AMBER CHRISTENSON, ALLEN ROBISH VS. SOUTH DAKOTA PUBLIC UTILITIES COMMISSION,
29615 19CIV20-000027

CHRISTENSON, AMBER - APPELLANT	ATTORNEY: TORNOW, R SHAWN
ROBISH, ALLEN - APPELLANT	ATTORNEY: TORNOW, R SHAWN
CROWNED RIDGE WIND II LLC - APPELLEE	ATTORNEY: PALMER, DANA VAN BEEK
	ATTORNEY: SCHUMACHER, MILES F
SOUTH DAKOTA PUBLIC UTILITIES COMMISSION - APPELLEE	ATTORNEY: EDWARDS, KRISTEN
	ATTORNEY: REISS, AMANDA

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BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL19-027

IN THE MATTER OF THE APPLICATION OF CROWNED RIDGE WIND II, LLC FOR A PERMIT OF THE CROWNED RIDGE II WIND FARM IN CODINGTON, GRANT AND DEUEL COUNTIES, SOUTH DAKOTA

Direct Testimony of David M Hessler
On Behalf of the Staff of the South Dakota Public Utilities Commission
December 5, 2019



Q. Please state your name and business address.

A. My name is David M. Hessler. The address of my company's administrative offices is 38329 Old Mill Way, Ocean View, Delaware 19970, and my personal office is located at 5096 N Silver Cloud Dr., St. George, Utah 84770.

Q. Mr. Hessler, by whom are you employed and in what capacity?

A. I have been employed for over 28 years by Hessler Associates, Inc., as Vice President and a Principal Consultant. Hessler Associates, Inc. is a family run engineering consulting firm that specializes in the acoustical design and analysis of power generation facilities of all kinds, including wind energy projects.

Q. Please describe your educational background and your professional experience?

A. I received a Bachelor of Science degree in Mechanical Engineering in 1997, *Summa cum Laude*, from the A. James Clark School of Engineering, University of Maryland, College Park, Maryland, and a Bachelor of Arts degree, 1982, from the University of Hartford, Hartford, Connecticut. I am a registered Professional Engineer (P.E.) in the Commonwealth of Virginia and I am a member of the Institute of Noise Control Engineering (INCE). My professional specialization is the measurement, analysis, control and prediction of noise from both fossil fueled and renewable power generation facilities. I have been the principal acoustical designer and/or test engineer on hundreds of power station projects all over the world and on roughly 70 industrial scale wind energy projects. I wrote the

chapter on measuring and analyzing wind turbine noise in the book "Wind Turbine Noise"[1], which was published in 2011. I also drafted a set of best practices guidelines[2] for siting new wind turbine projects and testing them once completed for the National Association of Regulatory Utility Commissioners (NARUC). My resume, which contains a list of the cases where I have testified as an expert witness, is also attached for reference as Exhibit DMH-1.

Q. What is the purpose of your testimony in this case?

A. I have been asked by the Staff of the South Dakota Public Utilities Commission to review and independently evaluate the adequacy of the sound study carried out by EAPC Wind Energy in support of the Crowned Ridge II Wind Farm Project (CRII) and to review the testimony of other parties concerning noise.

Q. What materials have you reviewed in this matter?

A. I have reviewed Appendix I of the Application, which is the original (July 7, 2019) sound study for the Project prepared by EAPC Wind Energy and its later revision dated September 18, 2019. I have also reviewed the direct and supplemental testimony of Jay Haley, who was the author of the sound study, Richard Lampeter and the supplemental direct testimony of Christopher Ollson and Dr. Robert McCunney.

[1] Bowdler, D., and Leventhall, G., Editors, "Wind Turbine Noise", Multi-Science Publishing Company, Brentwood, Essex, UK, 2011.

[2] Hessler, D., "Assessing Potential Impacts from Proposed Wind Farms & Measuring the Performance of Completed Projects", National Association of Regulatory Utility Commissioners, U.S. Department of Energy, October 2011.

Q. Can you please summarize your overall opinion of the sound study submitted on behalf of the project?

A. In general, the quality of the work and noise modeling is perfectly satisfactory and consistent with good industry practice. I agree with the modeling methodology and believe that the predictions are realistic, if not somewhat conservative because an explicit 2 dB uncertainty factor was added to the maximum turbine sound power level. However, I would fault the study for focusing exclusively on regulatory compliance rather than the minimization of potential community noise impacts. The project layout appears to have been aggressively devised, through careful placement and the now universal use of low noise trailing edge blades, to get the maximum number of turbines into the Project area while maintaining a predicted sound level at all non-participants of less than the Deuel and Grant County Ordinance limit of 45 dBA. In many cases the calculated sound level at non-participants is only an insignificant one or two tenths of decibel below that limit, which is still precariously close to the maximum allowable sound level even if the 2 dB uncertainty factor is neglected.

Q. Do you believe compliance with a 45 dBA noise limit is sufficient in and of itself to ensure that project noise will be considered acceptable to everyone?

A. No. Based on my experience and numerous studies by others, any time wind turbine sound levels higher than about 40 dBA are predicted at residences annoyance and complaints become much more likely. In this case, I gather from

the latest sound study report that there are 96 non-participants throughout the Project area where a mean sound level above 40 dBA is predicted. If one were to back out the explicit 2 dB design margin, the number of non-participants above 40 dBA (i.e. a predicted level of 42 dBA or greater) would still be 49. Those are large numbers and percentage of residents highly annoyed by sound levels above 40 dBA will not be zero - despite the argument to the contrary advanced by Mr. Ollson in his supplemental testimony.

Q. What did Mr. Ollson say about predicting annoyance?

A. Mr. Ollson argues that annoyance and complaints cannot be correlated to sound level. He illustrates this in part by reproducing an excerpt from a table (Table IV) from a 2012 paper by Michaud, et al. (Exhibit CO-S-2) that shows that the distribution of 'formal complaints' was fairly uniform across all receptor sound levels from below 30 to more than 45 dBA. However, the same table also shows that those reporting a "high (very or extreme) level of annoyance" goes from 1% at sound levels between 30 and 35 dBA to nearly 14% for sound level in the 40 to 46 dBA range. Mr. Ollson also refers to another table (Table 7) in a paper by Bakker, et al. (Exhibit CO-S-5) to make the point that the people in the study more commonly experienced sleep disturbance from noises other than wind turbines. Table 6 in that same paper, not mentioned in Mr. Ollson's testimony, shows that for a quiet, rural area 82% of the study participants were not annoyed by the adjacent wind project when the sound level at their house was in the 36 to

40 dBA range but that 45% were slightly to highly annoyed when the sound level increased into 41 to 45 dBA range.

Q. What do believe the Project should have done to address the potential for community disturbance?

A. Rather than attempt to dismiss annoyance as something that doesn't exist or wave it away as something that can't be quantified very well, I would have liked to have seen more of an effort on the Applicant's part to go beyond simple regulatory compliance and reduce the density of turbines, use fewer higher output turbines or otherwise optimize the layout so that the sound levels at all non-participating residences were as close to 40 dBA as reasonably possible. While the recent upgrade of all units to have low noise trailing edge blades would appear to be a step in the right direction, the number of non-participants with predicted sound levels above 40 dBA (96) has not, by my count at least, changed from the original July 7 modeling analysis. As it is, the actual sound levels at many non-participants produced by the currently proposed layout will exceed 45 dBA at times because wind turbine sound levels are highly variable with wind and atmospheric conditions and commonly fluctuate by +/- 5 dBA or more around the modeled sound level, which may be regarded as a long-term mean level. Consequently, it is good practice to attempt to keep the predicted project sound levels as far below the regulatory limit as is reasonably feasible.

Q. Do you see any specific layout changes at this point that might reduce the noise impact of the project?

A. Yes. According to Appendix B of the most recent revision of the sound study, which is a tabulation of the turbine coordinates and status, there are currently 6 alternate turbine locations: Turbines 94, 97, 103, 113, 134 and Alt6. In general, all of these sites are relatively far from non-participating residences and could be used as places to beneficially relocate units that are currently causing the sound levels at non-participants to exceed 40 dBA.

Q. Which, in your opinion, would be best candidates for relocation to the alternate turbine sites?

A. Unfortunately, there are a quite a few that I would like to see moved – many more than 6 – but the following 21 units, listed by the sound contour map inset section, would be at the top of my list.

Contour Map Enlargement Section	Turbines recommended for relocation to alternate sites.
A1	Alt4, 104, 125, 129
A2	98, 102
B1	72, 77, 81
B2	Alt5, 53, Unit South of 98 (number illegible)
C1	13
C2	3, 6, Alt9, Unit South of Alt9 (number illegible), 24, 30, 38, Unit South of 38 (number illegible)

I would urge the Applicant to review and enact these suggested relocations to the extent feasible or explain why they are not possible.

Q. Do you agree with the noise limits and sound testing protocol proposed on behalf of the Applicant by Richard Lampeter?

A. Yes. I agree that at a bare minimum the sound emissions from the entire project, in all three counties, should be limited as a permit condition to the Grant County Ordinance level of no more than 45 dBA at all non-participating residences and 50 dBA at participating residences. Short of a radical enlargement in the project footprint and/or a shift to higher MW units, I don't see any reasonable way of rearranging the project to realistically meet a lower acoustical design goal while still maintaining required PPA output. I also generally agree with the sound test procedure as proposed, especially the requirement that a minimum of 10 on/off tests be carried out to accurately quantify the concurrent background level allowing the project-only sound level to be determined with some confidence through logarithmic subtraction.

Q. There are two other wind projects in the vicinity of the Crowned Ridge II site: Crowned Ridge I Wind and the Deuel Harvest Wind Project. How should their sound emissions be factored into or possibly excluded from any operational sound test of the Crown Ridge II Project?

A. The nearest Deuel Harvest turbines are over 5 miles away from any of the proposed new units, so the two projects have no acoustical interaction and the Deuel Harvest Project may be ignored as an influence on any test.

The Crowned Ridge II Project (CRII), on the other hand, will essentially become a southern extension of the Crowned Ridge I Project (CRI) with no

significant separation. Consequently, the two projects must be considered one project for the purposes of any testing at Crowned Ridge II; i.e. sound measurements made at the northern end of CRII must be taken with all turbines in the area operating, irrespective of which project they actually belong to, and any shutdowns associated with the on/off tests within at least 1 mile of the CRII units must also include the southernmost CRI units within at least 1 mile of the test site. Exhibit DMH-2 is a proposed revision of Richard Lampeter's sound test protocol that is slightly modified to consider the pre-existing Crowned Ridge I units as part of the Crowned Ridge II Project for sound testing purposes.

Q. Questions were raised at the August public input meeting about adverse effects from low frequency noise and the Applicant brought in additional consultants, Mr. Ollson and Dr. McCunney, to rebut those concerns. What is your opinion of their testimony on this matter?

A. In general, I agree with their assessments, backed up by a number of valid technical papers, that no adverse health effects are likely to result from either the infrasonic or low frequency sound emissions from the Project. While I sympathize with those that I have met complaining of "wind turbine syndrome" symptoms, the preponderance of the current evidence, research and mainstream expert opinion indicates that there is no link between the extremely low levels of low frequency sound generated by wind turbines and any adverse health outcomes.

Q. In your testimony in several previous wind turbine dockets before the SDPUC you indicated that you thought a tiny minority of people were sensitive to the infrasonic blade passing pulsation produced by wind turbines, but that this sensitivity was so extremely uncommon, based on the large number of operating wind projects without this problem, that the risk of it occurring was essentially negligible. Has your position on this evolved?

A. Yes. As mentioned above, I have met with people seriously affected by what they feel is the low frequency sound from wind turbines and it is impossible to be dismissive or incredulous of their plight, which led me to have an open mind as to whether some link may be possible through some unknown and potentially unknowable mechanism. A research paper by Cooper in 2017[3] seemed to empirically demonstrate that those known to have a sensitivity to this type of sound could identify it when it was inaudibly reproduced in a laboratory setting. However, after talking about this study with colleagues at the most recent wind turbine noise conference in Lisbon last June I was made aware of a flaw in the study where the higher frequencies in the sample recording (of wind turbine sound inside a house at an Australian wind farm) were not completely inaudible as claimed in the text of the paper, nor was it clear if the reproduced sound actually contained the key low frequency content below 40 Hz, which is beyond the capability of conventional speakers to produce. Consequently, I had to

[3] Cooper, S and Chan, C, "Subjective perception of wind turbine noise – The stereo approach", 174th Meeting of the Acoustical Society of America, New Orleans, December 2017.

dismiss this study as evidence that infrasonic sound from wind turbines is perceptible to certain people.

Moreover, a large number of additional new papers on the subject were presented at the conference that all overwhelmingly concluded that any link between the low frequency sound emissions of wind turbines and adverse health effects was either highly unlikely or impossible. Consequently, while I continue to maintain an open mind on the subject, I would now concur with Mr. Ollson and Dr. McCunney that this or any wind project poses no significant health risk due to infrasound.

Q. How would you then explain the complaints of those who claim adverse effects?

A. The situation is still not entirely clear and may never be fully understood, but an interesting hypothesis by Crichton[4] (Exhibit DMH-3) and others is that such negative outcomes are related to negative expectations stemming largely from exposure to the large amount of rather frightening, non-scientific, anti-wind propaganda on the internet. In a nutshell, Crichton's experiment at the University of Auckland exposed two randomly selected groups of students to video presentations, one with anti-wind content from the internet and another that suggested low frequency sound was therapeutic[5], while also exposing both

[4] Crichton, F. et al., "The Power of Positive and Negative Expectations to Influence Reported Symptoms and Mood During Exposure to Wind Farm Sound", *Health Psychol* (2013), 33:1588-92. Doi:10.1037/hea0000037.

[5] It is believed by some that this may actually be the case. Crichton:

> We found that alternative medicine practitioners have explored the therapeutic impact of infrasound (e.g., Yount, Taft, West, & Moore, 2004) and therapeutic infrasound producing

groups to recordings of sound from a wind project. Not surprisingly, the first group reported such things as headaches, ear pressure, tiredness, etc. while second group actually felt rejuvenated.

Q. Does this conclude your testimony?

A. Yes.

devices are now marketed to the public. These devices have been promoted as alleviating the very symptoms infrasound exposure from wind farms is said to trigger (Haneke, Carson, Gregorio, & Maull, 2001).

CURRICULUM VITAE

DAVID M. HESSLER

Title:	Principal Consultant, Vice-President Hessler Associates, Inc.
Professional Affiliations:	Professional Engineer (P.E.), Commonwealth of Virginia Member Institute of Noise Control Engineering (INCE)
Education:	Bachelor of Science in Mechanical Engineering (B.S.), 1997 *Summa cum Laude* A. James Clark School of Engineering University of Maryland, College Park, MD Bachelor of Arts (B.A.), 1982 University of Hartford, Hartford, CT
Employer:	Hessler Associates, Inc. 38329 Old Mill Way, Unit 8 Ocean View, DE 19970 Years in present position: 28
Office Location:	St. George, UT
Current Job Description:	Acoustical engineer specializing in the prediction, assessment and mitigation of environmental noise from new and existing power generation and industrial facilities. Typical tasks include: • Field measurement studies of existing ambient sound levels in the vicinity of proposed project sites • Computer noise modeling of new facilities prior to construction • Environmental impact assessments for new projects • Noise mitigation design studies of new facilities • Verification measurements of completed facilities • Diagnostic studies of facilities with existing noise problems • Design and specification of noise mitigation measures • Educational lectures on noise issues for private corporations • Expert witness testimony
General Experience:	As an outside consultant to nearly all the major power industry EPC contractors, developers and OEM's, I have been the principal acoustical designer of over 400 power plants and industrial facilities worldwide ranging from a 3900 MW power station in Saudi Arabia to numerous combustion turbine combined cycle plants to refineries and wind turbine projects. Typically, the focus of the work on these projects was to anticipate potential noise impacts at sensitive receptors near the project and recommend practical noise abatement measures to avoid them. In addition, extensive verification measurements in and around the completed power plants and wind farms have been performed to confirm that the design recommendations have been successfully executed.

Wind Turbine Experience:	Over the past 16 years I have performed noise impact evaluations and siting optimization studies for roughly 70 large wind turbine projects in the United States, Canada and the Caribbean, involving nearly all current makes and models of wind turbines. I have developed test protocols and conducted long-term field measurement surveys of numerous newly completed wind projects to evaluate compliance with applicable permit conditions, to investigate complaints and/or to verify the accuracy of pre-construction noise modeling. I have carried out field tests of wind turbine sound power level in strict accordance with the IEC 61400-11 test methodology. I have carried out field measurement studies of operating wind turbines to evaluate their low frequency sound emissions, nacelle noise sources and radial directivity characteristics. I have testified as an expert witness at permitting hearings for proposed wind projects. I have attended six bi-annual Wind Turbine Noise conferences organized by INCE Europe.
Representative Papers and Publications:	"Wind Turbine Noise", Chapter 7 *Measuring and Analyzing Wind Turbine Sound Levels*, Multi-Science Publishing Co., Brentwood, Essex, UK, Jan. 2012. Comprehensive book on all aspects of wind turbine noise. Each chapter written by a recognized expert in that subject. Teleseminar "Wind Turbine Siting and Best Practices", National Regulatory Research Institute (NRRI), Invited speaker, Jan. 2012. "Best Practices Guidelines for Assessing Sound Emissions from Proposed Wind Farms and Measuring the Performance of Completed Projects", Prepared for the Minnesota Public Utilities Commission under the auspices of the National Association of Regulatory Utility Commissioners (NARUC), Oct. 2011. "Accounting for Background Noise when Measuring Operational Noise from Wind Turbines", Fourth International Meeting on Wind Turbine Noise, Rome, Italy, Apr. 2011. "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", *Noise Control Engineering Journal*, J.59 (1), January-February 2011. "Wind tunnel testing of microphone windscreen performance applied to field measurements of wind turbines", Third International Meeting on Wind Turbine Noise, Aalborg, Denmark, June 2009. "Experimental study to determine wind-induced noise and windscreen attenuation effects on microphone response for environmental wind turbine and other applications", *Noise Control Engineering Journal*, J.56, July-August 2008.
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Before the Pennsylvania Department of Environmental Protection on behalf of Waste Management and the Alliance Sanitary Landfill in Taylor, PA, 2006. Support in defending against a Class Action Lawsuit brought by neighbors of the landfill.

