properties are found. If human remains are found during construction, Freeborn Wind shall immediately halt construction at such location and promptly notify local law enforcement and OSA. Construction at such location shall not proceed until authorized by local law enforcement or OSA.⁶⁴⁵

N. Aviation

430. There are six airports within 20 miles of the Project Area. The nearest airport is the Northwood Municipal Airport, located approximately 3.6 miles south of the Project Area in Worth County, Iowa.⁶⁴⁶

431. The Project has been sited to meet setback requirements for airport facilities established by MnDOT, the Department of Aviation, and the Federal Aviation Administration (FAA). These setback requirements are incorporated into Draft Site Permit as Section 4.12.⁶⁴⁷ Additionally, Freeborn Wind agrees that it will coordinate with the Northwood Municipal Airport, the FAA, and applicable state authorities prior to construction to understand potential impacts.⁶⁴⁸ Draft Site Permit Section 4.12

⁶⁴³ *Id.* at 49, 50-51.

⁶⁴⁴ *Id.* at 52-53.

⁶⁴⁵ Draft Site Permit at 11 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁶⁴⁶ Ex. FR-1 at 58 (Application).

⁶⁴⁷ *Id.* at 60; Draft Site Permit at 6 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁶⁴⁸ Ex. FR-1 at 59 (Application).

adequately addresses airports and requires that Freeborn Wind notify all owners of airports within six miles of the Project prior to construction.

432. While the installation of wind turbine towers, above ground electric lines, and other associated above ground facilities in active croplands present a potential for collisions with crop-dusting aircraft, the turbines will be visible from a distance and lighted according to FAA guidelines.⁶⁴⁹ Permanent meteorological towers will be freestanding with no guy wires, and temporary meteorological towers with supporting guy wires have been marked with alternating red and white paint at the top and colored marking balls on the guy wires for increased visibility.⁶⁵⁰

433. The FAA requires obstruction lighting of structures exceeding an elevation of 200 feet above average ground level because they are considered obstructions to air navigation. To mitigate the visual impact of such lighting, Freeborn Wind states that it will use FAA guidance and standards when applying to the FAA for approval of a lighting plan that will light the Project, and will follow the approved plan to meet the minimum requirements of FAA regulations for obstruction lighting.⁶⁵¹ Freeborn Wind anticipates that the FAA review of the Project will result in a “No Hazard” issuance determination.⁶⁵²

434. Commenters Linda Herman, Brian Olson, and Judy Olson expressed concern that farmers would be unable to perform aerial spraying because of the turbines.⁶⁵³

435. Commenter John Thisius, an experienced aerial crop sprayer, testified that, while it is possible to treat crops on the outskirts of a wind facility, it is impossible to safely do so within a wind farm because of the turbulence from the moving blades and problems with depth perception.⁶⁵⁴

436. Commenter Ray Rauenhorst, also an experienced aerial crop sprayer, testified that wind farms were first appearing as he approached retirement. He had sprayed among widely spaced turbines. He also pointed out that turbines can be turned off to reduce the hazard they pose.⁶⁵⁵

437. In a previous position, Freeborn Wind employee Dan Litchfield had experience with landowners and the operations team on issues related to aerial spraying. He explained that aerial spraying and seeding only occurs when wind speeds are low. At those speeds, turbines barely operate, if at all.⁶⁵⁶ Mr. Litchfield states that many farmers find aerial applications expensive and inaccurate and use other methods. On behalf of Freeborn Wind, he committed the Applicant would cooperate with landowners in the

⁶⁴⁹ *Id.*

⁶⁵⁰ *Id.* at 60.

⁶⁵¹ *Id.* at 36.

⁶⁵² *Id.* at 60.

⁶⁵³ Public Hr'g Tr. at 47 (Herman), 57-59 (Olson), 68-69 (Olson) (Feb. 20, 2018).

⁶⁵⁴ *Id.* at 90-91 (Thisius).

⁶⁵⁵ *Id.* at 82-84 (Rauenhorst).

⁶⁵⁶ Tr. Vol. 1A at 18-19 (Litchfield).

Project Area to accommodate aerial spraying, which could involve shutting turbines down during spraying.⁶⁵⁷

438. AFCL argues that Project will result in barring aerial spraying and seeding in the Project Area causing farmers to incur more expense to accomplish these tasks.⁶⁵⁸ AFCL provided no testimony on the issue of aerial spraying and seeding.

439. The record contains no evidence that any of the affected landowners use aerial spraying. Nor is there a record of the cost of aerial spraying or its cost relative to other methods. It is unclear from the record how closely Mr. Thisius or Mr. Rauenhorst had studied the Project and considered how its turbine layout would affect aerial spraying. The Administrative Law Judge finds no basis for recommending that the site permit be denied because of any impacts the Project will have on aerial spraying and seeding.

440. The record demonstrates that Freeborn Wind has taken steps to minimize and mitigate impacts to aviation.

O. Wildlife

441. Freeborn Wind completed Tier 1, 2, and 3 wildlife studies consistent with the USFWS Land-Based Wind Energy Guidelines (WEG). The WEG are voluntary guidelines that provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development.⁶⁵⁹

442. The Tier 1 and 2 studies include preliminary site evaluation and site characterization to identify and characterize habitat and biological resources present within and surrounding the Project Area. These studies also summarize potential species of concern and sensitive ecological areas in the region.⁶⁶⁰

443. A Tier 1 preliminary site evaluation and a Tier 2 site characterization study were initially completed for the Project in Spring 2015, and were later expanded to include new areas being considered for development in Fall 2016.⁶⁶¹ The Tier 1 and 2 studies were based on a comprehensive desktop review of existing data including published technical literature, field guides, public datasets, site visits, agency correspondence, and meetings with MDNR and USFWS over the course of several years.⁶⁶²

444. Tier 3 studies include more extensive field surveys to document site wildlife conditions. They inform avoidance and minimization measures, and post-construction

⁶⁵⁷ *Id.* at 20-21.

⁶⁵⁸ AFCL Initial Br. at 51-54.

⁶⁵⁹ Ex. FR-1 at 82 (Application); Ex. FR-8 at 3 (Giampoli Direct).

⁶⁶⁰ Ex. FR-8 at 3-4 (Giampoli Direct).

⁶⁶¹ Ex. FR-1 at 83 (Application); see Ex. FR-1 at App. G (Application).

⁶⁶² Ex. FR-1 at 83 (Application).

monitoring.⁶⁶³ These field studies included raptor nest surveys, bat acoustic studies, and avian use studies from 2015 to 2017.⁶⁶⁴

445. Wildlife in the Project Area includes birds, mammals, reptiles, amphibians, and insects. Wildlife are both resident and migratory, and all utilize habitats in the Project area for foraging, breeding, and shelter.⁶⁶⁵ Wildlife species use the food and habitat available from agricultural fields, pasture, farm woodlots, and wetland areas.⁶⁶⁶ Reptile and amphibian species that may be present in the Project Area include turtles, frogs, and snakes.⁶⁶⁷ Reptiles and amphibians may utilize pasture areas, wetlands, and grasslands.⁶⁶⁸ Several species of birds and bats are also known to occur in the landscape, including grassland birds, migratory and resident birds, raptors, waterfowl, and hoary, little brown, eastern red, silver-haired, northern-long eared, and tri-colored bats.⁶⁶⁹

446. There are many species of insects and pollinators that may utilize the Project Area. Typically, these species inhabit native prairie.⁶⁷⁰ The Project has been designed to avoid mapped and field verified potential prairie, and, therefore, has no impact on insect species.⁶⁷¹

447. No species listed as endangered under the Endangered Species Act (ESA) are identified for Freeborn County.⁶⁷² However, the northern long-eared bat (NLEB), listed as threatened under the ESA, may potentially occur in Freeborn County.⁶⁷³ The Natural Heritage Information System (NHIS) data does not identify any NLEB hibernacula within ten miles of the proposed Project Area or any NLEB roost trees within the Project Area.⁶⁷⁴ Based on the Project's location relative to the nearest known NLEB hibernaculum, NLEB are not expected to occur in the Project Area during the fall swarming period or during the winter when they are hibernating.⁶⁷⁵ Consistent with federal NLEB guidance, Freeborn Wind has designed the layout to site turbines at least 1,000 feet from wooded habitat that NLEB and other bat species utilize for roosting and foraging.⁶⁷⁶

448. The USFWS Information for Planning and Consultation (IPaC) lists 23 species of migratory birds of particular conservation concern that may utilize or stop over

⁶⁶³ *Id.* at 82.