Before the Office of the Attorney General of New York on behalf of the Hudson Valley Community College Cogeneration (Diesel) Plant. Support in defending against a Class Action Lawsuit brought by neighbors.

Before the Hanover County (VA) Board of Supervisors on behalf of Martin Marietta Materials and the Doswell Quarry, 2008. Permitting support for a proposed quarry expansion.

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Before the Public Utilities Commission of Ohio, Ohio Power Siting Board on behalf of EverPower Renewables and the Buckeye Wind Project, 2008. Permitting support for a proposed wind turbine project in Ohio.

Before the Wisconsin Public Service Commission on behalf of Clean Wisconsin with regard to the proposed Highland Wind Farm in Forest, WI. Docket No. 2535-CE-100. Engaged as an independent expert to evaluate the Applicant's sound studies and the testimony of opposition groups.

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Before the Maine State Government Energy, Utilities and Technology Committee on behalf of Patriot Renewables and the Beaver Ridge Wind Project, 2014. Peer review of operational sound testing by others.

Before the South Dakota Public Utilities Commission, serving as an outside expert to the PUC Staff reviewing the noise aspects of the Dakota Range Wind permit application, Docket EL 18-003, June 2018.

Before the South Dakota Public Utilities Commission, serving as an outside expert to the PUC Staff reviewing the noise aspects of the Prevailing Wind Park permit application, Docket EL 18-026, October 2018.

Before the Rhode Island Energy Facility Siting Board, serving as an outside expert to the Town of Burrillville, RI reviewing the noise aspects of the Clear River Energy Center permit application, Docket SB-2015-06, December 2018.

Before the South Dakota Public Utilities Commission, serving as an outside expert to the PUC Staff reviewing the noise aspects of the Deuel Harvest Wind Project permit application, Docket EL18-053, April 2019.

Proposed Post Construction Sound Protocol

[Revised to consider the Crowned Ridge I turbines as being part of the Crowned Ridge II Project]

The Crowned Ridge II Wind Project (CRII), exclusive of all unrelated background noise except for that associated with the pre-existing Crowned Ridge I Wind Project (CRI), shall not generate a sound pressure level (10-minute equivalent continuous sound level, Leq) of more than 45 dBA as measured within 25 feet of any non-participating residence unless the owner of the residence has signed a waiver, or more than 50 dBA (10-minute equivalent continuous sound level, Leq) within 25 feet of any participating residence unless the owner of the residence has signed a waiver. The Project Owner shall, upon Commission formal request, conduct field surveys and provide monitoring data verifying compliance with the specified noise level limits. If the measured wind turbine noise level exceeds a limit set forth above, then the Project Owner shall take whatever steps are necessary in accordance with prudent operating standards to rectify the situation.

If a field survey and monitoring data is requested by the Commission, the Project Owner shall submit the test protocol to the Commission prior to conducting the survey and sound monitoring for approval. The test protocol shall include and be implemented as follows:

a) The post-construction monitoring survey shall be conducted following applicable American National Standard Institute (ANSI) methods.

b) Sound levels shall be measured continuously for 14 days in an effort to capture a sufficient quantity of valid readings meeting the wind conditions delineated below in subpart (e). A sufficient quantity shall be defined as 0.5% of the total number of samples, or a minimum of 10 for a 14 day measurement period. As a precaution against the possibility that a sufficient number of valid readings are not automatically recorded during the chosen 14 day sampling period, 10 on/off tests shall be carried out during the survey period when both the CRII and CRI Projects are operating at full power production irrespective of the ground level wind speed. For the on/off tests, all units within *at least* 1 mile of the measurement position shall be shut down for a 10 minute period synchronized with the monitors clocks (starting, for example, at the top of the hour or 10 minutes after, 20 minutes after, etc.). The background level measured during the shutdown interval can then be subtracted from the average of the levels measured immediately before and after it to determine the project-only sound level. The results from these tests may be used to make up for any shortfall in collecting 10 samples measured when the ground level wind speed is low.

c) Measurements shall be conducted at a select number of non-participating and participating residences with the highest expected noise levels and/or at specific residences identified in the Commission's formal request. At least 6 measurement locations total should be selected.

d) Measurements shall be conducted using sound level meters meeting ANSI Type 1 specifications. An anemometer shall be placed within 20 feet of each microphone, and at a height of approximately 2 meters above the ground.

e) The measurement data shall be analyzed as follows:

i. At a minimum, the closest five wind turbines associated with the CRII and CRI Projects will be operating for evaluation periods and when at least the closest wind turbine is operating at a condition at full (within one decibel of maximum sound power levels) acoustic emissions.

ii. Discard those samples measured when the 10-minute average ground wind speed is greater than 5 m/s.

iii. Discard those samples measured during periods with precipitation.

iv. If measured (total) sound levels exceed the sound level limits, determine project only sound levels by removing transient background noise (i.e. occasional traffic, activities of residents, farming activities, and wind gusts) based upon audio recordings, excessive wind gusts, personal observations, and/or comparison of sound level metrics.

v. If measured (total) sound levels exceed the sound level limits, determine project only sound levels by removing, continuous background noise. This approach requires wind turbine shutdowns, where the background noise is measured directly. The background sound level shall be measured with all turbines within *at least* 1 mile of the measurement location temporarily shut down. This would include turbines that are part of the CRI Project for measurement positions in the northern part of the CRII Project. Background noise levels will be subtracted from total noise levels measured during these wind conditions to calculate turbine-only noise levels.

vi. As necessary, review of the frequency spectra of potential turbine-only samples to identify and remove outliers (spectral shape clearly differing from those samples measured under very low (less than 2 m/s) ground wind conditions, which are the samples most representative of turbine only noise).

f) Compare the resulting turbine-only noise levels to the 45 and 50 dBA limits. Compliance shall be demonstrated if all samples are less than the limits.

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The Power of Positive and Negative Expectations to Influence Reported Symptoms and Mood During Exposure to Wind Farm Sound

Fiona Crichton, George Dodd, Gian Schmid, Greg Gamble, Tim Cundy, and Keith J. Petrie
University of Auckland

Objective: Wind farm developments have been hampered by claims that sound from wind turbines causes symptoms and negative health reports in nearby residents. As scientific reviews have failed to identify a plausible link between wind turbine sound and health effects, psychological expectations have been proposed as an explanation for health complaints. Building on recent work showing negative expectations can create symptoms from wind turbines, we investigated whether positive expectations can produce the opposite effect, in terms of a reduction in symptoms and improvements in reported health. ***Method:*** 60 participants were randomized to either positive or negative expectation groups and subsequently exposed to audible wind farm sound and infrasound. Prior to exposure, negative expectation participants watched a DVD incorporating TV footage about health effects said to be caused by infrasound produced by wind turbines. In contrast, positive expectation participants viewed a DVD that outlined the possible therapeutic effects of infrasound exposure. ***Results:*** During exposure to audible windfarm sound and infrasound, symptoms and mood were strongly influenced by the type of expectations. Negative expectation participants experienced a significant increase in symptoms and a significant deterioration in mood, while positive expectation participants reported a significant decrease in symptoms and a significant improvement in mood. ***Conclusion:*** The study demonstrates that expectations can influence symptom and mood reports in both positive and negative directions. The results suggest that if expectations about infrasound are framed in more neutral or benign ways, then it is likely reports of symptoms or negative effects could be nullified.

Keywords: psychological expectations, symptom reporting, environmental risks, wind energy, infrasound

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Sourcing renewable and sustainable energy is widely viewed as necessary to mitigate climate change and address the negative health impacts associated with fossil fuel consumption, such as mortality and morbidity due to cardiorespiratory diseases (Haines, Alleyne, Kickbusch, & Dora, 2012). To this end, harvesting wind power has become a key feature of clean energy development policies in many countries, with the aim of reducing greenhouse-gas emissions and related adverse health outcomes. Yet in many parts of the world wind farm implementation has been stalled by claims that living in the vicinity of wind farms may pose a health risk (Knopper & Ollson, 2011; Chapman, 2011). Given the importance of the role of wind energy in the attainment of clean energy targets worldwide, it is necessary to understand what could be causing reported health complaints and to explore approaches to address these complaints.

The type of health problems reported include a range of nonspecific physical symptoms, such as headache, nausea, ear problems, dizziness, and sleep dysfunction, as well as negative mood states, such as depression (e.g., Pierpont, 2009). Negative health effects from wind turbines have been attributed to the infrasound produced by the operation of wind turbines. Infrasound (sound between .01 and 20 Hz) is generally below the threshold of human hearing and is a common everyday phenomenon. Infrasound is produced by air turbulence and ocean waves, as well as by machinery such as air conditioners, and by internal physiological processes, such as respiration and heartbeat (Leventhall, 2007). Infrasound generated by wind turbines is subaudible and does not exceed typical levels of everyday infrasound exposure (Turnbull, Turner, & Walsh, 2012). Moreover, reviews of the scientific evidence have found the evidence does not support a direct pathophysiological link between the sound produced by wind turbine operations and the health of people living in the vicinity of wind farms (e.g., Ellenbogen et al., 2012; Fortin, Rideout, Copes & Bos, 2013; Knopper & Ollson, 2011).

Research has more recently focused on whether the health complaints by residents in the vicinity of wind farms could be due to psychological expectations. This work suggests that expectations could be established by media and Internet information asserting that adverse health effects are caused by exposure to infrasound produced by wind turbines. The expectations hypothesis is supported by a recent epidemiological analysis of health and noise complaints of Australian wind farms operating since 1993. This analysis shows that the majority of complaints commenced after 2009 and coincided with adverse health effects being promoted by groups opposed to the construction of wind farms

Keith J. Petrie and Fiona Crichton, Department of Psychological Medicine, University of Auckland; George Dodd and Gian Schmid, Acoustic Research Centre, University of Auckland; Tim Cundy and Greg Gamble, Department of Medicine, University of Auckland.

Correspondence concerning this article should be addressed to Keith J. Petrie, Psychological Medicine, Faculty of Medical and Health Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand. E-mail: kj.petrie@auckland.ac.nz

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(Chapman, St. George, Waller, & Cakic, 2013). Further support for the expectations hypothesis comes from a recent sham-controlled double-blind experimental study we conducted. The study showed that healthy volunteers, when given information designed to invoke either high or low expectations that exposure to infrasound causes symptom complaints, reported symptoms that were consistent with the level of expectation (Crichton, Dodd, Schmid, Gamble, & Petrie, 2013).

The provocative question that this research raises is that if negative expectations can create symptoms from wind turbines, can positive expectations produce a reduction in symptoms and improvements in reported health? To investigate this idea further we explored whether infrasound had ever been used as a therapy. We found that alternative medicine practitioners have explored the therapeutic impact of infrasound (e.g., Yount, Taft, West, & Moore, 2004) and therapeutic infrasound producing devices are now marketed to the public. These devices have been promoted as alleviating the very symptoms infrasound exposure from wind farms is said to trigger (Haneke, Carson, Gregorio, & Maull, 2001). We used this information to investigate whether positive health information about infrasound might create positive expectations leading to improved subjective health evaluation during exposure to wind farm sound. Such a finding would have the potential to inform interventions designed to safeguard against future symptom reporting and to reduce or reverse symptomatic experiences attributed to wind farms.

In this experimental study we tested whether the provision of either positive or negative health information about infrasound generated by wind turbines was reflected in participants' symptoms and health perceptions in response to wind farm sound. It was hypothesized that during listening sessions involving simultaneous exposure to audible wind turbine sound and infrasound, participants given negative expectations would experience an increase in the number and intensity of physical symptoms, an increase in negative mood, and a decrease in positive mood, and would evaluate exposure sessions as having adverse health impacts. In contrast, it was also hypothesized that participants given positive expectations would experience a decrease in the number and intensity of physical symptoms, a decrease in negative mood, and an increase in positive mood, and would evaluate exposure sessions as having health benefits.

Method

Sixty undergraduate participants (39 female, 21 male) with a mean age of 19.72 years (SD = 2.66) were recruited by flyers distributed at the University of Auckland. Following recruitment participants were randomly allocated to positive or negative expectation groups. All participants were told the purpose of the study was to investigate the effect of sound below the threshold of human hearing (infrasound) on the experience of physical sensations and mood. Experimental procedures were conducted in a listening room purpose built for subjective sound experiments to the standard set by the International Electrotechnical Commission (IEC268-13). Consistent with the cover story, the research was conducted in the Acoustic Research Centre, a facility associated with the School of Engineering.

Once baseline measurements were undertaken, participants viewed one of two 5-minute, 27-second DVD presentations, each of which contained wind turbine and health material available on the Internet. The negative health information DVD incorporated TV current affairs footage indicating that exposure to wind turbine sound, particularly infrasound, might pose a health risk. In contrast, the positive health information DVD framed wind turbine sound as containing infrasound, subaudible sound created by natural phenomena such as ocean waves and the wind, which had been reported to have positive effects and therapeutic benefits on health. Participants were contemporaneously and continuously exposed to infrasound (9Hz, 50.4dB) and audible wind farm sound (43dB), which had been recorded 1 km from a wind farm, during two 7-minute listening sessions. Both groups were made aware they were listening to the sound of a wind farm, and were being exposed to sound containing both audible and subaudible components and that the sound was at the same level during both sessions. Symptom and mood questionnaires were filled in at baseline and during each exposure period, prompted by a 2-second audible tone (middle C–262Hz) played 2 minutes into each session.

Symptoms and mood were assessed on a 7-point Likert scale ranging from 0 (*not at all*) to 6 (*extreme* or *extremely*). At baseline and during exposure sessions, participants evaluated their experience of 24 physical symptoms (e.g., headache, ear pressure, tiredness), and the extent to which they felt 12 positive mood items (e.g., relaxed, peaceful, cheerful) and 12 negative mood items (e.g., anxious, nervous, distressed). For each rating period a total symptom score was calculated as the number of symptoms experienced with a rating $\geq$1, and a total symptom intensity score was calculated as the sum of the ratings given for all symptoms experienced. Reliability of the symptom questionnaire was established in a previous study (Crichton et al., 2013). Further, for each rating period total positive mood and total negative mood scores were calculated. The symptom and mood scales all demonstrated good internal consistency (Cronbach's alpha for symptom intensity scale = .82; positive mood scale = .95; negative mood scale = .92). As a manipulation check to see if participants believed that exposure periods had influenced their symptoms, participants were asked whether they had experienced an improvement or worsening of symptoms during sessions on two 7-point Likert scales ranging from 0 (*not at all*) to 6 (*extreme*). Symptom improvement or worsening was assessed as a score $\geq$1. This assessment occurred in a room adjoining the listening room after experimental procedures had concluded.

Results

We first conducted mixed model analysis of covariance to assess within- and between-group differences in terms of change from baseline in symptom reporting during exposure session 1 and exposure session 2, controlling for baseline scores. These data are depicted in Figure 1. Results showed a significant interaction between expectation group and exposure session in relation to both symptom change scores, $F(1, 58) = 13.95$, $p < .001$, and symptom intensity change scores $F(1, 58) = 16.27$, $p < .001$. Tukey-Kramer post-hoc tests revealed that expectation group allocation differentially influenced symptom reporting during exposure sessions. There were significant differences between the negative expectation group and the positive expectation group in relation to symptom change scores during session 1 ($p = .005$) and session 2 ($p < .001$), and similarly, in relation

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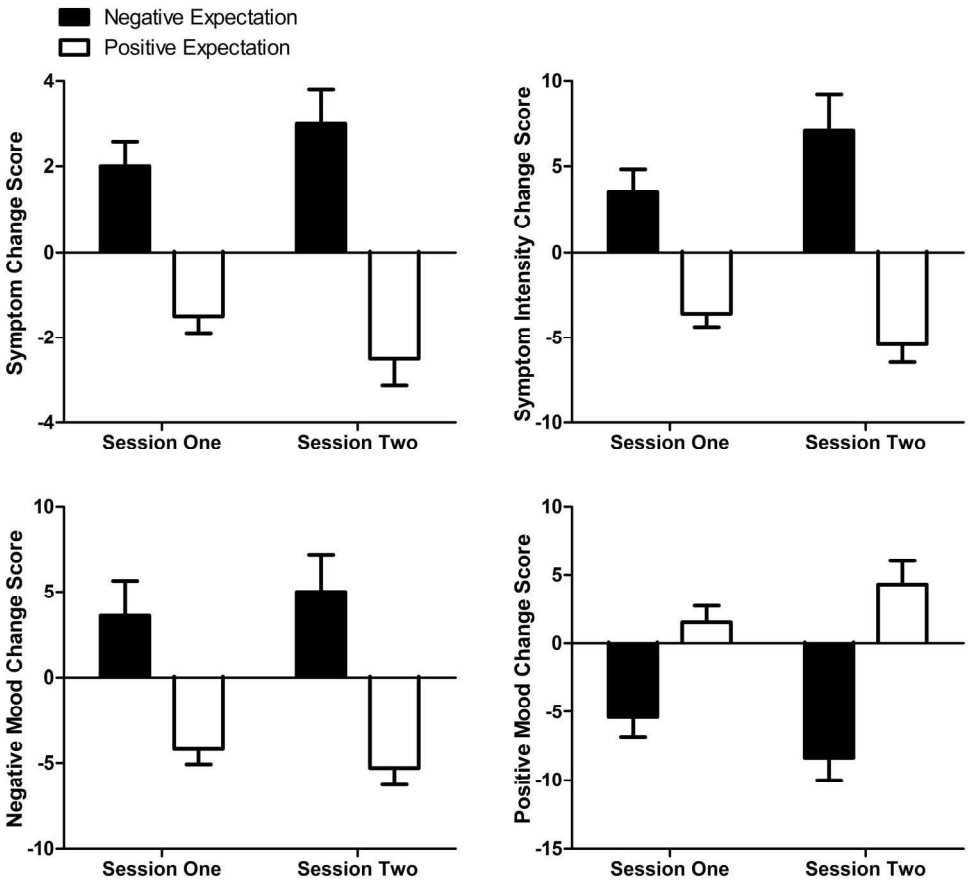


Figure 1. Changes in symptoms, symptom intensity, and mood in negative and positive expectation groups.