⁶⁶⁴ *Id.* at 83. The results of these studies are presented on pages 85-92 of the Application and in Appendix F of the Application and in Ex. FR-8 at Schedule 2 through 8 (Giampoli Direct).

⁶⁶⁵ Ex. FR-1 at 87-88 (Application).

⁶⁶⁶ *Id.* at 87.

⁶⁶⁷ *Id.* at 88.

⁶⁶⁸ *Id.*

⁶⁶⁹ *Id.* at 88, 90; Ex. FR-15 at Schedule 1 at 19 (Giampoli Rebuttal).

⁶⁷⁰ Ex. FR-1 at 88 (Application).

⁶⁷¹ *Id.*

⁶⁷² *Id.* at 83, 90.

⁶⁷³ *Id.* at 83.

⁶⁷⁴ *Id.* at 84.

⁶⁷⁵ *Id.* at 91-92.

⁶⁷⁶ *Id.* at 92.

in Freeborn County.⁶⁷⁷ Bald and golden eagles are also federally protected under the Bald and Golden Eagle Protection Act and are known to occur in Freeborn County.⁶⁷⁸ The Shell Rock River intersects a small portion of the western edge of the Project Area where the substation will be located.⁶⁷⁹ This area contains some of the only suitable bald eagle nesting and foraging habitat in the Project Area.⁶⁸⁰

449. Freeborn Wind followed the USFWS's Eagle Conservation Plan Guidance when conducting its avian use and raptor nest surveys.⁶⁸¹ Raptor nest surveys were completed in 2015, 2016, and 2017.⁶⁸² Thirteen occupied and active bald eagle nests, and one occupied and inactive bald eagle nest were identified within ten miles of the Project Area, but all were located outside of the Project Area.⁶⁸³

450. There are no protected areas or designated critical habitat in the Project Area.⁶⁸⁴ Surveys indicate that the Shell Rock River may be considered a feature of significant value for raptors.⁶⁸⁵ Freeborn Wind has committed to USFWS that it would build fewer than four turbines within 0.5 mile of the Shell Rock River, and it ultimately sited only one turbine 0.6 mile from the Shell Rock River. All other turbines are one mile or greater from the river to minimize impacts.⁶⁸⁶ Additionally, all turbines are sited to the east of the river so they are not placed between nesting habitat and the river, where eagles and other raptors may forage.⁶⁸⁷

451. AFCL witness Dorenne Hansen testified that there are at least five bald eagle nesting locations missing from Freeborn Wind's project map. AFCL provided approximate addresses and Geographic Information System (GIS) coordinates for the nests.⁶⁸⁸ AFCL provided photographs of eagles taken within the project footprint.⁶⁸⁹ At the public hearing, several commenters asserted the existence of additional eagle nests not identified in the Application.⁶⁹⁰

452. After being notified of possible additional eagle nests in the area, Freeborn Wind conducted several additional surveys of the area but did not find any omitted eagle nests in or near the Project Area.⁶⁹¹

⁶⁷⁷ *Id.* at 83.

⁶⁷⁸ *Id.*

⁶⁷⁹ *Id.*

⁶⁸⁰ *Id.*

⁶⁸¹ *Id.* at 85.

⁶⁸² *Id.* at 86. The results of these surveys are discussed in Ex. FR-1 at Appendix F (Application) and Ex. FR-8 at Schedules 2, 3, and 6 (Giampoli Direct).

⁶⁸³ Ex. FR-8 at 10 (Giampoli Direct).

⁶⁸⁴ Ex. FR-1 at 84 (Application).

⁶⁸⁵ *Id.*

⁶⁸⁶ *Id.* at 83.

⁶⁸⁷ *Id.* at 84.

⁶⁸⁸ Ex. AFCL-1 at 27 (Hansen Direct); see Comment by Dorenne Hansen (July 3, 2017) (eDocket No. 20177-133470-01).

⁶⁸⁹ Ex. AFCL-14 (Eagle Photos).

⁶⁹⁰ Public Hr'g Tr. at 104-105 (Hansen), 141-42 (Erickson) (Feb. 20, 2018); Ex. P-10; Ex. P-15.

⁶⁹¹ Tr. Vol. 1B at 31-32 (Giampoli); Ex. FR-8 at 10, Schedule 6 (Giampoli Direct).

453. If a new bald eagle or raptor nest is identified in the Project Area in the future, Freeborn Wind asserts that it will follow the procedures identified in the Avian and Bat Protection Plan (ABPP) and consult with MDNR, USFWS, and DOC-EERA as necessary.⁶⁹²

454. The Project has the potential to cause displacement of some bird species from the Project Area due to increased human activity or the presence of tall structures, though clearing of habitat will be minimal.⁶⁹³ Many of the most observed bird species within the Project Area were common, disturbance-tolerant species, similar to the results of surveys at other wind energy facilities in the region.⁶⁹⁴ Shorebirds and waterfowl using saturated depressions within croplands in the Project Area as stopover habitat during spring migration may be more sensitive to displacement by Project turbines, as displacement of these bird types has been reported at wind facilities in Europe.⁶⁹⁵ Given that most lands within the Project Area are already disturbed and subject to human activity related to farming, and because most of the birds observed were common, disturbance-tolerant species, displacement effects are expected to be minimal.⁶⁹⁶

455. Project operation may result in avian mortality from collision with the Project's turbines or other structures.⁶⁹⁷ Post-construction monitoring completed at wind facilities located on agricultural landscapes in southern Minnesota and northern Iowa show avian fatality estimates ranging from 0.27 to 5.59 birds per megawatt produced per year.⁶⁹⁸ Given the lack of unique ecological features within the Project Area that would attract birds, estimated avian fatality rates at the Project would be expected to be within this range or lower.⁶⁹⁹

456. Freeborn Wind conducted a bat acoustic study from April 14 to November 14, 2015.⁷⁰⁰ Freeborn Wind also completed further desktop review of northern long-eared bat habitat to determine potential summer roosting habitat and community/travel habitat.⁷⁰¹ All seven bat species known to occur in Minnesota may migrate through the Project Area, but bat habitat within the Project Area is limited to small groves of trees and fence rows near homesteads and riparian corridors along a few small streams with fringe wetlands.⁷⁰² Outbuildings can also provide roosting habitat.⁷⁰³

457. Bat fatalities may occur during Project operation.⁷⁰⁴ Bat fatalities at wind energy facilities in the United States have mostly occurred in the swarming and migration

⁶⁹² Ex. FR-8 at 12-13 (Giampoli Direct).

⁶⁹³ Ex. FR-1 at 88 (Application).

⁶⁹⁴ *Id.*

⁶⁹⁵ *Id.*

⁶⁹⁶ *Id.*

⁶⁹⁷ *Id.*

⁶⁹⁸ *Id.* at 89.

⁶⁹⁹ *Id.* at 88-89.

⁷⁰⁰ *Id.* at 87.

⁷⁰¹ *Id.*

⁷⁰² *Id.* at 90.

⁷⁰³ *Id.*

⁷⁰⁴ *Id.*

seasons, typically between mid-July and mid-September.⁷⁰⁵ Post-construction monitoring studies completed at other wind facilities in southern Minnesota show most bat fatalities occurring during the fall migration season and consisting primarily of eastern red bats and hoary bats, both migratory tree bat species.⁷⁰⁶ Post-construction fatality studies completed in Iowa and Minnesota show bat fatality estimates ranging from 0.74 to 20.19 bats/MW/year.⁷⁰⁷ The pre-construction acoustic study conducted for the Project recorded highest bat activity in the summer (June 1 to July 15), followed by the fall migration period (July 30 to October 14).⁷⁰⁸ Consequently, estimated bat fatality rates at the Project would be expected to be within the range reported from studies at other wind facilities in the region.⁷⁰⁹

458. MDNR identified two avoidance areas that contain an increased amount of habitat that may concentrate birds and bats.⁷¹⁰ The Project Area avoids both areas.⁷¹¹ Freeborn Wind states that it will also avoid siting turbines in mapped native prairie, sensitive habitat, and sites of biodiversity significance.⁷¹²

459. Freeborn Wind revised the Project boundary multiple times to avoid and create distance from higher quality wildlife habitats in the Project vicinity.⁷¹³ Freeborn Wind has incorporated the recommendations of MDNR in the Project layout and configuration.⁷¹⁴ Freeborn Wind revised the system configuration to connect at the Glenworth Substation due to the increased eagle activity near Albert Lea Lake.⁷¹⁵ Additionally, Freeborn Wind complied with the bat habitat setbacks recommended by MDNR.⁷¹⁶

460. To minimize Project-related bat fatalities during operation of the Project, the turbine blades will be feathered below the operational cut-in speed at specific times, and all turbines will have the necessary operational software to allow for the adjustment of turbine cut-in speeds.⁷¹⁷ The ABPP and Draft Site Permit were both revised to reflect the language recommended by MDNR.⁷¹⁸

461. The ABPP prepared by Freeborn Wind for this Project was developed in a manner consistent with the guidelines and recommendations of the WEGs and incorporates the results of the numerous studies conducted on the Project Area, as well

⁷⁰⁵ *Id.*

⁷⁰⁶ *Id.*

⁷⁰⁷ *Id.* at 91.