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to symptom intensity change scores during session 1 ($p = .01$) and session 2 ($p < .001$). There were also within group differences in symptom reporting in the negative expectation group during session 1 and session 2 in respect of symptom change scores ($p = .037$) and symptom intensity change scores ($p = .002$). Thus negative expectation group participants became more symptomatic over time, suggesting that experiences during the first exposure session reinforced symptom expectations leading to heightened symptomatic experiences.

To check whether the manipulation had also triggered a significant symptomatic change from baseline, we conducted repeated measure ANOVAs, using Greenhouse-Geisser correction when the assumption of sphericity had been violated, on mean symptom and symptom intensity scores recorded at baseline, during Session 1, and during Session 2, as reported in Table 1. Results showed that participants in the negative expectation group recorded a significant increase from baseline in the number of symptoms experienced $F(1.36, 39.45) = 12.12$, $p < .001$, $\eta_p^2 = .30$. Analysis revealed there were significant increases from baseline in the number of symptoms reported during both session 1 ($p = .002$) and during session 2 ($p = .001$). This pattern was also seen in relation to symptom intensity, whereby, an increase in symptom intensity was recorded from baseline $F(1.32, 38.35) = 9.57$, $p = .002$, $\eta_p^2 = .25$, and analysis showed significant increases in symptom intensity from baseline reported both during session 1 ($p = .013$) and during session 2 ($p = .002$). As predicted, in the positive expectation group there were significant decreases from baseline in the reported experience of both the number of symptoms $F(1.31, 37.92) = 14.56$, $p < .001$, $\eta_p^2 = .34$ and symptom intensity $F(1.25,36.26) = 23.72$, $p < .001$, $\eta_p^2 = .45$.

In terms of the number of symptoms, there were decreases from baseline during session 1 ($p = .001$) and session 2 ($p < .001$). This pattern was also reflected in relation to reported symptom intensity, whereby there was a decrease from baseline during session 1 ($p < .001$) and session 2 ($p < .001$).

Table 1
Mean (SD) Symptom and Mood Scores in the Negative Expectation (NE) and Positive Expectation (PE) Groups

	N	Group	Baseline	Session 1	Session 2
Symptom score	30	NE	5.2 (2.8)	7.2 (3.1)	8.2 (3.6)
	30	PE	6.7 (3.2)	5.2 (2.9)	4.2 (3.3)
Symptom intensity score	30	NE	9.1 (5.8)	12.7 (6.3)	16.3 (10.0)
	30	PE	11.8 (7.4)	8.2 (5.2)	6.4 (4.7)
Negative mood score	30	NE	7.5 (6.8)	11.1 (10.4)	12.5 (11.0)
	30	PE	9.3 (10.7)	5.1 (8.1)	4.1 (6.8)
Positive mood score	30	NE	37.0 (10.1)	31.5 (13.3)	28.6 (14.1)
	30	PE	34.4 (9.3)	35.9 (9.7)	38.7 (10.4)

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We further performed a mixed model analysis of covariance to assess within and between group differences in terms of change in positive and negative mood from baseline during exposure session 1 and exposure session 2, controlling for baseline scores. These data are also illustrated in Figure 1. In terms of change in negative mood from baseline, there was a significant main effect of group allocation, $F(1, 57) = 18.26$, $p < .001$. In relation to change in positive mood from baseline, analysis revealed a significant interaction between group and session, $F(1, 58) = 17.59$, $p < .001$. Tukey-Kramer post-hoc tests showed differences between the groups in relation to positive mood change scores during session 1 ($p = .011$) and during session 2 ($p < .001$). Further, there were within-group differences, such that from session 1 to session 2 there was a significant decrease in positive mood in the negative expectation group ($p = .016$), and a significant increase in positive mood in the positive expectation group ($p = .03$).

To assess whether mood during exposure sessions was significantly different from baseline assessment, we also conducted repeated measures ANOVA. Mood scores are also presented in Table 1. In relation to the negative expectation group, analysis revealed an increase in negative mood $F(1.48, 43.0) = 3.77$, $p = .043$, $\eta_p^2 = .12$, and a decrease in positive mood $F(1.46,42.18) = 20.48$, $p < .001$, $\eta_p^2 = .41$ from baseline. The increase in negative mood from baseline occurred during session 2 ($p = .031$). In relation to positive mood, there was a decrease from baseline during session 1 ($p = .001$) and session 2 ($p < .001$). In the positive expectation group there was a decrease from baseline in negative mood $F(1.66,48.12) = 21.54$, $p < .001$, $\eta_p^2 = .43$, and an increase in positive mood $F(1.46,42.31) = 4.99$, $p < .05$, $\eta_p^2 = .15$. Analysis showed a significant decrease from baseline in negative mood during session 1 ($p < .001$) and session 2 ($p < .001$). The significant increase in positive mood occurred during session 2 ($p = .02$).

In terms of the evaluation of perceived health impacts of infrasound exposure, 90% of the positive expectation group reported an improvement in physical symptoms after the listening sessions had concluded compared to 10% of the negative expectation group (χ^2 (1, $n = 60$) = 16.48, $p < .001$, $phi = -.52$). Consistent with this finding, 77% of the negative expectation group reported a worsening of symptoms during exposure, compared to 10% of the positive expectation group (χ^2 (1, $n = 60$) = 27.15, $p < .001$, $phi = .67$).

Discussion

In this study the experience of symptoms and mood during exposure to audible windfarm sound and infrasound was influenced by the type of expectations provided prior to the listening sessions. Participants randomized to the negative expectation group showed significant increases in the number and intensity of symptoms when exposed to windfarm sound, while participants given positive expectations about the sound showed the opposite pattern, with a significant reduction in the number and intensity of symptoms. The effect of expectations on mood following exposure to wind farm sound showed a very similar pattern with increases in negative mood in the negative expectation group and increases in positive mood in the positive expectation group.

The finding that negative expectations about windfarm sound prompted increased symptom reporting during exposure to infrasound is consistent with earlier research. In a previous sham-controlled experiment, the information that infrasound exposure has been reported to cause symptoms created elevated concern about the health effects of windfarms and triggered symptoms during exposure to both sham and genuine infrasound. The study demonstrated that symptom reports were provoked by expectations rather than any effect of actual infrasound (Crichton et al., 2013). The results are also consistent with other research indicating health warnings may elicit health complaints, even when the risk itself is purely one of perception and no genuine risk is posed (Colloca & Miller, 2011; Faasse, Gamble, Cundy, & Petrie, 2012; Faasse & Petrie, 2013). In one such study, viewing a TV report about purported health risks associated with exposure to electromagnetic fields produced by WiFi was shown to increase the likelihood of experiencing symptoms following sham exposure to a WiFi signal (Witthöft & Rubin, 2013). Evidence indicates that such information can increase anxiety and create related symptom expectations, which trigger later increased symptom reports (Faasse & Petrie, 2013).

It is important to note that this is the first study to demonstrate that participants exposed to wind farm sound experienced a placebo response elicited by positive pre-exposure expectations. Participants reported positive health effects during exposure to wind farm sound if they were given expectations that infrasound produced health benefits. These findings are consistent with previous work showing participants exposed to white noise, within a context designed to produce therapeutic expectations, evaluated the exposure as significantly more pleasant, relaxing, and beneficial than participants simply exposed to white noise without expectations (Kendrick & Elkins, 2012). The malleability of symptom reporting has also been demonstrated in an experiment where participants placing their finger on a rough vibrating surface interpreted the experience as pleasurable, painful or neutral, depending upon the way in which the stimulus was described prior to the experiment (Anderson & Pennebaker, 1980).

The study has two important implications. First, it provides further evidence that information easily accessible on the Internet concerning the health effects of wind turbines can create symptom expectations that are reflected in symptom and health reports. The fact that negative expectations in the current study were formed by viewing TV material sourced from the Internet suggests that a pathway for symptom reports attributed to wind farms could be via expectations created by media coverage about purported health effects. Second, the study demonstrates that if information about infrasound were framed in more neutral or benign ways, then reports of symptoms or negative health effects are likely to be nullified.

It should be noted that the study is limited by the fact that discrete sound exposure periods in a listening room may not entirely duplicate the experience of sound in the locale of a wind farm. However, the study has added ecological validity in that exposure was to audible sound recorded from a wind farm, overlaid with infrasound, and the health expectations were constructed using material easily available on the Internet. It should also be noted that it cannot be conclusively determined whether negative experiences triggered by negative health expectations can be reversed or alleviated by the later provision of positive information, or whether positive health information can protect against the future effects of exposure to negative health information, such as

is often circulated in communities where wind farms are proposed or operating (Chapman, 2011). This issue is of importance given that current media coverage has been shown to incorporate fright factors that may induce fear, anxiety, and concern about the health risk posed by wind farms (Deignan, Harvey, & Hoffman-Goetz, 2013). Future research should investigate whether positive expectations can change symptomatic experiences in participants previously made aware of negative health information, or provide a buffer against the influence of the later delivery of negative expectations. As part of this research, it will be important to discuss the ethical implications of using placebo effects as part of a public health strategy to counteract the effect of negative expectations. Such research could provide further evidence useful to inform strategies designed to reduce anxiety and symptom reporting in those living in the vicinity of wind farms.

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BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. EL19-027

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES, SOUTH DAKOTA, FOR CROWNED RIDGE II WIND FARM

Direct Testimony of Hilary Meyer
On Behalf of the Staff of the South Dakota Public Utilities Commission
December 5, 2019



Q: State your name.

A: Hilary Meyer

Q: State your employer.

A: State of South Dakota, Department of Game, Fish, and Parks

Q: State the program for which you work.

A: Division of Wildlife, Terrestrial Resource Section

Q: State the program roles and your specific job with the department.

A: The role of the Terrestrial Resources section is to study, evaluate, and assist in the management of all wildlife and associated habitats. Management includes game and non-game wildlife populations, habitat management on public lands and technical assistance and habitat development on private lands, population and habitat inventory, and environmental review of local and landscape projects. As the environmental review senior biologist, I coordinate reviews of various development projects within the state of South Dakota to assist developers with compliance with state wildlife laws and to serve as stewards of our state's outdoor resources.

Q: Explain the range of duties you perform.

A: Duties include coordinating environmental review evaluations and responses related to terrestrial and aquatic issues with department staff and represent the Department on state and national committees.

Q: On whose behalf was this testimony prepared?

A: This testimony was prepared on behalf of the Staff of the South Dakota Public Utilities Commission.

Q: What role does the Department of Game, Fish and Parks have in the permitting process of a wind energy development project?

A: Game, Fish and Parks has no regulatory authority when it comes to permitting wind energy development projects. The agencies role is to consult with developers and provide recommendations and suggestions on how to minimize or remove potential impacts to wildlife and associated habitats or provide available information to make informed decisions as related to natural resources.

Q: Have you reviewed the Application and attachments? How else did you learn details around the proposed project?

A: Yes, relevant sections of the application and attachments and also discussed project details with GFP biologists who have had direct communications with the developer, or that have specialized expertise related to wildlife species or the project location.

Q: Did the GF&P provide comments and recommendations to Crowned Ridge II about the project area? Please identify who provided those comments and provide a brief summary of them.

A: Game, Fish and Parks was initially contacted in October 2007 by TetraTech to request a search of GFP listed threatened or endangered species, and any additional environmental concerns for the project area. A response was sent in December of 2007 by Silka Kempema, wildlife biologist. During this initial contact, information about species of concern and important or sensitive wildlife habitats in the project area were shared with the applicant. Additionally, in November 2007, Doug Backland, wildlife biologist provided a shapefile of threatened, rare, or endangered species present within the project area (natural heritage database review). In December 2009, TetraTech contacted GFP to request an additional natural heritage database review. Game, Fish and Parks provided a list of species occurrences for the project area. In November of 2010, Western Area Power Administration (WAPA) contacted GFP with a scoping notice for the Crowned Ridge Wind Energy Center in Codington County, South Dakota. GFP replied to the WAPA scoping notice in January 2011 with a letter describing important wildlife habitats (grasslands, wetlands, etc.), information about rare, endangered or threatened species that could occur in the project area as well as general wildlife survey guidelines. In March 2014, GFP provided historic grouse lek locations in and around the project boundary. Game, Fish and Parks was contacted by TetraTech in February

2015 requesting information regarding ecologically significant areas and listed endangered, threatened or special concern species at a potential wind energy development site in Codington and Grant Counties, South Dakota. Game, Fish and Parks staff replied to their request in March 2015 with a letter describing ecologically sensitive areas in the project area and advising an up-to-date Natural Heritage database request, based on the amount of time that passed since the previous request. Information was also included about important wildlife habitats, avoidance of turbine placement in and around public lands, recommendations on transmission line construction and general wildlife survey guidelines for pre and post construction surveys. In March 2017, GFP was first contacted by Nextera, and Ms. Kempema recommended an in-person meeting for the opportunity to review proposed turbine layout and wildlife surveys that had been conducted to-date. In April 2017, a conference call with GFP, USFWS and Nextera was conducted to share a project overview, as well as results from wildlife surveys. During this conference call, Ms. Kempema recommended Nextera avoid placing turbines in untilled grasslands and wetlands, and recommended a 1 mile no-construction buffer around grouse leks. Ms. Kempema also requested a copy of any wildlife survey reports, and recommended a site-visit with GFP and USFWS. In July 2017, GFP received a request from SWCA Environmental Consultants to request information regarding ecologically sensitive areas and federally and state listed endangered, threatened or special concern species in the

Crowned Ridge project area. Results from a natural heritage database search was provided to SWCA in August 2017. On April 3rd, 2019, SWCA Environmental Consultants requested information regarding ecologically sensitive areas and federally and state listed endangered, threatened or special concern species in the Crowned Ridge project area. Results from a natural heritage database search were provided to SWCA on April 26th 2019.

Q: Do you agree with the comments and recommendations provided to Crowned Ridge II by Ms. Kempema? If not, please explain.

A: Yes. These are typical discussion topics and recommendations our Department would share with wind power companies to identify, minimize, or reduce impacts to wildlife and wildlife habitats, especially those projects that are proposed in grassland and wetland habitats.

Q: Based on the information provided in the Application, in your opinion did Crowned Ridge II utilize the proper studies and wildlife surveys necessary to identify potential impacts to the terrestrial environment?

A: Pre-construction wildlife survey data usually incorporates a small snap-shot in time (ex. monthly large bird counts) but is used to assess risks for the life of a project (~30 years) therefore, it is important to perform surveys with a high degree of scientific rigor. The US Fish and Wildlife Service

(USFWS) Land-Based Wind Energy Guidelines (hereafter referred to as USFWS guidelines) are intended to encourage scientifically rigorous survey, monitoring, assessment and research designs, produce potentially comparable data across the nation, and improve the ability to predict and resolve effects of wind energy development locally, regionally and nationally. These guidelines, along with GF&P siting guidelines (https://gfp.sd.gov/userdocs/docs/SDSitingGuides_2018-10-17.pdf) are voluntary suggestions (USFWS 2012).

Survey methods used by Crowned Ridge followed the USFWS guidelines, and were reasonable and appropriate. Crowned Ridge conducted aerial raptor nest surveys, avian use surveys, large bird use surveys, grouse lek surveys, bat acoustic surveys, bat habitat assessments and an endangered butterfly habitat assessment.

Q: **What are the potential impacts to wildlife as a result of the construction of a wind project?**

A: Direct; birds and bats can be killed by turbines due to direct strikes. Indirect; some species may be displaced from otherwise suitable habitat around turbines and roads. A research project on the effects of wind energy on breeding grassland bird densities in North and South Dakota showed seven of nine species of grassland birds had reduced densities around wind turbines over time (Shaffer and Buhl 2016).

Q: What potential impacts to wildlife habitat can result from a wind project?

A: Permanent loss; habitat is permanently converted to turbine pads, roads or buildings. This is often a small percent of the total project acreage (area defined by wind easements or otherwise defined project boundary). Temporary loss; habitat is disturbed for a time during construction (e.g. widened roads, crane paths) but is restored. Fragmentation; habitat fragmentation is the division of a block of habitat into smaller, and at times into isolated patches. Habitat fragmentation can decrease the overall value of the remaining habitat.

Q: Can you suggest methods to address temporary and permanent changes to habitat?

A: Temporary impacts to habitat resulting from construction activities likely can be reclaimed by restoring impacted areas by grading and reseeding. Disturbed areas should be restored using native seed sources to reduce the introduction of new or discourage encroachment of already present exotic and/or invasive species.

For those areas that are permanently changed, lost grassland or wetland acres could be addressed through consideration of mitigation options. Disturbed areas again should be restored using native seed sources to

reduce the introduction of new or discourage encroachment of already present exotic and/or invasive species. It would also be recommended that if lost acres are replaced to carry out these replacement activities in the closest possible proximity of the project.

Q: **Are there any other impacts besides temporary and permanent habitat impacts that are likely to occur as a result of the project?**

A: Indirect habitat impacts are also a consideration. Potential indirect impacts created by wind turbines and associated infrastructure raise concerns with habitat fragmentation and potential displacement, especially with regards to breeding grassland and wetland species. Research into the effects of wind energy on habitat avoidance has shown that some species will not use grassland or wetland habitat within a certain distance of a wind turbine (Loesch et al. 2013, Shaffer and Buhl 2016).

Q: **Did GFP have any wildlife or habitat concerns regarding the proposed Crowned Ridge II project? If yes, what are they?**

A: Yes. The area of primary interest is the potential impacts to the various grassland habitats and associated wildlife.

Q: **Did GFP provide any recommendations to avoid wildlife and habitat impacts from Crowned Ridge II? If yes, what were they?**

A: Yes. The primary recommendations were to site turbines and associated infrastructure in cropland, minimize fragmentation, utilize existing infrastructure and avoid siting turbines in grasslands, and completion of post-construction surveys for bat and bird mortality which could be used in assisting with operational adjustments in the future. Game, Fish and Parks also recommended a 1 mile no surface occupancy buffer for placement of project infrastructure near prairie grouse (greater prairie chicken and sharp-tailed grouse) leks, and a 2 mile no construction buffer around leks during the breeding season (1 March-30 June).

Q: Are there different types of grasslands?

A: Yes.

Q: Please describe the following: native prairie, hayland, pasture, CRP, and cropland.

A: Grasslands are areas that contain plants species such as graminoids and commonly used for grazing or set aside for conservation purposes. They can also be areas which are planted to a mixture of grasses and legumes for livestock grazing or feed. Native prairie is grassland upon which the soil has not undergone a mechanical disturbance associated with agriculture or any other type of development. Hayland is grassland that is managed by frequent mowing and often contains non-native plant species either intentionally or by encroachment. Pasture is grassland that may

contain non-native plant species either intentionally or by encroachment and is managed by through grazing. In some instances hayland and pasture could be native prairie; in other situations hayland and pasture in particular could be land once cultivated and restored to grassland habitat. Conservation Reserve Program acres (CRP) is grassland that occurs on land that was once tilled and used for crop production and has now been seeded to herbaceous cover to address soil loss, water quality, and provide wildlife habitat. Cropland could be described as agricultural lands cultivated and used to grow crops such as corn, soybeans, small grains, and others.

Q: **Are there any areas of native prairie in the proposed project?**

A: Yes. Spatial analysis conducted by Bauman et al. (2016) has identified potentially undisturbed lands within the proposed project boundary. This is one of the best available spatial data sets representing the location of untilled native grasslands. The applicant also identified within the application an estimated 17,889 acres of untilled grassland within the project area (pg. 49).

Q: Do grasslands other than native prairie have conservation value?

A: Yes. Given the loss of native prairie, working grasslands like pasture, hayland, and conservation grassland plantings serve as surrogates for native grasslands.

Q: To your knowledge, are there grazed grasslands in the project area?

A: Yes.

Q: Do grazed grasslands have any conservation value and what is the impact to grassland wildlife?

A: All grasslands have a conservation value, including those managed through grazing. Grassland birds require a diversity of grassland types and structure to complete life-cycle requirements. Studies have shown that grassland birds respond primarily not to variation in plant species composition but to the structure that these plants provide. Grassland birds have evolved with a gradation of grazing intensities. Grassland wildlife diversity can be maximized by creating a heterogeneous landscape comprised of short, medium and tall vegetation structures. Grazing (haying and burning) management can provide this variation in vegetative structure. Changes in land management and annual precipitation levels can alter plant species composition and vegetation structure of grassland within a short timeframe.

Q: One of the GF&P's recommendations was that efforts should be made to avoid placement of turbines and new roads in grasslands, especially untilled native prairie. Based on the information in the Application and the proposed turbine layout, did Crowned Ridge II

demonstrate efforts to address this recommendation? Please explain.

A: Data from the application indicates that approximately 11,599 acres of the 60,996 acre project area is native prairie habitat. From reviewing the available maps within the application there were efforts to avoid placement of turbines on untilled native prairie as approximately less than 20 of the no more than 132 planned turbines appear to be positioned in native prairie. A continued recommendation for wind development is to avoid untilled native prairie habitat to the greatest extent possible. It appears that multiple turbines are being planned in cultivated land (disturbed) which from a wildlife perspective is a positive siting approach. Some turbines will likely be placed on other types of grassland habitats (hay and pasture) within the project area. Avoidance of all grassland habitat will be challenging in this part of the state and in the project area as a high proportion of the total area is some type of grassland/herbaceous habitat as demonstrated by the application indicating that project construction easement is approximately 22% grass/pasture (Table 11.1).

Q: One of GF&P's concerns around wind farm development is the fragmentation of contiguous blocks of grasslands. Why is fragmentation a concern?

A: Fragmentation results in the direct loss of habitat and diminishes the value of remaining habitat. Habitat fragmentation is the division of large

contiguous blocks of habitat into smaller, and in some instances isolated patches. Identification of contiguous blocks of habitat, especially in predominantly non-habitat landscapes is an important component of grassland and wetland bird conservation.

Q: **Are there any areas of contiguous grassland habitat in the proposed project?**

A: Yes. Reviewing maps and figures provided with the application, it appears that the northern tier and southeastern section of the project area have the highest level of contiguous blocks of grassland habitat.

Q: Based on the information available does the GF&P have concerns over the placement of turbines and roads in contiguous blocks of grassland?

A: Based on reviewing available information, fragmentation of grassland habitats were avoided/minimized in some of the project area through the proposed layout of the infrastructure of the project. This is a result of primarily utilizing tilled agricultural fields for turbine locations. There are other locations of the project area which the placement of turbines will likely create some level of fragmentation of smaller grassland blocks (comprised of different grassland cover types: hay, pasture, etc.).

Q. Does the state or GF&P have specific mitigation recommendations that will minimize or compensate potential impacts from wind energy development if they cannot be avoided?

A. At the current time South Dakota does not have a state mitigation policy that can be provided to wind energy developers. However, there are resources available which can provide guidance and suggestions that can be considered as well as self-imposed actions or activities that can minimize natural resource impacts.

Q: What are potential mitigation considerations?

A: Mitigation can take multiple forms and can be accomplished in a multitude of ways. It could be an approach which implements an applied management activity/strategy on impacted lands which elevates these lands to a more productive state or higher ecological state (example – grazing management) to an approach which is more sophisticated and detailed using tools developed to calculate acres of habitat to be restored or created based on impacted acres and other relevant research data (example – decision support tool). Examples that are available specifically for wind energy projects is a decision support tool based off the research conducted by Loesch et al. (2013) that considers breeding waterfowl and another which focuses on breeding grassland songbirds resulting from research findings of Shaffer and Buhl (2016). Additionally, Shaffer et al.

(2019) describes a standardized method to estimate offsets based on results of Shaffer and Buhl 2016 and Loesch et al. 2013).

As stated earlier South Dakota does not have a state mitigation policy nor does the state endorse these studies and resulting products, however it is worthy of mentioning these tools demonstrating resources available to developers and managers.

Q: The GF&P recommended that turbines should not be placed in or near wetland basins and special care should be made to avoid areas with high concentrations of wetlands. Do you believe that Crowned Ridge II's proposed turbine layout incorporates this recommendation?

A: The application mentions under the wetland and waterbody impacts/mitigation section that project facilities have been sited to avoid both temporary and permanent impacts to wetlands and waterbodies to the extent possible. These are appropriate measures. Reviewing the turbine layout and using NWI wetland information for the project area, some turbines appear to be placed in areas of higher concentrations of wetland basins (specifically in the central and southeastern portions of the project). However, based on review of recent aerial imagery, many of these wetlands appear to be converted to crop production or reduced in size. It will be challenging to avoid areas of wetland concentrations and

other water bodies simply based on the total number different water bodies present in this part of the state and project area. Recommendations to avoid areas of higher concentrations of wetlands is supported by findings from Loesch et al. (2013).

Q: **Are you aware of any other wind farms near this proposed project?**

A: Yes. I am aware of projects in the area by reviewing the map of wind projects found on the PUC website indicating projects either in the status of existence, proposed, pending, or under construction.

Q: Does the GF&P have any thoughts regarding the potential for cumulative impacts the Project may have?

A: As projects are completed and based on location and proximity to other projects, the question of cumulative impacts will become more apparent. Knowing the importance of native prairie tracts and other forms of grassland habitat to several grassland dependent species, continued development on these types of lands could result in reduced or limited habitat value. Placement of turbines in lands currently under cultivation and avoiding where possible the different varieties of grassland and wetland habitats will help minimize potential cumulative impacts.

Our agency will continue to work with wind developers and provide recommendations that we believe will help minimize cumulative impacts.

No different than offered to this project, the focus could include, but not limited to, recommendations on avoiding grassland habitats, in particular native prairie remnants, avoidance of high wetland complex areas, maximize the use of existing corridors for infrastructure, and pre and post construction surveys to assess the proposed project area that may assist in operational decisions.

Q: Do any State threatened or endangered species have the potential to be impacted by the wind farm?

A: Two creeks (Stray Horse and Willow Creek) within the project boundary are known Topeka Shiner streams. We have records of Topeka Shiners within the project area, and immediately outside the project area, According to the application, Crowned Ridge II will file a storm water pollution prevention plan and put in place practices to reduce or eliminate sedimentation. These actions will help reduce potential negative impacts to Topeka Shiners that may be in or near the project area. Additionally, Crowned Ridge II proposes to directionally bore under streams to reduce impacts to streams, which will also reduce impacts to Topeka Shiners.

Q: Are there any GF&P lands or other public lands that may be impacted by the wind farm?

A: At the time of the application, there were five walk-in-area parcels within the project area; zero turbines are planned on these properties. These

properties are privately owned and an agreement with GFP opens them to free public access for hunting. Should a Walk-In Area be temporarily disrupted due to construction activities, GFP would ask we are notified to determine whether any action is required from our agency to notify the public.

No Game Production Areas are present within the project area and three Game Production Areas are located immediately adjacent to the project boundary. For clarification, Game Production Areas and Waterfowl Production Areas are not private land leased by GFP. Game Production Areas are owned by the State of South Dakota and managed by GFP. Waterfowl Production Areas are federally owned public land and managed by the US Fish and Wildlife Service.

Q: Does the GF&P have any recommendations to protect those GF&P lands or other public lands?

A: The state does not have an established set-back policy or recommendation for wind turbine placement in proximity to state properties such as Game Production Areas. Set-back policies have been established at local levels by local government entities and in some instances have been suggested as the potential set-back distance from state properties. At this time, it is the state's belief that these types of policies be established at the local level and at the discretion of the PUC

Commission to impose such set-backs when considering wind energy permits. Game, Fish and Parks is not aware of any local laws or ordinances that establish set-back distances from state properties for this project.

Q: If the final turbine locations changed from those provided in the proposed turbine layout, could the potential terrestrial environment impacts change?

A: Yes.

Q: You mentioned the applicant requesting data from the Natural Heritage Database. What is the South Dakota Natural Heritage database? What type of information does it contain?

A: The South Dakota Natural Heritage database tracks species at risk. Species at risk are those that are listed as threatened or endangered at the state or federal level or those that are rare. Rare species are those found at the periphery of their range, those that have isolated populations or those for which we simply do not have extensive information on.

This database houses and maintains data from a variety of sources including site-specific surveys, research projects and incidental reports of species that cover a time period from 1979 to the present. It is important to

note that the absence of data from this database does not preclude a species presence in the proposed project area.

Q: In a previous docket (Crowned Ridge), Game, Fish and Parks recommendation related to post-construction prairie grouse lek monitoring. Does Game, Fish and Parks have a similar recommendation for the Crowned Ridge II project?

A: Game, Fish and Parks recommended post-construction grouse lek monitoring of confirmed leks less than 1 mile from any wind turbines in the crowned ridge project. The Crowned Ridge II project had one GFP documented lek reported for the project area. Although the Department still has concerns over the effect of wind energy development on prairie grouse, we are not recommending a similar permit condition for the Crowned Ridge II project. Game, Fish and Parks is currently partnering with Crowned Ridge (Nextera and Excel Energy) to design and implement a prairie grouse telemetry study at the Crowned Ridge project to fulfill the applicants permit condition. This study will be more robust, and will be longer duration (3 year minimum vs. 2 years) as originally outlined in the permit condition. Due to the willingness of the applicant (Nextera/Crowned Ridge II) to undertake a more rigorous study on the potential impacts of wind energy to prairie grouse, Game, Fish and Parks is not recommending a similar permit condition for Crowned Ridge II.

Q: In summary, does GF&P offer any specific permit recommendations should the permit be granted?

A: Game, Fish and Parks recommends that the applicant be required to contact the department at least 60 days prior to the start of construction to coordinate public access to walk-in areas that may be temporarily disrupted due to construction activities. Game, Fish and Parks will then determine if any action is required from our agency to notify the public of any changes to public access. Possible actions by GFP include: updating the public hunting atlas (if notified before May 1st of construction year), updating the public access map in the GFP app and additional signage at affected properties during construction activities. Providing up-to-date information on timing of construction in or near walk-in areas will help ensure the safety of construction crews and hunters.

Q: Does this conclude your testimony?

A: Yes.

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Hilary A Meyer

South Dakota Game, Fish and Parks
523 E Capitol Ave
Pierre, SD 57501
605-773-6208 (office)
Hilary.Meyer@state.sd.us

Education

2011 M.S. Wildlife and Fisheries Science-Fisheries Option. South Dakota State University (SDSU), Brookings, SD.

Thesis: Influence of Diet and Environmental Variation on Physiological Responses of Juvenile Pallid Sturgeon (*Scaphirhynchus albus*).

2009 B.S. Fisheries and Water Resources-Fisheries Option, and Biology with Aquaculture minor. University of Wisconsin-Stevens Point (UWSP), Stevens Point, WI.

Professional Experience

Environmental Review Senior Biologist October 2018-present

SD Game, Fish and Parks, Pierre, SD

I review proposed development projects in the state of South Dakota. As part of the review process, I provide information on wildlife, wildlife habitat and work with developers to help them avoid or minimize conflicts with wildlife and wildlife habitat. I serve on the Interagency Review Team (IRT) for reviewing wetland mitigation projects and banking instruments. I work extensively with other state agencies to provide information and recommendations related to wildlife and provide expert opinion and testimony. I represent South Dakota on the Midwest Landscape Initiative Wind Energy Working Group and the Western Association of Fish and Wildlife Agencies (WAFWA) Crucial Habitat Assessment Tool Technical and Policy Committee.

Fisheries Biologist April 2013 – October 2018

SD Game, Fish and Parks, Ft. Pierre, SD

I lead and assisted field crews to complete biological surveys on Lake Sharpe and Lake Oahe in central South Dakota. Biological surveys included deploying gear such as: mono and multifilament gill nets, boat electrofishing, trotlines, fyke nets and drifted trammel

nets. I was the project lead for conducting nightime hydroacoustics surveys on Lake Oahe for coldwater prey fish (rainbow smelt and lake herring). I assisted with age-estimation of hard structures (otoliths, scales and fin rays), annual report review and preparation, manuscript preparation, manuscript reviews, creating presentations for public outreach, creating professional presentations and reviewing presentations for co-workers. I managed a multi-species acoustic telemetry database as part of multiple research projects on Lake Sharpe, SD. I wrote and reviewed research proposals to secure project funding. I hired, trained, supervised and mentored seasonal fisheries technicians (1-2 per field season) and assisted with mentoring and training numerous fisheries interns. I assisted with the development of new station projects, and performed data analysis as needs arose. I presented results of such analyses in the form of technical presentations to stakeholder groups and peer groups at professional meetings. I participated in and assisted in coordinating multiple outreach and education events throughout South Dakota.

Biological Science Technician (Fisheries) December 2011 – April 2013

U.S. Fish and Wildlife Service, Columbia, MO.

I lead and assisted field crews to complete biological assessments on the lower Missouri River. Biological assessments include deploying gear such as the otter trawl, experimental mesh gillnets, trotlines, mini-fyke nets, drifted trammel nets, push trawl and electrofishing. I conduct and assist in data collection on field computers (tablets), and oversee data management/quality control. I conduct standardized sampling to monitor long-term pallid sturgeon population trends and long-term fish community trends. I have also lead electofishing crews in the Chicago Area Waterway System (CAWS) to monitor for Asian carp presence, and assisted with environmental DNA (eDNA) sampling in the CAWS. I assisted the USFWS-Carterville office with reviewing Dual Frequency Identification Sonar (DIDSON) videos. I am responsible for writing annual reports, paper datasheet quality control, analyzing long-term datasets and maintaining multiple databases (Microsoft Access) for the Pallid Sturgeon Population Assessment Program. I participated in and assisted in coordinating multiple outreach and education events throughout the Columbia, Missouri area. I supervised and trained seasonal employees on Pallid Sturgeon Monitoring Protocols. I assisted with the development of new station projects, and performed data analysis as needs arose. I presented results of such analyses in the form of technical presentations to stakeholder groups and peer groups at professional meetings.