⁷⁰⁸ *Id.* at 90-91.

⁷⁰⁹ *Id.*

⁷¹⁰ *Id.* at App. A (MDNR Feb. 21, 2017 letter).

⁷¹¹ *Id.* at 83 (Application).

⁷¹² *Id.* at 85.

⁷¹³ *Id.* at 83.

⁷¹⁴ *Id.*

⁷¹⁵ Ex. FR-4 at 14-15 (Litchfield Direct), Ex. FR-8 at 6 (Giampoli Direct).

⁷¹⁶ Ex. FR-8 at 6 (Giampoli Direct).

⁷¹⁷ Draft Site Permit at 18 (Jan. 30, 2018) (eDocket No. 20181-139549-01); *see also* Ex. FR-15 at 1, Schedule 1 at 46 (Giampoli Rebuttal); Comment by MDNR (Oct. 6, 2017) (eDocket No. 201710-136200-01).

⁷¹⁸ Ex. FR-8 at 7 (Giampoli Direct).

as agency feedback and input from MDNR.⁷¹⁹ The ABPP includes minimization and avoidance measures to avian and bat species that will be implemented during construction and operation of the Project.⁷²⁰ It also includes construction practices and design standards, operational practices, permit compliance, and construction and operations worker training.⁷²¹ Freeborn Wind revised the ABPP to reflect MDNR's recommendations, including revising language in the ABPP regarding feathering to match language in recent site permits.⁷²² Further, Freeborn Wind contends that the ABPP is designed to be a living document, that it will be regularly updated, and sets forth procedures to follow should environmental conditions change during operation of the Project.⁷²³ These measures are consistent with Sections 4.7 (Native Prairie), 7.1 (Biological and Natural Resources Inventories), 7.5 (Avian and Bat Protection) in the Draft Site Permit.⁷²⁴

462. After reviewing the Draft Site Permit, revised ABPP, and most recent shapefiles of the Project layout, MDNR agreed that Freeborn Wind “has taken numerous measures, as outlined in the draft site permit and ABPP, to minimize the risk of fatalities to birds and bats,” stating it appreciated Freeborn Wind’s “efforts to develop a project that minimizes wildlife impacts.” Given the measures outlined in the Draft Site Permit and the ABPP, the MDNR had no recommendations concerning the proposed turbine locations.⁷²⁵

463. Noting that the Draft Site Permit states that there have been no bald eagle fatalities at Minnesota wind facilities, the MDNR recommended that Freeborn Wind discuss that issue with a particular representative of the USFWS.⁷²⁶

464. The Administrative Law Judge concludes that Freeborn Wind has demonstrated by a preponderance of the evidence that the Project is designed to minimize impacts to wildlife, if a Site Permit is issued in this docket.

P. Rare and Unique Natural Resources

465. Freeborn Wind conducted a desktop analysis to determine the presence of rare and unique natural resources within the Project Area.⁷²⁷ There is one NHIS record of a federal and state-listed plant species (the western prairie fringed orchid, last observed in 1939) that intercepts the Project boundary.⁷²⁸ Based on USFWS IPaC results, there is one federally-listed threatened species known to occur in Freeborn County: the northern

⁷¹⁹ *Id.* at 3-5.

⁷²⁰ *Id.* at 4-5.

⁷²¹ See Ex. FR-15 at Schedule 1 (Giampoli Rebuttal); Ex. FR-1 at 93 (Application).

⁷²² Ex. FR-8 at 7 (Giampoli Direct).

⁷²³ Ex. FR-15 at Schedule 1 at 5 (Giampoli Rebuttal).

⁷²⁴ See Draft Site Permit at 4, 15, 16-18 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷²⁵ Comment by MDNR (March 15, 2018) (eDocket No. 20183-141051).

⁷²⁶ Comment by Cynthia Warzecha, MDNR (Mar. 15, 2018) (eDocket No. 20183-141051-01).

⁷²⁷ Ex. FR-1 at 93-96 (Application).

⁷²⁸ *Id.* at 96.

long-eared bat.⁷²⁹ There are no other records of threatened or endangered species occurring within the Project Area.⁷³⁰

466. There is a special concern plant species and a watch list plant species within the Project. There are documented occurrences of one reptile and seven mussels within five miles of the Project Area that are state-listed endangered or threatened. However, none of these records are within the Project Area and none have been observed during field surveys.⁷³¹

467. There are 13 species of special concern (one bird, two fish, three mussels, and seven plants) that do not have a legal status but are being tracked by the MDNR that have been documented within five miles of the Project Area. There are two colonial waterbird nesting sites outside and Project Area and associated with Albert Lea Lake.⁷³²

468. Based on NIHS data, Freeborn Wind found there is one wet prairie (southern) within the Project Area and one dry sand-gravel oak savanna (southern) terrestrial communities within five miles of the Project. Freeborn Wind states that no Project infrastructure will be sited near these communities.⁷³³

469. Freeborn Wind has committed to avoid rare and unique resources to the extent practicable.⁷³⁴ Turbines and other project facilities have been sited to avoid mapped native prairie, native plant communities, railroad ROW prairie, site-specific potential prairie, and sites of biodiversity significance. Freeborn Wind has designed the Project to site turbines at least 1,000 feet from northern long-eared bat habitat.⁷³⁵

470. Accordingly, the Administrative Law Judge finds that the record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to rare and unique natural features. Further, the Draft Site Permit contains adequate conditions to monitor and mitigate the Project's potential impacts on rare and unique natural resources.⁷³⁶

Q. Vegetation

471. The majority of the land within the Project Area is cultivated cropland (91.6 percent) and developed areas (5.6 percent).⁷³⁷ There are also limited areas of potential native prairie, as well as other areas the MDNR has mapped as sites of

⁷²⁹ *Id.*

⁷³⁰ *Id.*

⁷³¹ *Id.* at 93.

⁷³² *Id.*

⁷³³ *Id.* at 96.

⁷³⁴ *Id.*

⁷³⁵ *Id.*

⁷³⁶ *E.g.*, Draft Site Permit at 15-17 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷³⁷ Ex. FR-1 at 77 (Application).

biodiversity significance, although there are no “outstanding” or “high” sites of biodiversity significance in the Project Area.⁷³⁸

472. Freeborn Wind plans to remove vegetation for the installation of turbine foundations, access roads, the Project substation, and O&M facilities. The majority of turbines will be sited in plowed crop fields that are typically planted in rows. The Project is estimated to result in up to 38.5 acres of permanent impacts to vegetation (including cropland).⁷³⁹

473. According to Freeborn Wind, temporary vegetation impacts will be associated with crane walkways, the installation of underground collection lines, and contractor staging and laydown areas. Freeborn Wind states that it will work with all Project construction parties entering the Project Area to control and prevent the introduction of invasive species. In addition, Freeborn Wind commits to reseed temporary disturbed areas to blend with existing vegetation. In addition, Freeborn Wind asserts that, to the extent practicable, direct permanent and temporary impacts to natural areas, including wetlands and native prairies, will be avoided and minimized.⁷⁴⁰

474. According to Freeborn Wind has taken established Wildlife Management Areas (WMAs), Scientific and Natural Areas (SNAs), state parks, Waterfowl Production Areas (WPAs), and other recreation areas were excluded from consideration for Project facilities.⁷⁴¹ In addition, Freeborn Wind states that the Project Area was revised to exclude two of the larger patches of potential native prairie in T101N R20W Section 30 and T102N R20W Section 17.⁷⁴² The Project Area excludes all MDNR-mapped native prairie, native plant communities, and railroad ROW prairie,⁷⁴³ and the Project was designed to minimize the need to clear existing trees.⁷⁴⁴ Freeborn Wind commits to use best management practices (BMPs) during construction and operation to protect topsoil and adjacent resources and to minimize soil erosion.⁷⁴⁵

475. Freeborn Wind asserts that it will avoid disturbance of wetlands during Project construction and operation. If jurisdictional wetland impacts are proposed, Freeborn Wind will need to obtain applicable wetland permits.⁷⁴⁶

476. The Administrative Law Judge finds that the Draft Site Permit contains adequate conditions to monitor and mitigate the Project’s potential impacts on vegetation. For example, Section 4.7 of the Draft Site Permit provides that Project facilities will not be placed in native prairie unless addressed in a Prairie Protection and Management Plan, and shall not be located in areas enrolled in the Native Prairie Bank Program. This section further requires Freeborn Wind to prepare a Prairie Protection and Management Plan in

⁷³⁸ *Id.* at 79-80.