Graduate Research Assistant (M.S.) June 2009 – November 2011

South Dakota State University, Brookings, SD.

I conducted research on pallid sturgeon physiology, including the effects of diet and temperature regime on growth, food consumption and metabolism. I maintained the U.S.G.S. cooperative research unit wet lab at SDSU, where we housed 48 federally

endangered pallid sturgeon and supervised and trained technicians. I presented the results of my research in the form of posters and technical presentations.

Fisheries technician April - June 2009

Wisconsin Department of Natural Resources, Oshkosh, WI

I assisted with the spring lake sturgeon spawning assessment, including capturing and PIT tagging large spawning adults. I also embedded, sectioned, and aged otoliths for a Lake Winnebago System-wide research project.

Assistant Laboratory Manager September 2004 – May 2009

Aquatic Biomonitoring Laboratory, UWSP, Stevens Point, WI

My primary job duties were to prepare slide mounts of Chironomidae larvae for identification, and sorting biotic index samples. I also prepared and updated laboratory protocols, tested new protocols, trained new personnel on laboratory protocols and participated in hiring and retention decisions. I identified aquatic insects to family level, assisted in quality control and assurance checks of sorted samples, and performed data transcription of sample information to proper log sheets.

Aquaculture Laboratory Assistant January - May 2009

Aquaculture Laboratory, UWSP, Stevens Point, WI

I assisted in designing and conducting a compensatory growth study using juvenile yellow perch. Juvenile yellow perch were reared on three different feeding regimes, and growth was measured weekly. Duties included collecting and analyzing growth data, and general maintenance of aquaculture facilities.

Fisheries Genetics Researcher September 2008 – May 2009

Molecular Conservation Genetics Laboratory, UWSP, Stevens Point, WI

I worked as an independent researcher identifying molecular markers for hybrid detection in *Morone* species. Job duties included DNA extraction from fin clips, polymerase chain reaction, microsatellite genotyping, data analysis and primer optimization.

Student Ambassador May – August 2008

Nyumbani Village, Kitui, Kenya

Through the Global Environmental Management program at UWSP, I was selected to travel to Nyumbani Village, Kenya to assist in managing an organic farm. I created crop rotation, harvest, and planting schedules to maximize yields and reduce pest problems. Our overarching objective was to produce a surplus of food for the villagers

to sell in organic markets to bring income into the village. This position required collaboration with many different village officials, residents and farm laborers.

Fish Pathology Researcher September 2007 – May 2009

Histology Laboratory, UWSP, Stevens Point, WI

I worked as an independent researcher, characterizing the pathology of "white-tail syndrome" in cultured yellow perch using histological methods including preparing and embedding specimens, sectioning specimens, reagent preparation, microtome sectioning and examination of specimens using light microscopy. As part of a two person team, I worked with a number of private aquaculturists in central Wisconsin to collect specimens and determine a cause for this uncategorized disease.

Hydrologic Technician May – August 2007

Chequamegon-Nicolet National Forest, USDA Forest Service, Park Falls, WI

I conducted road-stream crossing inventories and fish passage surveys across the Chequamegon-Nicolet National Forest. I also assisted with hook and line surveys, remnant logging dam surveys, and stream crossing construction. I managed road-stream crossing data in Microsoft excel and access and used the program FishXing to identify possible fish passage barriers throughout the forest.

Hydrologic Technician May – July 2006

Chequamegon-Nicolet National Forest, USDA Forest Service, Park Falls, WI

I performed road-stream crossing inventories, fish passage surveys and backpack electro-fishing across the Chequamegon-Nicolet National Forest. I also assisted biologists with hook and line surveys and remnant logging dam surveys. I managed road-stream crossing data in Microsoft excel and access and used the program FishXing to identify possible fish passage barriers throughout the forest.

Fisheries Technician/Intern May – August 2005

Utah Division of Wildlife Resources, Vernal, UT

I performed extensive backpack electro-fishing in the Uinta Mountains. We used depletion-removal techniques to remove invasive brook trout and hybrid cutthroat trout to restore native and genetically pure Colorado River strain cutthroat trout. Other duties included riparian habitat improvements (i.e. - removing invasive plant species), trout egg collection and fertilization and various maintenance on stream sampling equipment.

Professional Affiliation

2004 – Present American Fisheries Society
Parent society (2009-Present)
Fisheries Management Section (2013- 2018)
Education Section (2010-2018)
Genetics Section (2009-2018)
Dakota Chapter (2009-present)
South Dakota State University Student Sub-unit (2009-2011)
Wisconsin Chapter (2008-2012)
University of Wisconsin-Stevens Point Student Sub-unit (2004-2009)

2012 - 2018 North American Sturgeon and Paddlefish Society

2018-Present The Wildlife Society
South Dakota Chapter

2018-Present Association of State Wetland Managers

Professional Service

Wind Energy Work Group Member 2019
Midwest Landscape Initiative
Midwest Association of Fish and Wildlife Agencies

Crucial Habitat Assessment Tool Technical Committee 2019
Western Association of Fish and Wildlife Agencies

Crucial Habitat Assessment Tool Policy Committee 2019
Western Association of Fish and Wildlife Agencies

AFS Professional Certification Committee 2017-Present
American Fisheries Society

Website Manager 2015-2018
Dakota Chapter AFS

Secretary 2015-2018
North Central Division AFS Walleye Technical Committee

Poster Judge February 2015
Annual Meeting, Dakota Chapter AFS, Bismarck, ND

Young Professional Committee Member 2013-2018
Fisheries Management Section

Committee Chair 2013-2014
North Central Division AFS Walleye Technical Committee

Peer Reviewer September 2009 – November 2011
Fisheries Management and Ecology and Transactions of the American Fisheries Society.

Awards

2018 Outstanding Performance Award South Dakota Game, Fish and Parks

2018 Best Professional Poster Award Dakota Chapter AFS (co-author)

2017 Best Professional Poster Award Dakota Chapter AFS (co-author)

2017 Emerging Leader Mentorship Award American Fisheries Society

2016 Best Professional Poster Award Dakota Chapter AFS (lead author)

2016 Award of Merit American Fisheries Society Fish Management Section

2014 MICRA Sturgeon and Paddlefish Committee Travel Award

2011 American Fisheries Society John E. Skinner Memorial Award

2011 Honorable Mention for Best Student Poster Competition, 141st Annual Meeting of the American Fisheries Society, Seattle, WA.

2011 World Sturgeon Conservation Society-North American Chapter Student Travel Award

2011 2nd Place Oral Presentation, Missouri River Natural Resources Conference, Nebraska City, NE

2011 Graduate School Travel Award, South Dakota State University

2009 Clive A. David Memorial Research Scholarship, UWSP

2009 Royal Anderson Ecology Award 2009, UWSP

2009 Gerhardt Outstanding Water Student, UWSP

Publications

Fincel, M., N. Kludt, **H. Meyer**, M. Weber and C. Longhenry. 2019. Long-term data suggest potential interactions of introduced walleye and smallmouth bass on native sauger in four Missouri River impoundments. Journal of Fish and Wildlife Management. In Press.

Maahs, B.C., **H.A. Meyer**, N.D. Huysman, J.M. Voorhees and M.E. Barnes. 2018. Mortality of landlocked fall chinook salmon broodstock after electrofishing or ascending a fish ladder. Jacobs Journal of Aquaculture and Research 3:1-3.

Huysman N., J.M. Vorhees, **H. Meyer**, E. Krebs and M.E. Barnes. 2018. Chracteristics of landlocked fall chinook salmon producing either viable or completely non-viable eggs. International Journal of Fisheries and Aquatic Sciences 6: 86-88.

Reese, S.E., A.J. Long, H.A. **Meyer** and M.E. Barnes. 2017. Landlocked fall chinook salmon sperm motility after short term milt storage. International Journal of Innovative Studies in Aquatic Biology and Fisheries, 3:9-13.

Meyer, HA, SR Chipps, BDS Graeb, and RA Klumb. 2017. Growth, food consumption and energy status of age-0 pallid sturgeon (*Scaphirhynchus albus*) fed a commercial or invertebrate diet. Journal of Fish and Wildlife Management.

Kaemingk, MA, DJ Dembkowski, **HA Meyer**, and LM Gigliotti. 2013. Some insight for undergraduates seeking an advanced degree in wildlife and fisheries sciences. Fisheries.

Reports

Meyer, HA, RP Hanten, K Potter, MJ Fincel and MJ Smith. 2015. Annual Fish Population and Angler Use, Harvest and Preference Surveys on Lake Oahe, South Dakota, 2014.

Meyer, HA, CJ Wrasse, CJ Ridenour, WJ Doyle and TD Hill. 2012. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segment 14 2011 annual report. U.S. Fish and Wildlife Service, Columbia Fish and Wildlife Conservation Office, Columbia, Missouri. Prepared for the U.S. Army Corps of Engineers Missouri River Recovery Program.

Ridenour, CJ, **HA Meyer**, CJ Wrasse, WJ Doyle and TD Hill. 2012. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segment 13 2011 annual report. U.S. Fish and Wildlife Service,

Columbia Fish and Wildlife Conservation Office, Columbia, Missouri. Prepared for the U.S. Army Corps of Engineers Missouri River Recovery Program.

Ridenour, CJ, CJ Wrasse, **HA Meyer**, WJ Doyle and TD Hill. 2012. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: 2011 Contingency Sampling. U.S. Fish and Wildlife Service, Columbia Fish and Wildlife Conservation Office, Columbia, Missouri. Prepared for the U.S. Army Corps of Engineers Missouri River Recovery Program.

Presentations

Goble, C., H. **Meyer,** M. Fincel, C. Pasbrig and D. Turner. 2019. Using acoustic telemetry to re-establish historic fisheries. Midwest Fish and Wildlife Conference Annual Meeting, Cleveland, OH.

Meyer, H., C. Pasbrig and M. Fincel. 2018. Population dynamics and movement of shovelnose sturgeon in a Missouri River impoundment. North American Sturgeon and Paddlefish Society Annual Meeting, Columbia, MO.

Turner, D., H. Meyer, L. Pierce and D. James. 2018. Movement of hatchery-reared Age-0 paddlefish in Lake Sharpe, South Dakota (poster). North American Sturgeon and Paddlefish Society Annual Meeting, Columbia, MO.

Jungwirth, J., B. Miller, H. **Meyer**, J. Davis, M. Fincel and C. Longhenry. 2018. Selective removal of largemouth bass in small prairie impoundments (presenting author). North Central Division AFS Walleye Technical Committee Meeting, Spirit Lake, IA.

Fincel, M., R. Hanten, D. Jost, J. Jungwirth, H. **Meyer**, K. Potter and M. Smith. 2018. Success of stocking walleye (*Sander vitreus*) in select bays of a large Missouri River reservoir. Dakota Chapter of the American Fisheries Society Annual Meeting, Brookings, SD.

Maahs, B., H**. Meyer**, R. Hanten and M. Fincel. 2018. Comparison of short-term survival of electroshocked and ladder caught chinook salmon in Lake Oahe, South Dakota (poster). Dakota Chapter of the American Fisheries Society Annual Meeting, Brookings, SD.

Gravenhof, D., B. Maahs, H. **Meyer**, R. Hanten and M. Fincel. 2018. Catch raceway escapement of chinook salmon at Whitlocks Bay spawning station (poster). Dakota Chapter of the American Fisheries Society Annual Meeting, Brookings, SD.

Turner, D., D. James, L. Pierce, H. **Meyer**, N. Starzl and J. Powell. 2018. Acoustic tag retention and initial dispersal of hatchery-reared juvenile paddlefish. Dakota Chapter of the American Fisheries Society Annual Meeting, Brookings, SD.

Davis, J., N. Kludt, H. **Meyer** and M. Fincel. 2018. Feasibility of hydro-acoustic surveys to monitor Rainbow smelt (*Osmerus mordax*) and rainbow trout (*Oncorhynchus mykiss*) in Pactola Reservoir, South Dakota. Dakota Chapter of the American Fisheries Society Annual Meeting, Brookings, SD.

Meyer, H.A., M.J. Fincel and R.P. Hanten. 2017. Use of acoustic telemetry to assess over-winter survival of gizzard shad. American Fisheries Society Annual Meeting, Tampa, FL.

Stacy, W., K. Grohs, D. James, L. Pierce, H. **Meyer** and D. Shuman. 2017. Distribution and movement of translocated paddlefish: Implications for future spor fishery potential in Lake Sharpe, SD. Dakota Chapter of the American Fisheries Society Annual Meeting, Jamestown, ND.

Reese, S., T. Long, H. **Meyer** and M. Barnes. 2017. Effects of short term storage on chinook salmon sperm motility (poster). Dakota Chapter of the American Fisheries Society Annual Meeting, Jamestown, ND.

Meyer, HA, R.P. Hanten, M.J. Fincel. 2016. Movement of tagged gizzard shad in a large Missouri River reservoir. American Fisheries Society Annual Meeting, Kansas City, MO.

Meyer, H.A., R.P. Haten, M.J. Fincel and J.L. Davis. 2016. Survival of gizzard shad after dummy transmitter implantation (poster). Dakota Chapter of the American Fisheries Society Annual Meeting, Spearfish, SD.

Greiner, M.J., R.P. Hanten, H.A. **Meyer,** and M.J. Fincel. 2016. Detection efficiency of acoustic transmitters in three reservoir habitats (poster). American Fisheries Society Annual Meeting, Kansas City, MO.

Meyer, HA, K Grohs, D Shumann and MJ Fincel. 2015. Movement of translocated paddlefish in Lake Sharpe, South Dakota. North American Sturgeon and Paddlefish Society Annual Meeting, Oshkosh, WI.

Meyer, HA and MJ Fincel. 2015. Fast food: movement of gizzard shad in Lake Sharpe, South Dakota. North Central Division of the American Fisheries Society, Walleye Technical Committee Annual Meeting, Brookings, SD.

Meyer, HA, MJ Fincel, WE Adams and CL Longmire. 2014. The business of fishing: use and satisfaction of anglers on a large reservoir. 144th Annual Meeting of the

Meyer, HA, CJ Ridenour, WJ Doyle and TD Hill. 2012. Influence of flow regime on the condition of blue suckers in the lower Missouri River. 142nd Annual Meeting of the American Fisheries Society, St. Paul, MN.

Meyer, HA, SR Chipps, BDS Graeb, and RA Klumb. 2012. Evidence for countergradient variation in pallid sturgeon physiology (Poster). Missouri River Natural Resources Committee Conference, Pierre, SD.

Meyer, HA, CJ Ridenour, and TD Hill. 2012. Seasonal resource selection by blue suckers in the lower Missouri River (Poster). Missouri River Natural Resources Committee Conference, Pierre, SD.

Meyer, HA, CJ Ridenour, WJ Doyle and TD Hill. 2012. Lateral distribution of *Scaphirhynchus* sturgeon during flood flows in the lower Missouri River: 2010 case study. Mississippi Interstate Cooperative Resource Association Sturgeon and Paddlefish Committee Annual Meeting, Kirkwood, MO.

Meyer, HA, SR Chipps, BDS Graeb, and RA Klumb. 2011. Latitudinal variation in pallid sturgeon physiology. 141st Annual Meeting of the American Fisheries Society, Seattle, WA.

Meyer, HA, SR Chipps, BDS. Graeb, and RA Klumb. 2011. Growth and energy status of age-0 pallid sturgeon fed a commercial or invertebrate diet (Poster). 141st Annual Meeting of the American Fisheries Society, Seattle, WA.

Meyer, HA, SR Chipps, BDS Graeb, and RA Klumb. 2011. Growth, metabolism and energy density of juvenile pallid sturgeon fed commercial and natural diets. Missouri River Natural Resources Committee Conference, Nebraska City, NE.

Meyer, HA, BL Sloss and R Franckowiak. 2009. Hybrid detection in four species of temperate basses (*Morone spp.*). 2009 College of Natural Resources Undergraduate Research Symposium, Stevens Point, WI.

Meyer, HA, and J Sheffy. 2009. Quantifying organic food production in Nyumbani village, Kitui, Kenya (Poster). 2009 College of Natural Resources Undergraduate Research Symposium, Stevens Point, WI.

Meyer, HA, AM Purdy, C Hartleb, and R Schmitz. 2009. Investigation of white-tail syndrome in yellow perch in Wisconsin. 2009 Wisconsin, Minnesota and Ottawa Tri-Chapter meeting of the American Fisheries Society, Duluth, MN.

Training Received

Mitigation Banking and In-Lieu Fee Program Interagency Review Team Training The Conservation Fund	June 2019
Writing and reviewing NEPA documents Shipley Group	March 2019
Overview of the NEPA Process Shipley Group	January 2019
Nationwide Permits Wetland Training Institute	January 2019
First Aid, Adult CPR Red Cross	August 2018
S.C.U.B.A.-Openwater Diving SSI	October 2017
Program MARK Workshop Iowa State University	July 2017
Sturgeon and Paddlefish tagging and age estimation North American Sturgeon and Paddlefish Society	October 2015
ATV Operation Training SDGFP	September 2014
R for Fisheries Scientists Michigan State University/American Fisheries Society	August 2013
Electrofishing Safety (FWS-CSP2202-OLT)	June 2012
Sturgeon Osmoregulation Workshop North American Sturgeon Conservation Society	July 2011
National Safety Council Defensive Driving Course Department of the Interior	January 2011

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. EL19-027

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES, SOUTH DAKOTA

DIRECT TESTIMONY OF PAIGE OLSON ON BEHALF OF THE COMMISSION STAFF

December 6, 2019



Q. State your name.

A. Paige Olson.

Q. By who are you employed?

A. State of South Dakota.

Q. For what department or program do you work and what is your job title?

A. South Dakota State Historical Society, State Historic Preservation Office (SHPO), Review and Compliance Coordinator.

Q. Please explain the program goals and your role and duties within SHPO.

A. The National Historic Preservation Act of 1966 is the foundation for the preservation work of the South Dakota State Historical Society (SDSHS). The State Historic Preservation Office (SHPO), a program under the SDSHS, is responsible to survey historic properties and maintain an inventory; identify and nominate properties to the National Register of Historic Places; advise and assist federal, state, and local government agencies in fulfilling their preservation responsibilities; provide education and technical assistance in historic preservation; develop local historic preservation programs; consult with federal and state agencies on projects affecting historic properties; and advise and assist with rehabilitation projects involving federal assistance. My specific role is to monitor state permitted and federally funded, licensed or permitted projects to

ensure historic properties are taken into consideration. I provide technical analyses, reviews and assistance to government agencies to ensure compliance with state and federal guidelines. I serve as the lead over the review and compliance function of SHPO.

Q. On whose behalf was this testimony prepared?

A. This testimony was prepared on behalf of the Staff of the South Dakota Public Utilities Commission.

Q. State and explain the South Dakota laws that protect archaeological and historic resources in this state.

A. South Dakota Codified Law 1-19A-11.1 - Preservation of historic property – Procedures. The state or any political subdivision of the state may not undertake any project which will encroach upon, damage or destroy any property included in the State Register of Historic Places or National Register of Historic Places.

Q. Have you reviewed the Application and Crowned Ridge Wind II, LLC's testimony?

A. I reviewed portions of the Application containing the project description and all portions of the Application specific to cultural resources, namely Section 2.0 Description of the Nature and Location of the Project, Section 6.0 General Site and Project Component Description (ARSD 20:10:22:11), and Section 18.6 Cultural

Resources. I also review the direct and supplemental testimony of Sarah Sappington.

Q. Has SHPO provided any recommendations to Crowned Ridge Wind II, LLC regarding places of historical significance and cultural resources?

A. Yes. In a letter dated March 12, 2009, to Mr. Adam C. Holven at Tetra Tech EM Inc.

Q. Please describe what those recommendations were.

A. I recommended that an on the ground survey of the project area be conducted and that all sites identified during the survey be avoided. I also recommended an architectural survey of the project area, including a one-mile buffer around the perimeter of the project area. Finally, I recommend contacting American Indian tribes with specific knowledge of this area to discuss the identification Traditional Cultural Properties and places of religious and cultural significance.

Q. Did Crown Ridge Wind II, LLC adequately address those recommendations? If not, please explain.

A. Yes, the following reports were submitted by SWCA Environmental Consultants, consultant to NextEra Energy Resources, LLC, for SHPO review and comment.

- "Crowned Ridge Wind Energy Facility Overview and Cultural Resources Review, June 2017."

- "Level III Intensive Archaeological and Traditional Cultural Property Resources Inventory for the Crowned Ridge II Generation Tie Line, Codington and Deuel Counties, South Dakota, March 2019."
- "Historic Architectural Resources Assessment for the Crowned Ridge II Generation Tie Line, Codington and Deuel Counties, South Dakota," March 2019."
- "Addendum 1 to Level III Intensive Archaeological and Traditional Cultural Property Resources Inventory for the Crowned Ridge II Generation Tie Line, Codington and Grant Counties, South Dakota, July 2019".
- "Level III Intensive Archaeological and Traditional Cultural Property Resources Inventory for the Crowned Ridge II Wind Turbine Array, Codington, Deuel and Grant Counties, South Dakota, July 2019".
- "Historic Architectural Resources Assessment for the Crowned Ridge Wind II Turbine Array, Codington, Deuel, And Grant Counties, South Dakota, July 2019".

Q. Do you agree with Crowned Ridge Wind II, LLC's conclusions made in the Application and testimony regarding impacts to cultural resources and places of historical significance? If not, please explain.

A. Yes.

Q. Is SHPO waiting for any additional studies to review? If so, please explain what those studies are and what SHPO will ultimately do with those studies.

A. No, but will review and comment on any additional information submitted as a result of future construction modifications.

Q. In your opinion, does the Application and Crowned Ridge Wind II, LLC's pre-filed testimony as presented to the Commission contain enough information to properly understand any potential adverse impacts to places of historical significance and cultural resources? If not, please explain.

A. Yes. It is my opinion that enough information has been submitted to properly understand any potential adverse impacts to places of historical significance and cultural resources.

Q. If Crowned Ridge Wind II, LLC changed any turbine locations from those presented in the preliminary layout could that change any of the conclusions Crowned Ridge made regarding potential impacts to places of historical significance and cultural resources? Please explain.

A. It is unlikely that a change in the preliminary layout would physically impact any properties that are listed in the State or National Register of Historic Places.

Q. Do you have a recommendation for a permit condition, or conditions, the Commission should consider?

A. 1. Not only are cultural resource sites non-renewable, but no two sites are same. Once a resource is damaged or destroyed, the information the resource may

contain about the history of South Dakota is gone. Therefore, I recommend the following condition:

> "The Applicant agrees to avoid direct impacts to cultural resources that are unevaluated, eligible for or listed in the National Register of Historic Places (NRHP). When a NRHP unevaluated, eligible or listed site cannot be avoided, Applicant shall notify the State Historic Preservation Office (SHPO) and the Commission of the reasons that complete avoidance cannot be achieved in order to coordinate minimization and/or treatment measures."

2. The Sisseton-Wahpeton Oyate, Yankton Sioux, Rosebud Sioux and Spirit Lake Tribal Historic Preservation Officers (THPOs) have determined that the Project will impose setting-related impacts at sites of traditional, cultural and religious importance to Native peoples and have the support of the project archaeologists. The Project developers worked with the THPOs to create the following avoidance, minimization, and mitigation measures for TCPs. Therefore, I recommend the following condition as outlined in the Application on page 104, Section 18.6.3.1:

> "The Applicant agrees to implement the avoidance, minimization and mitigation measures identified for TCPs:
>
> - Implement standard avoidance or resource protection practices (e.g., barrier fencing, contractor training) where feasible in collaboration with the Sisseton-Wahpeton Oyate,

Yankton Sioux, Rosebud Sioux and Spirit Lake THPOs and the Applicant.

- Make best effort to identify participating landowners who may be willing to work with the tribes on site preservation, accessibility and protection of TCPs on their property.
- Conduct site revisits prior to construction.
- Help facilitate post-construction site revisits for tribes with the landowners.
- Identify and implement education/interpretation opportunities regarding tribal resource preservation and/or Native American perspectives which may include sensitivity training when needed. "

3. "Prior to the commencement of construction, Applicant agrees to develop an unanticipated discovery plan for cultural resources and comply with SDCL 34-27-25, 34- 27-26, and 34-27-28 for the discovery of human remains."

4. "Applicant shall file a Level III Archaeological survey of the remaining facilities (i.e. access roads, crane paths, collection lines, O&M facilities, concrete batch plant, and laydown areas) with the Commission and provide a copy of the survey to SHPO prior to commercial operation. The survey report may contain confidential information and all confidential portions of the survey report shall be filed as confidential and not for public disclosure. If any potential adverse impacts to NRHP

unevaluated, listed, or eligible cultural resources are identified in the survey, Applicant shall file with the Commission a report describing the SHPO-approved planned measures to ameliorate those impacts."

Q. Does this conclude your testimony?

A. Yes.

PAIGE HOSKINSON OLSON

Pierre, SD 57501

Education

1998-2001	Master of Arts, Anthropology University of Montana, Missoula, MT Major: Cultural Resource Management Minor: Archaeology
1989-1995	Bachelor of Arts University of Montana, Missoula, MT Major: History Minor: Political Science
1985-1989	Whitehall High School, Whitehall, MT

Professional Experience

January 2007 - Present

Archaeological Review and Compliance Coordinator, South Dakota State Historical Society - State Historic Preservation Office (SHPO), 900 Governors Drive, Pierre, SD

- Assess impact of projects on historic properties and ensure those properties are taken into consideration during planning and implementation of project in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended and South Dakota's state preservation law, South Dakota Codified Law 1-19A-11.1.
- Assess the eligibility of properties for listing on the National Register of Historic Places in accordance with the criteria developed by the National Park Service.
- Review archaeological survey reports and documentation submitted by federal, state and contracting archaeologist to determine if proper methodology and standards established by state and federal government are met.
- Negotiate with and assist agencies in developing legal agreements to mitigate effects to historic properties, such as memorandums of agreement.
- Negotiate with and assist agencies in developing legal agreements to provide for alternative review and compliance procedures, such as programmatic agreements.
- Provide technical assistance to government and tribal officials, contactors, and the general public concerning federal and state laws.
- Participate in consultation meetings to discuss project effects on historic properties with federal, state and tribal officials.
- Develop effective public information programs about state and federal preservation laws and archaeology.
- Ensure a database of all projects submitted for review is maintained and accurate for reports and future federal funding requests.
- Monitor changes in the interpretation of federal and state rules and regulations.
- Provide work direction and training for review and compliance program staff to ensure project are reviewed in an accurate, consistent and timely manner.
- Supervise student interns and volunteers in various projects.
- Site Manager for Fort Pierre Chouteau National Historic Landmark.
- Prepare and write comprehensive plans to manage cultural resources in South Dakota and update guidelines to ensure historic properties are identified and protected.
- Manage contracts focused on archaeology.
- Coordinate annual Archaeology Camp for twenty school age children.

- Participate in State Hazard Mitigation Group.
- Participated as a member of the Social Cultural Economic Technical Team for the development of the Missouri River Ecosystem Restoration Plan.

June 2002 – January 2007

Historic Archaeologist, South Dakota State Historical Society - State Historic Preservation Office, 900 Governors Drive, Pierre, SD

- Assessed impact of projects on historic properties and ensure those properties are taken into consideration during planning and implementation of project in accordance with Section 106 of the National Historic Preservation Act and South Dakota's state preservation law, South Dakota Codified Law 1-19A-11.1.
- Assessed properties eligibility for listing on the National Register of Historic Places in accordance with criteria established by the National Park Service.
- Reviewed archaeological survey reports and documentation submitted by federal, state and contracting archaeologist to determine if proper methodology and standards established by the state and federal government are met.
- Negotiated with and assisted agencies in developing legal agreements to mitigate effects to historic properties, such as memorandums of agreement.
- Negotiated with and assisted agencies in developing legal agreements to provide for alternative review and compliance procedures, such as programmatic agreements.
- Provided technical assistance to government officials, contactors, and the general public concerning federal and state laws and compliance requirements under Section 106 of the National Historic Preservation Act.
- Maintained a database of all projects submitted for review.
- Supervised student interns in various projects.
- Site Manager for two National Historic Landmarks owned by the state.
- Updated state guidelines for cultural resource surveys and survey reports specifically for Section 106 review and compliance.
- Managed contracts focused on archaeology.
- Coordinated Archaeology/ Preservation Month.

April 2001- June 2002

Historic Preservation Specialist, South Dakota State Historical Society - State Historic Preservation Office
900 Governors Drive, Pierre, SD

- Functioned as West River Coordinator for National and State Register of Historic Places Programs, Certified Local Government program and historic preservation grant program.
- Apply National Register Criteria to make preliminary determinations of eligibility for listing properties on the National Register of Historic Places.
- Prepared and edited in house National and State Register Nominations.
- Surveyed commercial and residential districts to update existing National Register nominations.
- Furnished technical advice and grant management services to local historic preservation organizations and the general public.
- Acted as contact for GIS Technical Advisory Group.
- Used GoeExplorer III for data collection and ArcView/Mapit to create accurate maps.
- Consulted on review and compliance issues under state preservation law.

January 2000 – April 2001

Archival Technician, National Park Service, Grant-Kohrs Ranch National Historic Site, PO Box 790, Deer Lodge, MT

- Functioned as field archaeologist observing ground disturbing activities and making

onsite assessments for work associated with Natural Resource Damage Assessment.

- Acted as liaison between NPS personnel and University of Montana field research crews.
- Worked closely with Natural Resource Management Division to protect cultural and natural resources.
- Oversaw groundwater, soil, vegetation and range management research occurring at the Grant-Kohrs Ranch.
- Provided relevant information to University of Montana field crews to comply with state and federal laws.
- Drafted necessary documents involving Section 106 compliance for the Montana State Historic Preservation Office.
- Attended and represented the Grant-Kohrs Ranch at Natural Resource Damage Assessment meetings.
- Gathered financial information for Natural Resource Damage Assessment cost recovery.
- Maintained Administrative Record for Grant-Kohrs Ranch damage assessment.
- Worked with confidential and sensitive legal material.
- Completed a two-month detail in Atlanta, Georgia working directly with NPS Natural Resource Damage Assessment staff.

January 2000 – May 2001 — Thesis Project, Bureau of Land Management, Fort Missoula Road, Missoula, MT

- Updated Cultural Resource Inventory for abandoned mining town of Coloma.
- Surveyed and recorded approximately 149 structures and features related to mining activities.
- Used GeoExplorer II for data collection to map structures and features.
- Documented current condition of structures and features using appropriate Bureau of Land Management forms and photographs.
- Completed literature search and develop comprehensive history of Coloma.
- Researched and compiled annotated bibliography.
- Supervised documentation of archaeology sites by volunteers.

February 2000 – May 2000 — Intern, Montana State Historic Preservation Office, Helena, MT

- Performed record searches and entered archaeology site data using Oracle databases: Cultural Resource Information System, Cultural Resource Annotated Bibliography System, and Project, Eligibility and Effect Reports System.
- Compiled information to complete narrative and physical descriptions for nomination of historic district.
- Completed National Register of Historic Places nomination for Slayton Mercantile, Lavina, Montana.
- Surveyed and evaluated historic structures located within historic district for nomination as National Historic Landmark.
- Reviewed and prepared site files to be assigned Smithsonian Numbers.

Field Schools and Volunteer Experience

April 2014 — Natural Resource Conservation Service, Pierre Field Office, Pierre, SD

- Assisted NRCS Archaeologist in three archaeological inventories for the placement of pipelines and tanks.
- Inventory included walking transects to identify historic and prehistoric resources.

October 1999 – Bureau of Land Management, Fort Missoula Road, Missoula, MT

November 1999

- Assisted BLM Archaeologist in archaeological inventory for timber sale and land exchange.
- Walked 30 meter transects to identify historic and prehistoric artifacts and features.
- Identified and recorded prehistoric and historic sites

July 1998 — University of Montana Field School, Prehistoric Campsite
Department of Anthropology, Missoula, MT

- Laid out, excavated, and screened soil from excavation units.
- Conducted block style excavations.
- Mapped vertical and horizontal stratigraphy.
- Point plotted artifacts and established vertical provenience.
- Maintained detailed excavation notes.

August 1998 - December 1998 — University of Montana Field School, Historic Structure at Fort Missoula
Department of Anthropology, Missoula, MT

- Laid out, excavated, and screened soil from excavation units.
- Conducted block style excavations.
- Mapped vertical and horizontal stratigraphy.
- Point plotted artifacts and established vertical provenience.
- Maintained detailed excavation notes.

Training

July 2015 — *The Section 106 Advanced Seminar*
Advisory Council on Historic Preservation
Pierre, SD

July 2015 — *Section 106 Essentials*
Advisory Council on Historic Preservation
Pierre, SD

June 2014 — *Working in Indian Country*
Larry D. Keown
Rapid City, SD

May 2014 — *Current Archaeological Prospection Advances for Non-Destructive Investigations in the 21st Century*
National Park Service, Midwest Archeological Center
Aztalan State Park., Aztalan, WI

September 2012 — *Archaeological Damage Investigation and Assessment; Archaeological Violation Investigation Class*
Martin E. McAllister
Pierre, SD

August 2010 — *National Register/ National Historic Landmark Workshop*
National Park Service
Virginia City, NV

June 2008 — *Section 106 Essentials*
Advisory Council on Historic Preservation, Pierre, SD

April 2008	Native American Sensitivity Training Curley Youpee, Russell Eagle Bear and Ben Rhodd Pierre, SD
May 2007	*Identification and Management of Traditional Cultural Places* National Preservation Institute, Claudia Nissley Seattle, WA
February 2006	National Environmental Policy Act (NEPA) Training Federal Highway Administration Pierre, SD
November 2005 - December 2005	Native American Awareness Training Albert White Hat, Dorothy LeBeau, Wayne Evans, and Craig Howe Pierre, SD
August 2005	*Shenandoah-Dives Mill HAER Documentation and Historic Structure Assessment Workshop* San Juan Historical Society Silverton, CO
September 2004	*Section 106: How to Negotiate and Write Agreements* National Preservation Institute, Claudia Nissley Honolulu, HI
September 2004	*Integrating Cultural Resources in NEPA Compliance* National Preservation Institute, Claudia Nissley Honolulu, HI
July 2003	*Archaeological Law Enforcement Class* Archaeological Resource Investigations, Martin McAllister, Wayne Dance and John Fryar Pierre, SD
September 2002	*Section 106 for Practitioners* National Preservation Institute, Tom King Seattle, WA
July 2001	*Introduction to ArcView GIS Version 3.1* Kadrmas, Lee and Jackson Pierre, SD

Publications

A Cultural Site Evaluation Coloma, Montana, 2000. Missoula: University of Montana Press, 2001.