⁷³⁹ *Id.* at 80; Ex. FR-4 at 30-31, Schedule 9 (Litchfield Direct).

⁷⁴⁰ Ex. FR-1 at 80 (Application).

⁷⁴¹ *Id.* at 81.

⁷⁴² *Id.* at 78-79.

⁷⁴³ *Id.* at 79.

⁷⁴⁴ *Id.* at 81.

⁷⁴⁵ *Id.*

⁷⁴⁶ *Id.*

consultation with MDNR if native prairie is identified within the site boundaries. According to Freeborn Wind, the Prairie Protection and Management Plan will address steps that will be taken to avoid impacts to native prairie, and mitigation to unavoidable impacts to native prairie by restoration or management of other native prairie areas that are in degraded condition. Freeborn Wind will accomplish this by conveyance of conservation easements, or by other means agreed to by Freeborn Wind, MDNR, and the Commission.⁷⁴⁷

477. The Administrative Law Judge finds that the record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to vegetation. Further, the Draft Site Permit contains adequate conditions to monitor and mitigate the Project's potential impacts on vegetation.

R. Soils, Geologic, and Groundwater Resources

478. Ten soil associations are found within the Project Area: Webster-Nicollet-Clarion-Canisteo; Webster-Nicollet-Lester; Kenyon-Floyd-Clyde; Lester-Hamel; Mayer-Estherville-Biscay; Webster-Estherville-Dickinson; Muskego-Caron-Blue Earth variant-Blue Earth; Moland-Merton-Maxcreek-Canisteo; Waukee-Udolpho-Marshan-Hayfield-Fairhaven; and Newry-Maxcreek-Havana-Blooming.⁷⁴⁸

479. Construction of the Project will increase the potential for soil erosion and compaction during construction. In some locations, some prime farmland may be converted from agricultural use to wind energy generation use. As discussed previously, fewer than 35 acres will be permanently removed from agricultural production.⁷⁴⁹ The Project is estimated to result in up to 38.5 acres of permanent impacts to vegetation (including cropland).⁷⁵⁰

480. Freeborn Wind will acquire a National Pollutant Discharge Elimination System (NPDES) permit from the MPCA to discharge storm water from construction facilities. BMPs will be used during construction and operation to protect topsoil and adjacent resources and to minimize soil erosion. In addition, Freeborn Wind will develop a Storm Water Pollution Prevention Plan (SWPPP) prior to construction that will include BMPs such as silt fencing, revegetation plans, and management of exposed soils to prevent erosion.⁷⁵¹

481. Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be limited and wells will not be impacted. The proposed O&M facility water requirements will be satisfied with a new well. Construction and operating of the Project will not impact existing water wells. Thus, no mitigation is necessary.⁷⁵²

⁷⁴⁷ Draft Site Permit at 4-5 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁴⁸ Ex. FR-1 at 69 (Application).

⁷⁴⁹ *Id.* at 72.

⁷⁵⁰ *Id.* at 80; Ex. FR-4 at 30-31, Schedule 9 (Litchfield Direct).

⁷⁵¹ See Draft Site Permit at 8 (Jan. 30, 2018) (eDocket No. 20181-139549-01); Ex. FR-1 at 72 (Application).

⁷⁵² Ex. FR-1 at 73 (Application).

482. According to the Minnesota Regions Prone to Surface Karst data set, the Project Area is located near a region prone to karst.⁷⁵³ Freeborn Wind undertook a geotechnical evaluation to evaluate the likelihood of karst in the proposed turbine locations. Freeborn Wind conducted a geophysical investigation to explore for voids and examine soil borings. This investigation confirmed there is no karst bedrock within 50 feet of the soil surface and that the proposed turbine locations would not impact any karst areas.⁷⁵⁴ Additionally, the Draft Site Permit contains adequate conditions to monitor, avoid, and mitigate the Project's potential impacts karst. For example, Condition 7.5.5 requires additional field testing be completed to identify karst features, should standard geotechnical testing indicate the presence of karst.⁷⁵⁵ This condition has already been satisfied by the performance of the geotechnical testing. Freeborn Wind states that the final wind turbine foundation design will satisfy the permit conditions.⁷⁵⁶

483. AFCL raised concerns regarding groundwater impacts and mitigation; specifically, AFCL asserted that Project construction — particularly “leaching” from concrete used for turbine foundations — can cause a number of surface and groundwater impacts.⁷⁵⁷ Freeborn Wind provided testimony that cured (hardened) concrete does not leach chemicals, and that, although there is no evidence to suggest that uncured concrete leaches, dewatering strategies will be implemented to prevent potential contamination from the portion of uncured concrete that comes into contact with the soil. The wind turbine concrete mix follows the building code requirements for concrete exposure and thus is similar to any exterior concrete in constant contact with the ground, such as foundations for houses, barns, offices, and sidewalks. Additionally, the chemical properties of the groundwater are investigated during the subsurface investigation. If the groundwater is determined to be acidic or potentially corrosive to concrete (which could potentially cause leaching) the concrete would be mixed with a chemically resistant formula to increase the concrete durability and resistance to chemical attack.⁷⁵⁸

484. The record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to soils, geologic, and groundwater resources. Further, the Draft Site Permit contains adequate conditions to monitor and mitigate the Project's potential impacts on soils, geologic, and groundwater resources.

S. Surface Water and Wetlands

485. Freeborn Wind states that surface water and floodplain resources for the Project Area were identified through review of U.S. Geological Survey topographic maps and Minnesota Public Waters Inventory (PWI) maps. The Project Area occurs within the vicinity of the Lower Mississippi River Basin in the Shell Rock River and Cedar River watersheds. There are two impaired waters within the Project Area: Shell Rock River and

⁷⁵³ Ex. EERA-8 at 11 (Comments and Recommendations on a Preliminary Draft Site Permit).

⁷⁵⁴ Ex. FR-4 at 31 (Litchfield Direct); see also Ex. FR-4 at Schedule 10 (Litchfield Direct).

⁷⁵⁵ Ex. FR-1 at 72 (Application).

⁷⁵⁶ See Draft Site Permit at 18 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁵⁷ Ex. FR-4 at Schedule 10 (Litchfield Direct); Ex. FR-4 at 31 (Litchfield Direct).

⁷⁵⁸ See Ex. AFCL-1 at 11-14 (Hansen Direct).

⁷⁵⁸ Ex. FR-11 at 6 (Litchfield Rebuttal).

Woodbury Creek. There is one PWI wetland, three PWI watercourses, and one PWI ditch in the Project Area.⁷⁵⁹

486. According to Freeborn Wind, there are a total of 404.7 acres of NWI wetlands in the Project Area. Approximately two-thirds (269.9 acres) of the mapped wetlands are palustrine emergent (“PEM”). Approximately 20 percent (81 acres) of the wetlands are mapped as palustrine forested, which are primarily associated with the Shell Rock River. The remaining 14 percent of wetlands are mapped as palustrine shrubbed wetlands (28.1 acres) and freshwater pond or riverine wetlands (25.3 acres). There is one PWI wetland located within the Project Area, which also overlaps the NWI wetland.⁷⁶⁰ Access roads may impact 0.1 acre of PEM wetlands.⁷⁶¹

487. Freeborn Wind denies that the Project will require the appropriation of surface water or permanent dewatering. However, Freeborn Wind acknowledges that temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches.⁷⁶²

488. There are no turbines sited within Federal Emergency Management Agency floodplains, according to Freeborn Wind. The access roads to Turbines 28, 33, and 34 will cross floodplains, but Freeborn Wind does not anticipate the roads will increase the flood stage level or reduced the flood storage capacity. In addition, Freeborn Wind notes that temporary workspace associated with these turbines will be within a floodplain, but commits to restore the affected areas to preconstruction grades and elevations.⁷⁶³

489. Freeborn Wind recognizes that Project facilities such as collection lines, access roads, crane paths, and the Project substation have the potential to impact surface water runoff. Ground-disturbing construction activities may also cause sedimentation. However, Freeborn Wind expects these impacts to be minimal.⁷⁶⁴

490. Freeborn Wind plans to site turbines to avoid direct impacts to surface waters, floodplains, and wetlands. In addition, Freeborn Wind states it will design access roads and the Project Substation to minimize impacts on surface waters and floodplains. Temporary impacts associated with crane paths will also be minimized. Installation of electrical collection cables is expected to avoid impacts by boring under surface water features, as necessary. Furthermore, after field verification of wetlands, Freeborn Wind maintains that Project facilities may undergo minor shifts to avoid wetland features to the extent practicable. As stated above, Freeborn Wind asserts it will use BMPs during construction and operation to minimize soil erosion, protect topsoil, and protect surface waters and floodplains from direct and indirect impacts.⁷⁶⁵

⁷⁵⁹ Ex. FR-1 at 73-74 (Application).