"Creations in Stone: Petroforms in East River SD", South Dakota History. Vol. 35, No. 4 (Winter 2005): 347-362.

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL19-027

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN THE COUNTIES OF DEUEL, GRANT AND CODINGTON SOUTH DAKOTA, FOR THE CROWNED RIDGE WIND II PROJECT

Pre-Filed Direct Testimony and Exhibits of David Lawrence
On Behalf of the Staff of the South Dakota Public Utilities Commission
December 6, 2019



Q: State your name and occupation.

A: My name is David Lawrence, and I am a real property appraiser.

Q: State your business address.

A: My business address is 4820 E. 57th Street, Sioux Falls, South Dakota.

Q: By whom are you currently employed?

A: I am a real property appraiser with DAL Appraisal & Land Services.

Q: Please state your educational and professional background.

A: I received a Bachelor of Business Administration from Western State University in Gunnison, Colorado. After completing a four-year degree, I worked in real estate development, site acquisition, and management for a nationally branded franchise system. My career transitioned to real property valuation, and I began work with the RJ Hobson Appraisal Firm. I continued my real property studies with the Appraisal Institute earning the MAI designation, the SRA designation, the AI-RRS, and AG-RRS designation. After completing my designations with the Appraisal Institute, I continued my real property studies with the International Right of Way Association, earning the SR/WA designation. I am currently active in the Appraisal Institute, the International Right of Way Association and the Professional Appraisers Association of South Dakota.

Q: What work experience have you had that is relevant to your involvement in this project?

A: I have a wide range of appraisal experience across South Dakota and neighboring states including property types such as residential, commercial, ranch and farm. I've been fortunate in my appraisal career to have worked across the diverse market areas of South Dakota, including East and West River. Most of my appraisal experience is in right-of-way, linear and energy projects. As part of my practice, I provide appraisal services for damaged property and diminution value studies. These assignments have ranged from measuring the impacts of a high-voltage transmission line on residential property values to analyzing the impacts of the 2011 Missouri River flood on residential and agricultural property values in Union County. In the last ten years, I've completed several studies analyzing the impacts of underground pipelines on agricultural land values in Montana, South Dakota, Minnesota, and Nebraska. I have extensive experience in South Dakota developing damage studies and their relationship to property values. I've developed South Dakota impact studies on the Keystone Phase I, Keystone XL, NuStar, SDIP, Northern Border, Lewis & Clark, Magellan, Rockies Express, and MDU pipelines. In May of 2018, I completed research that analyzed the influences from the Buffalo Ridge Wind Facility on rural property values in Brookings County. Since 2018 I have completed a considerable amount of work with related wind energy projects in South Dakota, including Docket EL17-055 Crocker Wind Farm, Docket EL18-003 Dakota Range I & II, Docket EL18-026 Prevailing Wind Park EL, Docket 18-046 Dakota Range III and Docket 18-053 Deuel Harvest Wind Energy.

My experience with impact studies across the state has given me the knowledge and experience to research and apply the methodology for credible analysis.

Q: Have you testified before the South Dakota Public Utilities Commission?

A: Yes. I have provided testimony in Docket EL18-003 for the Dakota Range Wind Project in Grant County and Codington County. I have also provided testimony in Docket EL17-055 for the Crocker Wind Farm in Clark County.

Q: On whose behalf was this testimony prepared?

A: This testimony was prepared on behalf of the Staff of the South Dakota Public Utilities Commission.

Q: Have you previously provided research for the South Dakota Public Utilities Commission regarding property value impacts from wind energy facilities operating in South Dakota?

A: Yes, in Docket EL17-055 Crocker Wind Farm, EL18-003 Dakota Range I and II, EL18-026 Prevailing Winds, EL18-46 Dakota Range III an EL18-053 Deuel Harvest. The previous research included a 2018 market impact study of the Buffalo Ridge wind development operating in Brookings County. This research is identified as Exhibit DAL_1 in the previous Docket filings and included as an exhibit with my testimony.

Q: What is the purpose of your testimony in this proceeding?

A: The purpose of my testimony is to (1) assist the Commission in understanding valuation principles and techniques and how they can be appropriately applied to estimate value impacts from the Crowned Ridge Wind II project and (2) provide the Commission with an update to the 2018 market reseach completed for previous wind dockets.

Q: Can you briefly describe the scope of work for the Brookings County research completed for the Dakota Range Wind Project in Docket EL18-003?

A: In preparation for the Dakota Range hearing, I completed research in Brooking County to identify properties that have sold in proximity to a wind project, tower or turbine. My research identified thirteen arm's length transactions in Brookings County. Unfortunately, due to time constraints of the June hearing, I was not able to perform a complete case-by-case analysis for the thirteen sales identified. I did prioritize the residential sales BK1, BK2, BK3, BK4, BK5, and BK7. For these sales, I performed a site inspection, interview analysis, and sales analysis. The remaining sales were analyzed with site inspections and interviews. My field research and site inspections had a particular emphasis on examining the proximity of a wind tower and how the tower proximity relationship can influence rural properties. Inspections were done from the public roadway for sales BK1, BK2.5, BK6, BK7, BK9, BK10, BK11, and BK12. In five cases the property owner was present, and I was able to complete an on-site inspection with sales BK2, BK3, BK4, BK5, and BK8. I relied on high-resolution aerial images for sale JD13 and a

telephone participant interview. In addition to the BK sales, I visited several rural residential and agricultural properties in the market area influenced by a wind tower. These inspections allowed me to evaluate the influences a wind tower can have on the different property types in the market area of Brookings County. After completing the field work, the next step was to interview as many of the participants in the transaction as possible. I knew a buyer's name and address, and/or a broker involved with the transaction from preliminary research. Given the name and address, I was able to search for phone numbers. Unfortunately, finding a working phone number for participants is becoming more difficult, but I was able to talk with about twenty participants by phone or in person. The objective of the interview analysis was to verify terms of the sale and to inquire whether the sale and/or subsequent use of the property were in any way affected by the proximity of a wind tower. A set of scripted questions were asked in such a manner that no bias or preconceived notions were projected during the interview. Based on the recorded legal documents, site inspections, and information gathered, a detailed description of BK1, BK2, BK3, BK4, BK5, and BK7 was developed for the sales analysis. The next step was to develop data on property sales that were similar in time, location and property type to each of the BK sales, but not in proximity to a wind tower. The methodology of the analysis is similar to the sales comparison approach in the appraisal process, with South Dakota's definition of *market value* as the foundation for the sales selection. To identify this research, I used the Brookings County MLS, Beacon and aerial images to confirm that each comparable sale was unaffected by a wind tower, turbine or wind project. Then each of these sales was

summarized in terms of physical characteristics and qualitatively analyzed for differences. The uninfluenced sales were compared to the BK influenced sale for analysis. The final step was to analyze the information collected for each transaction and draw conclusions with respect to the effect, if any, of the proximity of the wind tower on the transaction or on use of the property. The summary of BK1, BK2, BK3, BK4, BK5, and BK7 can be found in Exhibit DAL_1. My scope of work did not include: 1) a sales analysis for sales BK6, BK8, BK9, BK10, BK11, BK12, and JD13; 2) a site visit for JD13; 3) a review of the chain of title for each property ownership since the project first became operational; 4) a site visit and additional verification for the comparable sales identified with MLS; 5) an analysis of the history of the wind project(s) in Brookings County, such as installation date, tower characteristics, project capacity, project construction, operational history, etc. and 6) supplemental research in the other thirteen South Dakota counties with operating wind projects.

Q: What are your general conclusions from the research you completed from the May 2018 Impact Study of Brookings County?

A: Based on my research within the Brookings County market, the evidence supports the presumption there have been no adverse effects on the selling price of rural residential properties in proximity to a wind tower, turbine or wind project. However, the interview and site analysis support the presumption that proximity to a wind tower can infuence the quite enjoyment of the property and view of the rural scenery. Given the responses from market participants, there is a relationship

between the distance from a turbine and the effects on the value perceived by individual property owners who live in proximity to wind towers. Wind tower noise is the number one reason cited by market participants for a perceived impact on value; however, the sales data suggests otherwise. More specifically, the Brookings County research for rural residential properties suggests: 1) there was no discernible adverse impact on the selling prices in Brookings County that could be supported for sales BK1, BK2, BK3, BK4, BK5 and BK7; 2) Interviews with buyers of properties near wind towers were unanimous to report the proximity of the wind tower did not influence the price they paid; 3) In six of six rural residential sales, the market data was consistent, even though the site inspection observed influences of noise and view obstructions within the property boundaries.

Although I did not complete a sales analysis for the agricultural sales, the research supports the presumption there have been no adverse effects on the selling price of agricultural properties in proximity to and within the boundaries of the property with a wind tower. During the interview process, participants of agricultural properties were consistent to report the price paid was not affected by a wind tower and in some cases reported a stronger price per acre when the wind payments transferred with the property. The most common issues farmers cited about wind towers are the limitation of aerial spraying, poor reclamation, and compaction issues after the installation of the towers, possible yield loss due to the inability to plant straight rows and the difficulties associated with working around the towers during planting and harvest. Without comparison of the sales evidence with the interview evidence, the agricultural analysis is determined to be inconclusive;

however, all agricultural participants were consistent to report there was no adverse effect on the price paid because of the presence of a wind tower. The summary of my research is limited to Brookings County and supported by analyzing six rural residential sales, seven agricultural sales, and twenty market participant interviews.

Q: Have you completed any additional research since the EL 18-003 Docket?

Yes, I was asked by the PUC staff to update the sales data for rural residential properties located near wind towers in the Buffalo Ridge wind project in Brookings County. The development of the research was completed with the same scope of work as the Brookings 2018 study and included sales research, site visits, and interviews. The research resulted in three additional market sale transactions for analysis that occurred since May 2018 in Brookings County. The sale analysis is identified as BK12, BK13, and BK14. During the research process, four additional market transactions were discovered within proximity to the Deuel Harvest Wind Project for analysis identified as DE1, DE3, DE4, and DE5. Coincidently, back in May of 2018, these properties were all listed for sale on the Northeast MLS. I was told by a property owner the listings were a result of the announcement of the Deuel Harvest Wind Project, and the owners were selling because they did not want to live in proximity to wind development. I now have had the opportunity to investigate the transactions and complete a sale analysis for these market transactions. In the process of my research, I also found additional sale transactions for Tatanka Ridge and Crown Ridge wind development projects

identified as CD1, CD2, and DE2. As mentioned previously, the scope of the work and analysis were developed like the 2018 Brookings County research where I completed an interview analysis, site investigation, and sales analysis. In total, ten new market sale transactions have been identified and analyzed that have sold in proximity to a wind tower, turbine or project. It was important to point out that in DE1, DE2, DE3, DE4, and DE5 it is public knowledge the permitting process was approved at the time of the sale, but the construction of the project had not commenced. With sale analysis CD1 and CD2 project construction had started with various wind towers erected within the neighborhood, but the project was not operational. The sale transactions are identified in the DAL Exhibit_2.

Q: Is the research completed in November 2019 consistent with the May 2018 Analysis?

A: In my opinion, the overall data is consistent with the research that was completed in May 2018 to support the conclusion that rural South Dakota residential property values have not been negatively influenced by the presence of a wind turbine, tower or wind project; however, there has been new evidence with a sale transaction in Codington County in the footprint of the Crown Ridge II wind development that showed a possible negative effect to the sale price due to the announcement of the project and future location of wind towers in proximity to the residence. Before I review this sale transaction, let me first start by reviewing the new sales data that has been identified since May 2018. In Brookings County, three sale transactions were identified within the Buffalo Ridge wind project. These

sales are referenced as BK12, BK13, and BK14. These sale transactions were consistent with the previous Brookings County research and did not show a negative measurable effect on the selling price. The interview analysis had similar results with pessimistic comments from South Dakota market participants. Most common cited comments by buyers and sellers of rural residential properties in Brookings County included invasion of noise, view obstruction, and a reduced pool of prospective buyers that were willing to purchase rural residences in the proximity to a wind tower. Although market participants were less optimistic about the presence of wind towers in proximity to rural residences, the Brookings sales data suggests there was no market evidence to support a negative effect on the selling price. For example, the most recent sale transaction identified as BK13 sold via the Brookings MLS in November 2019. Thirteen wind turbines surround the property providing influences from view obstructions, flicker effect and noise. An interview with the seller provided nothing positive about living within the proximity of the towers, but the sales data shows the property selling within 25 days on the market and having a market appreciation rate of 6.26% a year between the 2015 purchase and the 2019 selling transaction. The seller reported numerous potential buyers that showed initial interest would not consider the property because of the surrounding proximity of the wind towers near the residence. Again, many negative comments from the market and the seller, but the sales data suggests a normal market transaction without any measurable effect on the selling price. BK12 and BK14 buyer interviews provided similar negative comments about wind towers within the neighborhood but all proceeded to purchase the property with

knowledge of the wind towers, turbines, and project. Consistent with previous market evidence from the Brookings 2018 research, the market provided negative comments about the impacts of the wind projects to the rural landscape of South Dakota, yet the sales evidence did not support an impact or measurable effect to the selling price due to the proximity to a wind tower, turbine or wind project. Although the logic of increased days on the market due to the presence of wind towers seems logical, the data analyzed did not support that conclusion.

Q: Did the 2019 Brookings County research include any updates with agricultural properties?

A: No. Analyzing the effects on agricultural properties from wind towers, turbines and wind projects was not part of the scope of work for the Buffalo Ridge Brookings sales update, but during the interview analysis, market participants that owned agricultural properties were consistent to report inconveniences with wind towers, such as working around the towers, loss of acres due to the base of the tower and roads, and inconsiderate management from the wind tower companies such as leaving cattle gates open and poor reclamation. Overall impacts on agricultural property surrounding a wind tower or adjacent to a wind project were minimal, as long as the highest and best use was not affected. There seemed to be a consistent theme within the market that if a participant was receiving payments from wind towers, the participant was more likely to have positive or neutral comments regarding impacts from the wind towers. From the data analyzed, the market evidence supports the conclusion that agricultural properties with

consistent wind lease revenue can have a positive effect and may in some cases increase the property value due to the income above the property's agricultural production capabilities.

Q: Did you research rural residential sale transactions in the vicinity of the Deuel Harvest Wind Project?

A: Yes. As mentioned previously, in May of 2018 my field researched identified four properties near Gary, South Dakota that all were listed on the market at the same time. Rural residential properties typically have a reduced population of listings and scattered around the rural area, so having four properties listed for sale in the same neighborhood and adjacent to the Deuel Harvest Wind Project struck me as odd. Back in May of 2018, I elected not to continue with the research because Deuel Harvest was not permitted and approved by the PUC and none of the properties were completed transactions. In October 2019 my investigation revealed that all properties have since sold via the Northeast MLS. The sale transactions are identified as DE1, DE3, DE4, and DE5. All transactions were influenced by a permitted wind project; however, tower construction has not commenced. Sales DE2 and DE3 were specifically influenced by recorded wind memorandums within the title records. After further investigation and interviews with the managing broker, the sale motivations were not influenced by the Deuel Harvest Wind Project and the sales evidence suggested the properties sold within the range of market transactions uninfluenced by the proximity of wind tower, turbine or project.

Q: Are you familiar with any property owners in South Dakota that have claimed a negative impact on their property value due to the presence of wind turbines, towers, or a wind project?

A: I am aware of three properties in South Dakota with claims of negative impacts on rural residential properties. The first property is located near Toronto South Dakota, identified as JE1. I became aware of this property from an article in a local newspaper. On May 23, 2018, I met at the property with the owner to understand the property characteristics and influences from wind towers located near the property. The property owner grew up in the area and decided to relocate to South Dakota for his retirement years. I sat at the kitchen table with the property owner and talked about experiences with living in the rural neighborhood before and after the wind towers, followed by a detailed tour of his property. The property includes 15 treed acreages improved with a 1994 ranch home with 6,192 square feet, five bedrooms, and three bathrooms. The acreage also has geothermal heat and a shop building. The setting is typical of most acreages in rural South Dakota; however, turbines surround the property on all sides with the closest turbines being located within 1,200 +/- feet of the property. The day I toured the property; the weather conditions were typical of most South Dakota days in May with strong winds from the south. As I stood in the driveway and backyard, I was very surprised at the audible sounds of the turbines within the property effecting the peace and enjoyment of the property, along with the visual presence of the towers that bounded over the west and east boundaries. The shadow effect from the rotation

of the turbine blades was not evident at the time of my site inspection; however, the property owner reported shadow and flicker effects within the property boundaries and interior of the home through the west and east windows. The property was listed on July 22, 2019, for $749,000 and expired on October 22, 2019. According to the MLS, the property was only listed for 92 days on the market, with a listing price at the high end of current active listings in the market. My conclusion of JE1 is there could be a potential negative influence from the proximity of towers in terms such as view and noise; however, any value impacts are unknown at this time because there is no sale transaction to analyze and the complexities surrounding the measure of depreciation in relation to the ideal improvement.