⁷⁶⁰ *Id.* at 76.

⁷⁶¹ *Id.* at 77.

⁷⁶² *Id.* at 74.

⁷⁶³ *Id.* at 75.

⁷⁶⁴ *Id.* at 74-75.

⁷⁶⁵ *Id.* at 75.

491. If Project facilities will impact waters of the United States, Minnesota's PWI, or 100-year floodplains, Freeborn Wind states that it will work with the appropriate agencies to apply for the necessary permits.⁷⁶⁶

492. According to the Application, there are no expected wetland impacts from turbines or the Project Substation and O&M facilities. Additionally, all turbines have been sited at least 1,000 feet from Class III-IV wetlands.⁷⁶⁷ Freeborn Wind has committed to completing formal wetland delineations before construction, and wetlands will be avoided to the extent possible during Project construction and operation. If wetland impacts cannot be avoided, Freeborn Wind will submit a permit application to the United States Army Corps of Engineers (USACE) for dredge and fill within Waters of the United States under Section 404 of the Clean Water Act (CWA), to the Local Government Unit (LGU) for Minnesota Wetland Conservation (WCA) coverage, and the MPCA for Water Quality Certification under Section 401 of the CWA before construction. Freeborn Wind asserts that it will mitigate direct or indirect wetland impacts during construction and operation by protecting topsoil, minimizing soil erosion, and protecting adjacent wetland resources.⁷⁶⁸

493. The Administrative Law Judge finds that the record demonstrates that Freeborn Wind has taken steps to avoid and minimize impacts to surface water and wetlands. Further, the Draft Site Permit contains conditions that adequately address potential impacts. For example, conditions of Section 4.6 requires that wind turbines and associated facilities not be placed in public waters wetlands, except that electric collector or feeder lines may cross or be placed in public waters or wetlands subject to applicable permits and approvals.⁷⁶⁹ Conditions contained in Section 5.2.7 include additional provisions related to wetlands, including a requirement that construction in wetlands occur during frozen ground conditions to minimize impacts, to the extent feasible. When winter construction is not possible, wooden or composite mats shall be used to protect wetland vegetation. Further, the conditions require that wetland and water resources disturbed by construction will be restored to pre-construction conditions, in accordance with applicable permits and landowner agreements.⁷⁷⁰

T. Air and Water Emissions

494. Throughout their operational life-cycle, LWECS operations emit the smallest amount of greenhouse gasses compared to other energy generation methods by replacing energy generated by fossil fuels. Wind energy production also eliminates emission of SO_x, NO_x, PM₁₀, and mercury, as well as drastically reduces water consumption.⁷⁷¹

495. Over 30 years, the Project's generation is anticipated to reduce carbon dioxide (CO₂) emissions by over 11 million tons relative to coal-fired electricity, and

⁷⁶⁶ *Id.*

⁷⁶⁷ *Id.* at 77.

⁷⁶⁸ *Id.*

⁷⁶⁹ Draft Site Permit at 4 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁷⁰ *Id.* at 8-9.

⁷⁷¹ Ex. FR-1 at 56 (Application).

reduce CO₂ emissions by over 4.5 million tons relative to gas-fired electricity. The entire 200 MW Wind Farm would reduce CO₂ emissions by approximately 26 million tons relative to coal-fired electricity over 30 years.⁷⁷²

496. Increased deployment of wind and other renewable resources with near-zero life-cycle greenhouse gas (GHG) emissions leads to a direct reduction in the use of fossil fuels like coal and natural gas. As described in the comment submitted by Minnesota Center for Environmental Advocacy (MCEA), the Project will aid Minnesota in meeting its statewide GHG emission reduction goals and reducing harmful air pollutants.⁷⁷³

497. The avoided air emissions from the Wind Farm “will benefit all Minnesotans, especially helping children with asthma, seniors with COPD, and others with respiratory conditions.”⁷⁷⁴ A representative from the American Lung Association in Minnesota attended the public hearing and stated that “projects like this are important for avoiding the use of fossil fuels and helping protect the air quality we all breathe.”⁷⁷⁵

498. Wind energy also requires virtually no water to operate. Therefore increased wind energy leads to an overall reduction in water use, as well as less competition for water resources with other uses like agriculture and drinking water.⁷⁷⁶

499. The Administrative Law Judge finds that the Project, if a Site Permit is issued by the Commission, will not have a negative impact on water emissions, and will have a positive impact on air emissions.

U. Solid and Hazardous Wastes

500. Potential hazardous materials within the Project Area may be associated with agricultural activities and material uses. Freeborn Wind states it will conduct a Phase I Environmental Site Assessment (Phase 1 ESA) for the Project to identify known recognized environmental conditions or historically recognized environmental conditions. The Phase I ESA will be conducted before construction to locate and avoid hazardous waste sites.⁷⁷⁷

501. Three types of petroleum product fluids are necessary for turbine operation: gear box oil; hydraulic fluid; and gear grease. Freeborn Wind has committed to service the turbines will be regularly, including managing any waste fluids that are generated with the servicing. Furthermore, if disposal is necessary, Freeborn Wind states fluids will be disposed of or recycled in compliance with the requirements of applicable laws and regulations.⁷⁷⁸

⁷⁷² Ex. FR-4 at 10 (Litchfield Direct).

⁷⁷³ Comment by MCEA (March 9, 2018) (eDocket No. 20183-140900-01).

⁷⁷⁴ Ex. FR-4 at Schedule 4 at 2 (Litchfield Direct).

⁷⁷⁵ Public Hr'g Tr. at 129 (Hunter) (Feb. 20, 2018).

⁷⁷⁶ Comment by MCEA at 3 (March 9, 2018) (eDocket No. 20183-140900-01).

⁷⁷⁷ Ex. FR-1 at 62 (Application).

⁷⁷⁸ *Id.*

502. Freeborn Wind asserts that, because any potential hazardous waste sites identified will be avoided, no mitigation measures are necessary. Freeborn Wind acknowledges that, if any wastes, fluids, or pollutants are generated during any phase of the operation of the Project, must be handled, processed, treated, stored, and disposed of in accordance with Minn. R. ch. 7045.⁷⁷⁹

503. The Administrative Law Judge finds that the record demonstrates that Freeborn Wind has taken steps to avoid and minimize potential solid and hazardous waste impacts. Further, the Draft Site Permit contains adequate conditions to monitor and mitigate the Project's potential impacts from solid and hazardous wastes.⁷⁸⁰

V. Future Development and Expansion

504. The Project is located in southcentral Minnesota, where there are already eight other large-scale wind energy facilities located within 20 miles of the Project Area.⁷⁸¹

505. Section 4.1 of the Draft Site Permit imposes a wind access buffer and provides for setbacks from properties where Freeborn Wind does not hold wind rights.⁷⁸²

506. There is no evidence that the Project is inconsistent with any future development or expansion plan.

W. Decommissioning, Turbine Abandonment, and Restoration

507. The anticipated life of the Project is approximately 30 years beyond the date of first commercial operation.⁷⁸³

508. Freeborn Wind's decommissioning, abandonment, and restoration obligations are particularly important to the owners of land upon which turbines will be built. Commenter Wayne Brandt expressed his concerns in oral and written comments:

The easement states that if grantee fails to fulfill their obligation within one year, then the owner may do so and the owner will be reimbursed for reasonable and documented costs. Even if the owner was to take these turbines down, they should not have to be responsible for finding the cranes and equipment and so forth to do so. The astronomical cost to remove these towers and access roads could be more than \$100,000 per turbine, probably more than that, and probably more than what farmers could afford.⁷⁸⁴

⁷⁷⁹ *Id.*

⁷⁸⁰ Draft Site Permit at 13 (Jan. 30, 2018) (eDocket No. 20181-139549-01) (Conditions 5.2.22 and 5.2.23).

⁷⁸¹ Ex. FR-1 at 102 (Application).

⁷⁸² Draft Site Permit at 3 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁸³ Ex. FR-1 at 110 (Application).

⁷⁸⁴ Tr. Public Hearing (Feb. 20, 2018) at 134.

In my opinion, I firmly believe Grantees [Freeborn Wind] have no intention of taking these wind turbines down. I believe that about a year from their final termination, they will deed the wind turbines back to the Owner, relieving the Grantee of all obligations to do so. The Grantee will be long gone shortly thereafter with no address or phone number to be found and no one to be held accountable.⁷⁸⁵

In closing, I would like to know how our townships are going to be protected from all the damage that will be incurred during the reverse procedure of removing these eyesores. We will have to contend with considerable damage to our roads because the huge cranes and trucks will cause damage once again.⁷⁸⁶

509. Once the Easement terminates, Freeborn Wind is obliged to “remove above-ground and below-ground . . . Windpower Facilities” and to restore the subject property “to a condition reasonably similar to its original condition.”⁷⁸⁷

510. The Easement’s Assignment section gives Freeborn Wind the right, without the property owner’s consent, to:⁷⁸⁸

sell, convey, lease, assign, mortgage, encumber, or transfer to one or more Assignees the Easement, or any or all right or interest in the Easement . . . or any or all right or interest of Grantee in the Property or in any or all of the Windpower Facilities that Grantee or any Assignee party may now or hereafter install on the Property.

511. The Assignment paragraph also requires:⁷⁸⁹

Grantee shall notify Owner in writing of any such assignment, and any such Assignee shall assume in writing the obligations of Grantee under this Agreement which Grantee will no longer be fulfilling pursuant to the terms and conditions of such assignment with respect to the Property assigned.

512. The Administrative Law Judge finds that the Easement Agreement requires that any future owners of any wind energy facilities built as part of the Freeborn Wind Project will be required to bear the costs of decommissioning, as defined in the any Site Permit the Commission grants to Freeborn Wind, to the same extent as Freeborn Wind is required to bear those costs.

⁷⁸⁵ Ex. P-14 Wayne Brandt (Mar. 12, 2018) (eDocket No. 20183-140951-09); see also Public Hr’g Tr. at 48 (Herman) (Feb. 20, 2018).

⁷⁸⁶ Public Hr’g Tr. at 135-36 (Brandt) (Feb. 20, 2018).

⁷⁸⁷ Ex. FR-19 at 16 (Easement Form).

⁷⁸⁸ *Id.* at 11.

⁷⁸⁹ *Id.*

513. AFCL asserts that Freeborn Wind has not complied with Freeborn County's ordinance regarding decommissioning requirements.⁷⁹⁰ While the limited comments Freeborn Wind made in its Site Permit Application regarding decommissioning do not meet Freeborn County's requirements, the Ordinance has no timeline attached to it. Thus, Freeborn Wind is not in violation of the Ordinance.

514. Pursuant to Section 11.1 of the Draft Site Permit, Freeborn Wind will develop a Project decommissioning and restoration plan in accordance with the requirements of Minn. R. 7854.0500, subp. 13, prior to the Project's pre-operation meeting with DOC-EERA.⁷⁹¹ At the end of commercial operation, the Project owners will be responsible for removing wind facilities, and removing the turbine foundations to a depth of four feet below grade.⁷⁹²

515. AFCL objects to Freeborn Wind's proposal to develop its decommissioning and restoration plan after the Site Permit is issued. AFCL argues that Minn. R. 7854.0500, subp. 13 requires these plans be submitted with the application.⁷⁹³ AFCL argues the Commission should deny the permit application because Freeborn Wind has not provided these plans.

516. Minn. R. 7854.0500, subp. 13 requires:

The applicant shall include the following information regarding decommissioning of the project and restoring the site:

- A. the anticipated life of the project;
- B. the estimated decommissioning costs in current dollars;
- C. the method and schedule for updating the costs in current dollars;
- D. the method of ensuring that funds will be available for decommissioning and restoration; and
- E. the anticipated manner in which the project will be decommissioned and the site restored.

517. The Decommissioning Plan included in Freeborn Wind's Application estimates the service life of Project to be thirty years, and states that "[p]roject decommissioning has not yet been determined."⁷⁹⁴ Freeborn Wind goes on to state that it will create a "thorough decommissioning cost estimate prior to construction

⁷⁹⁰ See AFCL redlined version of Freeborn Wind Proposed Findings of Fact, Conclusions of Law, and Recommendation at 19 (Apr. 4, 2018).

⁷⁹¹ Draft Site Permit at 23-24 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁷⁹² See *id.* Freeborn Wind also represents that its responsibility for decommissioning is also a term in its wind lease agreements. Tr. Vol. 1A at 24 (Litchfield).

⁷⁹³ AFCL Initial Br. at 13-15; AFCL Reply Brief at 22-25.

⁷⁹⁴ Ex. FR-1 at 110 (Application).

begins”⁷⁹⁵ The Decommissioning Plan in the Application includes language stating that Freeborn Wind will remove the improvements from properties, and restore them to their approximate original condition. Specifically, it says that decommissioning “will include the removal of above-ground wind facilities” In addition, “[f]oundations will be removed to a depth of 48 inches below current grade.” Unless landowners want them to remain, access roads will be removed, and disturbances created from the decommissioning itself will be restored.⁷⁹⁶

518. The Commission issued its Order Finding Application Complete and Varying Time Limits; Notice and Order for Hearing [Order] on August 31, 2017.⁷⁹⁷ AFCL did not raise its decommissioning and restoration plan concerns in comments prior to the issuance of the Order. No one requested reconsideration of the Order. Accordingly, the Commission’s Order is final.

519. The Commission found the application “substantially complete.”⁷⁹⁸ The Commission’s order granted variances to the time frames for consideration of application completeness and for issuance of a draft site permit, but not for the submission of developed decommissioning and restoration plans.⁷⁹⁹ The Draft Site Permit contemplates submission and review of decommissioning and restoration plans after construction has been completed but before commencing operations.⁸⁰⁰

520. The Commission referred this matter to the Office of Administrative Hearings because AFCL had “identified contested issues of fact.”⁸⁰¹ The Commission did not specifically identify decommissioning and restoration plans in its referral. However, the Commission further explained: “The ultimate issue in this case is whether Freeborn Wind’s proposed site application meets the criteria set forth in Minn. Stat. § 216F and Minn. R. ch. 7854. This turns on numerous factors that are best developed in formal evidentiary proceedings.”⁸⁰² The Administrative Law Judge interprets the Commission’s referral to request findings and recommendations as to whether the requirements of ch. 7854 have been met with regard to permit issuance.

521. DOC-EERA proposed to add language to the Draft Site Permit Section 11.1 that “requires the Permittee to update the decommission plan every five years, and also to identify all sureties and financial securities that are established to ensure site restoration.”⁸⁰³ With DOC-EERA’s proposed language included, Section 11.1 reads:

⁷⁹⁵ *Id.*

⁷⁹⁶ *Id.*

⁷⁹⁷ Order Finding Application Complete and Varying Time Limits; Notice and Order for Hearing (Aug. 31, 2017) (eDocket No. 20178-135140-01).

⁷⁹⁸ *Id.* at 3.

⁷⁹⁹ *Id.* at 3-5.

⁸⁰⁰ Draft Site Permit at 23 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁸⁰¹ Order Finding Application Complete and Varying Time Limits; Notice and Order for Hearing at 4 (Aug. 31, 2017) (eDocket No. 20178-135140-01).

⁸⁰² *Id.* at 5.

⁸⁰³ Ex. EERA-8 at 26.

The Permittee shall submit a decommissioning plan to the Commission at least fourteen 14 days prior to the pre-operation meeting, and provide updates to the plan every five years thereafter. The plan shall provide information identifying all surety and financial securities established for decommissioning and site restoration of the project in accordance with the requirements of Minn. R. 7854.0500, subp. 13. The decommissioning plan shall provide an itemized breakdown of costs of decommissioning all project components, which shall include labor and equipment. The plan shall identify cost estimates for the removal of turbines, turbine foundations, underground collection cables, access roads, crane pads, substations, and other project components. The plan may also include anticipated costs for the replacement of turbines or repowering the project by upgrading equipment.

The Permittee shall also submit the decommissioning plan to the local unit of government having direct zoning authority over the area in which the project is located. The Permittee shall ensure that it carries out its obligations to provide for the resources necessary to fulfill its requirements to properly decommission the project at the appropriate time. The Commission may at any time request the Permittee to file a report with the Commission describing how the Permittee is fulfilling this obligation.⁸⁰⁴

522. The Commission's referral of this matter to the Office of Administrative Hearings requests findings and recommendations concerning the Draft Site Permit's compliance with Minnesota Rules chapter 7854. Minnesota Rule 7854.0500, subpart 13 requires decommissioning and restoration plans be submitted with the application.

523. Freeborn Wind and DOC-EERA assert that the requirement in section 11.1 of the Draft Site Permit that Freeborn Wind submit a fully-developed plan to comply with subpart 13 at least 14 days prior to commencing operations satisfies subpart 13 sufficiently to allow a permit to issue. This position may be reasonable concerning some details of the decommissioning process that can be more meaningfully developed once construction is completed. It is likely substantially easier to estimate costs of removing structures and restoring the site after construction. Furthermore, as noted above, Freeborn Wind stated in its Application that it would provide a "thorough decommissioning cost estimate prior to construction begins"⁸⁰⁵

524. In addition, it does not follow that all aspects of decommissioning and restoration are best considered post-permit issuance. Perhaps the most pressing concern with regard to decommissioning and restoration for AFCL and members of the public is whether Freeborn Wind will have the funds to pay to remove the turbines and other facilities and physically restore the area.⁸⁰⁶

⁸⁰⁴ *Id.*

⁸⁰⁵ *Id.*

⁸⁰⁶ AFCL Initial Brief at 16 (referring to the comments of Wayne Brandt quoted above in ¶ 502).

525. Subpart 1 of Minn. R. 7854.0900 (2017) requires public notice of draft site permits. It further requires that an informational public meeting be held and offers the opportunity to request a contested case proceeding. No similar notice requirements or procedural rights are implicated by the pre-operation filings of decommissioning and restoration plans.⁸⁰⁷

526. Freeborn Wind employee Daniel Litchfield stated that he is a member of a Commission working group on decommissioning. He stated that the Commission is considering whether “they need to change permit conditions on decommissioning” and the working group is considering “establishing some form of financial assurance, independent from just a promise that the project will get removed.”⁸⁰⁸ Mr. Litchfield’s testimony suggests that both regulators and industry participants recognize that financial guarantees should be secured during the permitting process.

527. The Administrative Law Judge concludes that the requirements of chapter 7854 are not met unless Freeborn Wind demonstrates its capacity to guarantee it can fund the decommissioning and restoration of its Project prior to commencing construction. Furthermore, the Draft Site Permit contains appropriate conditions to ensure proper decommissioning and restoration of the Project site, with the exception of demonstrating that it has the resources necessary to carry out decommissioning and restoration.⁸⁰⁹

528. The Administrative Law Judge recommends that, if the Commission issues a Site Permit in this docket, Section 11.1 be amended to require that any successors or assigns of Freeborn Wind be obligated to bear the costs of decommissioning to the same extent that Freeborn Wind is, unless Freeborn Wind retains those obligations for itself.

529. Furthermore, if a Site Permit is issued, the Administrative Law Judge recommends that Section 11.1 be amended to require a pre-construction demonstration that the applicant can guarantee that the resources needed for decommissioning and restoration will be available. The Administrative Law Judge recommends that the Commission provide the public notice of Freeborn’s submission as required by Minn. R. 7854.0900. In future wind farm site permit proceedings, an applicant should provide this information in its initial filings.

530. Freeborn Wind has reserved the right to extend operations instead of decommissioning at the end of the site permit term. As necessary, Freeborn Wind may apply for an extension of the LWECS Site Permit to continue Project operation. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.⁸¹⁰

531. Section 11.2 provides that Freeborn Wind is required to dismantle and remove all towers, turbine generators, transformers, overhead and underground cables

⁸⁰⁷ Minn. R. 7850.0900 (2017).

⁸⁰⁸ Tr. Vol. 2 at 100 (Litchfield).

⁸⁰⁹ Draft Site Permit at 23-24 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁸¹⁰ Ex. FR-1 at 110 (Application).

and lines, foundations, buildings, and ancillary equipment to a depth of four feet. Any agreement for removal to a lesser depth or no removal shall be recorded with the county and shall show the locations of all such foundations. Further, Freeborn Wind is required to restore and reclaim the site to its pre-Project topography and topsoil quality within 18 months of the Project's termination.⁸¹¹ Freeborn Wind is responsible for decommissioning costs, both as a condition of the Site Permit and pursuant to the terms of its private easement agreements.⁸¹²

532. The record demonstrates that, if the Commission issues a Site Permit in this docket, decommissioning has been appropriately addressed by Freeborn Wind and the Draft Site Permit with the modifications recommended by the Administrative Law Judge.

X. Complaint Process

533. AFCL maintains that the Commission's complaint process is not effective and asks that the Administrative Law Judge recommend changes in the process in this proceeding.

534. Commenter Marie McNamara submitted written public comments regarding the Commission's complaint process.⁸¹³ Ms. McNamara questioned whether the State "is tracking or doing any comparison of wind project monthly logs for noise complaints to determine if Freeborn Wind or any project should be permitted as proposed."⁸¹⁴ Ms. McNamara stated that permittees self-report complaint information, including information about the status of complaints. In addition, Ms. McNamara asserted that permittees are redacting information from Minnesota wind complaint logs, in violation of site permit conditions requiring them to provide complainant contact information "to the extent possible."⁸¹⁵

535. The other parties did not take a position on AFCL's concerns about the complaint process.

536. The Administrative Law Judge notes that the Commission has responded recently to noise complaints at other wind farms by initiating noise monitoring and reporting, and requiring remedial action by the owners of the facilities.⁸¹⁶

⁸¹¹ Draft Site Permit at 24 (Jan. 30, 2018) (eDocket No. 20181-139549-01).

⁸¹² Tr. Vol. 1A at 24 (Litchfield); *see also* Draft Site Permit at 24 (Jan. 30, 2018) (eDocket No. 20181-139549-01); Ex. FR-19 at 16 (Litchfield Affidavit and Freeborn Wind Easement Form).

⁸¹³ Comment by Marie McNamara (Mar. 15, 2018) (eDocket No. 20183-141050-01).

⁸¹⁴ *Id.* at 2.

⁸¹⁵ *Id.*

⁸¹⁶ *In re the Site Permit Issued to Big Blue Wind Farm, LLC for the 36 MW Big Blue Wind Farm in Faribault County* (Big Blue Project), PUC Docket No. IP-6851/WS-10-1238, Order Requiring Wind Turbine Noise Study by an Approved Consultant and the Development, Distribution, and Use of Revised Complaint Procedures (Mar. 8, 2018) (eDocket No. 20183-140861-01); *In re Application of Wisconsin Power and Light for a Large Wind Energy Conversion System Site Permit for the Bent Tree Wind Project in Freeborn County*, PUC Docket No. ET6657/WS-08-573, Order Requiring Noise Monitoring, Noise Study, and Further Study (Aug. 24, 2016) (eDocket No. 20168-124382-01), Order to Show Cause, Requiring Further Review by the Department of Commerce, and Continuing Curtailment (Mar. 23, 2018) (eDocket No. 20183-141316-01).

537. The Commission is developing revised complaint procedures for the Big Blue Project.⁸¹⁷

538. The Administrative Law Judge finds that the existing complaint procedures, as set forth at Attachment A to the Commission's Draft Site Permit, are sufficient pursuant to the requirements of Minn. R. 7829.1500, .1600, and .1700 (2017). There is insufficient evidence in the record for the Administrative Law Judge to recommend specific changes in the procedures.

539. The Administrative Law Judge recognizes that the Commission may develop new procedures which it believes will be more effective in the future and may choose to substitute those procedures for the procedures proposed in the Draft Site Permit. Should the Commission decide to issue a Site Permit in this proceeding, it would be appropriate for it to use either the Complaint Procedures in as attached to the Draft Site Permit, or to use revised procedures currently being developed.

XII. Site Permit Conditions

540. The Draft Site Permit issued on January 30, 2018, includes a number of proposed permit conditions, many of which have been discussed above. The conditions apply to site preparation, construction, cleanup, restoration, operation, maintenance, abandonment, decommissioning, and other aspects of the Project.

541. Many of the conditions contained in the Draft Site Permit were established as part of the site permit proceedings of other wind turbine projects permitted by the Commission. Comments received by the Commission have been considered in development of the Draft Site Permit for this Project.

542. The Administrative Law Judge has not recommended that the Commission issue a Site Permit in this docket. Should the Commission decide, initially, or at a later date, to issue a Site Permit, the Administrative Law Judge recommends the amendments and additions to the conditions and special conditions in the Draft Site Permit, as discussed in the following paragraphs.

543. As a result of the contested case proceeding and the public hearing and public comments received in this docket, the Administrative Law Judge recommends the following amendments and additions to the Draft Site Permit:

544. The Administrative Law Judge recommends that Section 5.2 of the Draft Site Permit should be amended, as follows:

Freeborn Wind must provide notice which includes a description of the Project's potential to interfere with OTA TV service, Freeborn Wind's

⁸¹⁷ Big Blue Project, Order Requiring Wind Turbine Noise Study by an Approved Consultant and the Development, Distribution, and Use of Revised Complaint Procedures at 5 (Mar. 8, 2018) (eDocket No. 20183-140861-01).

mitigation program, and copies of the Site Permit and Complaint Procedure to households in the following areas:

- all households in “at risk” areas identified for all six local television stations, as identified in Appendix D of the Site Permit Application; and
- each household in the communities of Albert Lea, Northwood, Silver Lake, Gordonsville, Glenville, Hayward, and Moscow.

545. The Administrative Law Judge recommends that Section 5.2.16 of the Draft Site Permit be amended as follows:

- Upon receiving a complaint from a household within the required Notice area regarding interference, Freeborn Wind shall evaluate the complaint to determine whether Freeborn Wind’s operations are the likely cause of the interference. In the event that the wind farm is determined to be the likely cause of interference, Freeborn Wind should offer the mitigation measures it has proposed as listed in paragraph 378 of this Report.
- Freeborn Wind shall investigate any non-frivolous claims of OTA TV interference.
- Freeborn Wind shall not dismiss a complaint on the basis that it arises from a location further than 10 kilometers distant from any turbine, or because its location is not within an “at risk” area.
- Freeborn Wind shall file a report with the Commission on the first working day of each month. The report shall inform the Commission of the results of the previous month’s investigations of TV interference complaints, including the role of the wind farm in causing the interference, and whether Freeborn Wind’s remedial measures resolved the interference issues.
- Freeborn Wind shall maintain and submit with its monthly report, a map showing the location of the complainant households, their distance to the nearest turbine, and their locations in relation to the “at risk” areas. Freeborn Wind will report the date of each complaint, its response, and the date the complaint is closed.
- Freeborn Wind shall make these reports publicly available.

546. The Administrative Law Judge recommends that Special Condition Section 7.2 of the Site Permit be revised as recommended by DOC-EERA, with one modification:

Draft Site Permit Section 7.2 Shadow Flicker

At least 14 days prior to the pre-construction meeting, the Permittee shall provide data on shadow flicker for each residence of non-participating landowners and participating landowners within and outside of the project boundary potentially subject to turbine shadow flicker exposure. Information shall include the results of modeling used, assumptions made, and the anticipated levels of exposure from turbine shadow flicker for each residence. The Permittee shall provide documentation on its efforts to avoid, minimize and mitigate shadow flicker exposure. The results of any modeling shall be filed with the Commission at least 14 days prior to the pre-construction meeting to confirm compliance with conditions of this permit.

Shadow flicker detection systems will be utilized during project operations to monitor shadow flicker exposure at receptor locations that were anticipated to receive over ~~30~~ 27 hours of shadow flicker per year. The Permittee will submit a Shadow Flicker Monitoring and Management Plan at least 14 days prior to the pre-construction meeting. The Shadow Flicker Monitoring and Management Plan will detail the placement and use of any shadow flicker detection systems, how the monitoring data will be used to inform turbine operations, and a detailed plan of when and how turbine operations will be adjusted to mitigate shadow flicker exposure exceeding 30 hours per year at any one receptor. The results of shadow flicker monitoring and mitigation implementation will be reported by the Permittee in the Annual Project Energy Production Report identified in Section 10.8 of this Permit.

547. Because of the many potential sources of inaccuracy in the pre-construction noise level measurements and post-construction noise level predictions, the Administrative Law Judge recommends replacing Special Condition 7.4, Noise Studies, with the following Special Condition:

A post-construction noise study must be made, commencing as soon as the Project begins operations, and continuing for the first 12 months of its operation. The study shall be conducted by an independent consultant selected by the DOC-EERA at Freeborn Wind's expense. The independent consultant shall develop a methodology in consultation with the DOC-EERA. The study must incorporate the Department of Commerce Noise Study Protocol to determine the operating LWECS noise levels at different frequencies and at various distances from the turbines at various wind directions and speeds. In addition, the study must demonstrate the extent to which turbine-only noise contributes to the overall decibel level. Special attention should be paid to receptors predicted to experience the highest

turbine noise levels. The consultant should be charged with ensuring that there are no receptors where levels of ambient noise plus turbine noise exceed L₅₀ 50 dB(A) during nighttime hours. If, during the course of the study, noise levels exceeding those permitted by Minn. R. 7030.0040 are measured, the measurements shall be reported to the Commission within five working days, or as designated by the Commission. The completed post-construction noise study shall be filed with the Commission within 14 months after the Project becomes operational.

548. In light of the revised total noise predictions, and the lack of evidence that Freeborn Wind took the required 500 additional feet into account in establishing residential setbacks, the Administrative Law Judge recommends that Draft Site Permit Condition 4.2 be amended to require Residential setbacks of 1500 feet for all non-participating landowners.⁸¹⁸

549. The Administrative Law Judge recommends that Site Permit Section 5.2.25 be amended as follows:

Site personnel shall inspect any turbines located closer than 1,200 feet to structures, roads, or trails for ice when weather conditions are such that ice is likely to accumulate on turbine blades. To the extent that ice is accumulating on the blades of turbines located within 1,200 feet of structures, roads, or trails, the turbines shall be deactivated until such time as the turbine blades have been re-inspected and found free from ice.

550. The Administrative Law Judge recommends that Special Conditions Section 11.1 be amended as follows:

Any successors or assigns of Freeborn Wind will be obligated to bear the costs of decommissioning to the same extent that Freeborn Wind is, unless Freeborn Wind retains those obligations, in writing, to itself.

551. The Administrative Law Judge recommends that Special Conditions Section 11.1 be amended to require:

The Applicant must demonstrate, at least 45 prior to the scheduled start of construction, that it can guarantee that the resources needed for decommissioning and restoration will be available.

552. If Freeborn Wind demonstrates that it can meet the requirements of Minn. R. 7030.0040 and the Commission issues a Site Permit for the Project with the Draft Site Permit conditions, as amended by the Administrative Law Judge's recommended amendments and additions to the Permit Conditions and Special Conditions set forth above, the Freeborn Wind Project would satisfy the Site Permit criteria for an LWECs at

⁸¹⁸ There are four non-participating landowners with setbacks of less than 1500 feet. Ex. FR-4 at 19 (Litchfield Direct).

Minn. Stat. ch. 216F, 216E.03, subd. 7, Minn. R. 7854.0500, and all other applicable legal requirements.

553. Any of the foregoing Findings more properly designated Conclusions of Law are hereby adopted as such.

Based on the foregoing Findings of Fact and the record in this proceeding, the Administrative Law Judge makes the following:

CONCLUSIONS OF LAW

1. The Commission and the Administrative Law Judge have jurisdiction over the site permit applied for by Freeborn Wind for the up to 84 MW proposed Project pursuant to Minn. Stat. §§ 216F.04 and 14.57-.62 (2016).

2. Freeborn Wind has substantially complied with the procedural requirements of Minn. Stat. ch. 216F, Minn. Stat. § 216E.03 (2016), and Minn. R. ch. 7854 (2017).

3. A public hearing was conducted in a community near the proposed Project. Proper notice of the public hearing was provided, and the public was given an opportunity to speak at the hearing and to submit written comments.

4. An evidentiary hearing was conducted pursuant to Minn. R. 1405.0200-.2400, 1400.5010-.8400, and chs. 7854 and 7829 (2017).

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.

6. The Commission has the authority under Minn. Stat. § 216F.04 to place conditions in a LWECS site permit.

7. The Draft Site Permit contains a number of important mitigation measures and other reasonable conditions that adequately address the potential impacts of the Project on the human and natural environments.

8. It is reasonable to amend the Draft Site Permit to include 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.

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.

10. With the exception of its noncompliance with Minn. R. 7030.0040, the Project, with the Draft Site Permit Conditions and amended and additional Permit Conditions and Special Conditions discussed above, does not present a potential for significant adverse environmental effects pursuant to the Minnesota Environmental Rights Act and/or the Minnesota Environmental Policy Act.

11. Any of the foregoing Conclusions of Law which are more properly designated Findings of Fact are hereby adopted as such.

Based upon these Conclusions, the Administrative Law Judge makes the following:

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.

Dated: May 14, 2018



LAURASUE SCHLATTER
Administrative Law Judge