I became aware of the second property through my field research and interview process. Three different brokers directed me to a sale transaction that took place near Waverly South Dakota and within the Crowned Ridge wind project. It is my understanding the property owner has also presented details to the PUC regarding this sale transaction. This sales analysis is referenced as CD2 in the DAL Exhibit_2. My analysis included a site visit, sales analysis and interview analysis with parties to the transaction, including the seller and broker. The basic summary of the transaction is the property was listed for sale for $369,000 on the MLS system. An offer was presented and accepted by the seller for $350,000. After discussions with the agent, the seller felt an obligation to present material facts about the proximity of the Crown Ridge wind project. The offer was rescinded, and the property was relisted on the MLS with the updated disclosure of the wind

project. After extended marketing time, the seller accepted an offer of $275,000. From the perspective of the seller and broker, the presence of the wind project and the proximity of the tower caused a market reduction in the selling price of $75,000. Preliminary facts of the transaction seem to support a negative influence on the selling price from project anticipation stigma and/or influence from the timing of the updated disclosure form during the negotiation process. This is the second transaction that I'm aware of in eastern South Dakota in which disclosure of the wind project or location of a wind tower in proximity to a rural residence has influenced the negotiation process, and supports market participant comments that some buyers are sensitive to living near wind towers. As concluded within the CD2 sales analysis, further investigation is required to support the facts for a final conclusion as to the influence and effects from the proximity of the wind tower and project.

The third property is north of Gary, South Dakota in the proximity of the Deuel Harvest Wind Project. This transaction is identified as DE1. Preliminary investigation completed in May 2018 revealed possible negative influences from the disclosure of Deuel Harvest Wind Project during the negotiations process; however, final review of the completed market sale transaction could not support a measurable effect to the sale price from the announcement of the wind project or future locations of the towers. DE1 can be referenced in the DAL Exhibit_2.

Q: Do you believe there is enough information with CD2 to support the position of the seller and agent that the proximity of the turbine, tower and/or project negatively influenced the selling price?

A: My conclusion is that it is difficult to provide a definitive conclusion at this time without a complete investigation of the motivations surrounding the transaction including further interview participation from both seller(s), buyer-1, and buyer-2, an on-site property inspection to evaluate property characertistics and review of title and transactional documents to support the preliminary facts.

A: Is there any other information that you have discovered through your research process the commission should be aware of that could influence a rural residential property in the proximity of a wind tower, turbine or wind project?

A: Yes. During the interview process of my analysis with brokers working in the Codington, Deuel and Grant market area I started noticing varying opinions between agents about what materials facts should be disclosed on the South Dakota Seller's Property Condition Disclosure Statement for residential properties in regards to a wind development, permitted project or proximity to wind towers. Let me give the commission some quick background about the SD Real Property Disclosure form. In South Dakota, as required by law, a seller must complete a property disclosure statement in compliance with SDCL 43-4-38 when a residential property is listed and sold. As part of the disclosure statement, a seller and agent are to disclose any material facts about the property to potential buyers

and if the seller becomes aware of any change of material fact, the seller is required to provide an updated disclosure prior to closing. The South Dakota Seller's Property Condition Disclosure Statement can be referenced in DAL Exhibit_3, specifically with reference to item number 11 which states, *"Are you aware of any other material facts or problems that have not been disclosed on this form?"* During the course of my interview investigation with brokers, there was inconsistency about the topic of whether the knowledge of a wind project or proximity to a future tower should be disclosed. Some brokers and sellers felt an ethical responsibility and a legal obligation, while others felt it wasn't their responsibility to disclose. My interview analysis did not result in a consistent answer of how the market deals with the material facts of towers, turbines or developing wind projects, but there seems to be a consensus that there is a segment of the market in which disclosure of the material facts of a wind project, turbine or tower could affect the decision-making process of a buyer. In attempting to further investigate, I contacted the South Dakota Real Estate Commission for guidance on the topic. I posed the hypothetical question to the compliance examiner:

I have a rural acreage in eastern South Dakota. It's the typical South Dakota setting with a classic farmhouse, 10 acres, shelterbelt, and unobstructed rural views. I have become aware that a large wind development project has been approved by the PUC and construction will begin on the project within a year in my neighborhood. I attend a public project meeting at the local community center and have also learned the wind company is planning to construct two wind towers on the adjacent 160-acre farmland. The wind turbines will be within 1,500 to 2,000 feet of my property. After becoming aware of the changes that will be taking place in the neighborhood as a result of the wind project, I have decided to sell my property and move to an area without any wind towers. I hire a licensed S.D. real estate agent to sell my property. The agent presents a Seller's Property Condition Disclosure Statement and explains this is a legal document required by South Dakota Law that I must complete in order to sell my residence. Am I obligated to report the material facts about the proximity of the wind turbines that will be constructed near my property and the future wind project that will be constructed in the neighborhood?

The response I received from the Real Estate Commission provided me with the definition cited by the commission to assist brokers in understanding what must be legally disclosed and what a material fact is from *The Language of Real Estate*, Third Edition by author John W. Reilly. A material fact is defined as, *"Any fact that is relevant to a person making a decision"* The Real Estate Commission would not take a position on the topic and said to seek the counsel of an attorney for a legal opinion on how to answer the question for the disclosure statement. Regardless of the legal answer, this is an issue that is being created for sellers of residential property by the permitting of multiple wind projects and construction of hundreds of turbines across eastern South Dakota.

Q: Do you have any concluding remarks?

A: Based on my research within Brookings County and surrounding market, the overall evidence supports the presumption there have been no adverse effects on the selling price of rural residential properties in proximity to a wind tower, turbine or wind project; however, it does not rule out the fact that some market participants are sensitive to living in proximity to a wind tower, turbine or development. It is important to realize that as the rural landscape of South Dakota continues to be influenced by an increasing population of wind towers, there could be certain situations where there could be potential influences on a rural residential property as evident by the preliminary analysis of CD2 and the South Dakota Disclosure Statement. The South Dakota research I have conducted indicates that increasing

the distance relationship from a wind turbine and a rural residence can greatly alleviate potential negative impacts on rural residential properties from a wind tower, turbine or project.

Q: Does this conclude your testimony?

A: Yes.

Exhibit 1:

Rural Residential Transaction Summary Table						
Transaction Reference	**Property Type**	**Physical Evidence of Effects**	**Interview Evidence of Effects**	**Sales Evidence of Effects**	**Consistency of Sale Evidence with Interview Evidence**	**Overall Conclusion**
BK1	Rural Residential	Yes	None	None	Consistent	No measurable effects
BK2	Rural Residential	Yes	None	None	Consistent	No measurable effects
BK3	Rural Residential	Yes	None	None	Consistent	No measurable effects
BK4	Rural Residential	Yes	None	None	Consistent	No measurable effects
BK5	Rural Residential	*None*	None	None	Consistent	No measurable effects
BK7	Rural Residential	Yes	None	None	Consistent	No measurable effects

****Turbines were not in operation during the site visit of BK5. Winds light and variable. ****

Ag Transaction Summary Table						
Transaction Reference	**Property Type**	**Physical Evidence of Effects**	**Interview Evidence of Effects**	**Sales Evidence of Effects**	**Consistency of Sale Evidence with Interview Evidence**	**Overall Conclusion**
BK2.5	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK6	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK8	AG/Res	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK9	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK10	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK11	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
BK12	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview
JD13	AG	None	None	**Not Developed**	Inconclusive	None apparent per interview

****Sales analysis not developed due to time constraints****

Interview Summary Table			
Interview Reference	**Property Type**	**Participant**	**Interview Summary Comments**
BK1	Residential	Broker	Can be noisy. Limits potential buyers . Doesn't seem to affect price.
BK2	Residential	Buyer	Did not affect purchase decision. Don't like the noise. Flicker effect certain times of the day. Blade broke and threw fragments near the house. Sounds like a continual swooshing sound when it's windy.
BK2 BK2.5	Res/AG	Seller	Satisfied with price. Could feel vibrations inside the house. Glad not to be living near wind towers. Had to give up a wind lease option to sell the house.
BK2.5	AG	Buyer	No affect on purchase price of BK2.5. Own & lease farmland with wind towers. Live in proximity to wind towers. Noisy. Poor reclamation after construction of towers; compaction & loss of yields. Difficult to farm around towers. Currently have farmland under contract with towers.
BK3	Residential	Broker	Some buyers won't look at home near wind towers. However, there is demand for acreages in the market and it doesn't seem to affect the price.
BK3	Residential	Buyer	The towers sound like jet planes when you are working in the yard. But paid the same, even though they don't like the noise.
BK4	Residential	Buyer	Some noise, but doesn't bother me. Paid the same. Happy with purchase.
BK4	Residential	Seller	Got tired of the annoying noise. Decided to sell. We thought it would effect the value; but it didn't matter to the buyer. Glad to not be living next to wind towers.
BK4	Residential	Broker	Though sellers initally expressed concerns about the turbines affecting the price, it took only four months to sell a high-end rural home. Agent doesn't think there was any effect on the price.
BK5	Residential	Broker	Really noisy. Distracts some buyers. Limited acreages in the market. Doesn't seem to be a negative effect on the price. Distance from Brookings is more of a concern to buyers than the wind towers.
BK5	Residential	Buyer	Can be noisy, but didn't matter to us when we purchased the home. Paid the same. No issues.
BK6	AG	Broker	Sales and manages properties with wind towers. Doesn't seem to affect the price or ability to get market rents. There are issues with towers. Can't aerial spray. Breaks up the land; can't plant straight rows. Some guys like them; some don't. It really comes down to a personal decision.
BK7	Residential	Buyer	No affect on value. Property value has increased. Proximity to towers doesn't matter. Little bit of noise when working in the yard. No affect to animals. No concerns or issues.
BK8	AG	Buyer	No issues or concerns. Cattle don't care about the noise. Purchased the land on a CFD and paid market price with towers located on the quarter and no wind payment. No difference in price to me.

Interview Summary Table (continued)			
Interview Reference	**Property Type**	**Participant**	**Interview Summary Comments**
BK9	AG	Buyer	Has over 47 towers located on various ground. Lives near towers, too. Issues with lightning strikes and shattered blades. The company does not clean up well. Good wind payments. Have some towers that pay $12,000/year. Increases land value with wind payments. No affect with land without payments. People who complain are not getting the payments. Just purchased another 152 acres with a wind tower with no payment. Doesn't affect the price as long as you can farm it and there are no affects with yields.
BK12	AG	Broker	Managed auction with wind payments from two towers. Pasture land sold to adjoining land owner. Wind payments $12,373 per year. Property sold in 2018 for $616,000. Wind payments alone are approximately a 2% return and you still can lease or use the property. Believes sale price was positively influenced by the wind payments. No issues with pasture land; have had some issues with tillable ground. Can't plant straight rows, no aerial spraying and can't hunt around the towers. You can hear them run if you are near a tower. Payments offset the hassles with towers.
JD13	AG	Broker	Managed a pasture land auction with towers. Wind lease with 43 years remaining and a 1% annual increase. Land sold for a 10%-15% premium according to auctioneer. Some restrictions because of the towers. You can't shoot around them. Noisy and limits aerial applications.
BKGH	Residential	Seller	Trying to sell a house within the proposed project area. Currently listed on MLS. Had an offer on the property, but believes the disclosure of the proposed wind project near the property ended the deal.
BKDJ	Residential	Owner	Built retirement home prior to the wind project. Towers within 1,000 ft of property on all sides. Noisy. Shadow and flicker effect during certain times of the day. Have to deal with constant noise. Some days louder than others, depending of direction on the wind. Believes the towers are effecting his ability to sell the property.
BKBB	Residential	Owner	Purchased home prior to the wind project. There are periods of the day when there is a shadow effect depending on the angle of the sun. Best way to describe it is like a camera flash. The curtains in the house have to be closed during the flicker times. The flash scares the horses. The red lights, light up the night sky and destroy star gazing. The house was listed for sale and most potential buyers drove away when they saw how close the towers are to the house. The wind company over promised and under delievered.

SALES ANALYSIS BK1		
	SALE No.	BK1
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	8 Acres
Improvements:	2003 Ranch modular design
Finished Area:	2,356 S.F. GLA, 300 S.F. Lower Level
Garage:	Attached 2-Stall
Features:	Treed shelter belt. (2) Pole buildings 40x96 & 34x50
Access:	Gravel road linkage

Sales Analysis Data:

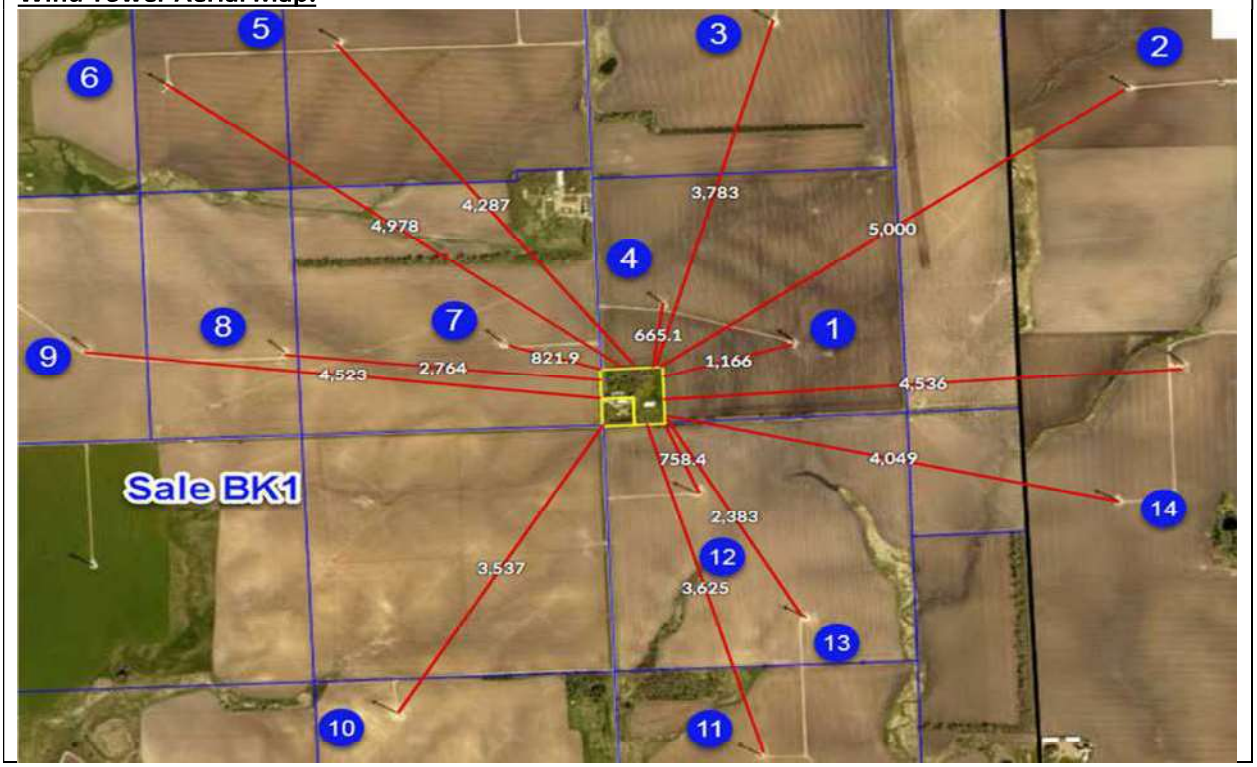
Date of Sale:	January 28, 2016
Market Exposure:	MLS
Listing Price:	$218,000
Sale Price:	$183,000
Verification:	Deed; Beacon; Interview with Broker
Type:	Arm's Length Sale
DOM:	153

Wind Project:

Project:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height from Ground:	399 feet
Wind Tower Property Notes:	Encompassed by 14 wind turbines circling the property. Tower #1 1,200 +/- feet to the east. Tower #2 5,000 +/- feet to the northeast. Tower #3 3,800 +/- feet to the north. Tower #4 665 +/- feet to the north. Tower #5 4,300 +/- feet to the northwest. Tower #6 5,000 +/-

	feet to the northwest. Tower #7 800 +/- feet west. Tower #8 2,700 +/- feet west. Tower #9 4,500 +/- feet southwest. Tower #10 3,500 +/- feet southwest. Tower #11 3,600 +/- feet southeast. Tower #12 750 +/- feet southeast. Tower #13 2,400 +/- feet southeast. Tower #14 4,000 +/- feet southeast.

Wind Tower Aerial Map:



Appreciation Analysis:

(Influenced by Tower) Sale 1 Bk1:	October 30, 2009	$166,000
(Influenced by Tower) Sale 2 BK1:	January 28, 2016	$183,000
	6.24 Years	$23,000
BK1 Appreciation:	**$3,685/Year**	**1.64%/Year**
(Uninfluenced) Sale 1 486th:	December 7, 2004	$133,000
(Uninfluenced) Sale 2 486th:	October 11, 2013	$145,000
	9.25 Years	$12,000
486th Appreciation:	**$1,298/Year**	**.98%/Year**
(Uninfluenced) Sale 213th:	August 10, 2013	$266,000
(Uninfluenced) Sale 213th:	May 24, 2018	$290,903
	4.62 Years	$24,906
213th Appreciation:	**$5,390/Year**	**2.02%/Year**

Conclusion:	Sale BK1 has market appreciation within the range of the market sales that are not influenced by a wind tower, turbine or wind project.

Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:

Interview Conducted by:	David Lawrence
Party Interviewed:	Broker
Interview Date:	May 28, 2018

Interview Notes with Broker:	This is the second time the broker has sold the property. The property sold within 150 days. The broker made sure to include pictures of the wind towers in the photos so potential buyers would be aware of the proximity. The broker stated that some potential buyers did not like the proximity of the wind turbines, while other potential buyers didn't care. There were more issues with the manufactured home design than concern for the wind towers. Broker stated the buyers liked the majestic beauty of the towers and there was no detrimental effect on the selling price because of the proximity of the wind towers.

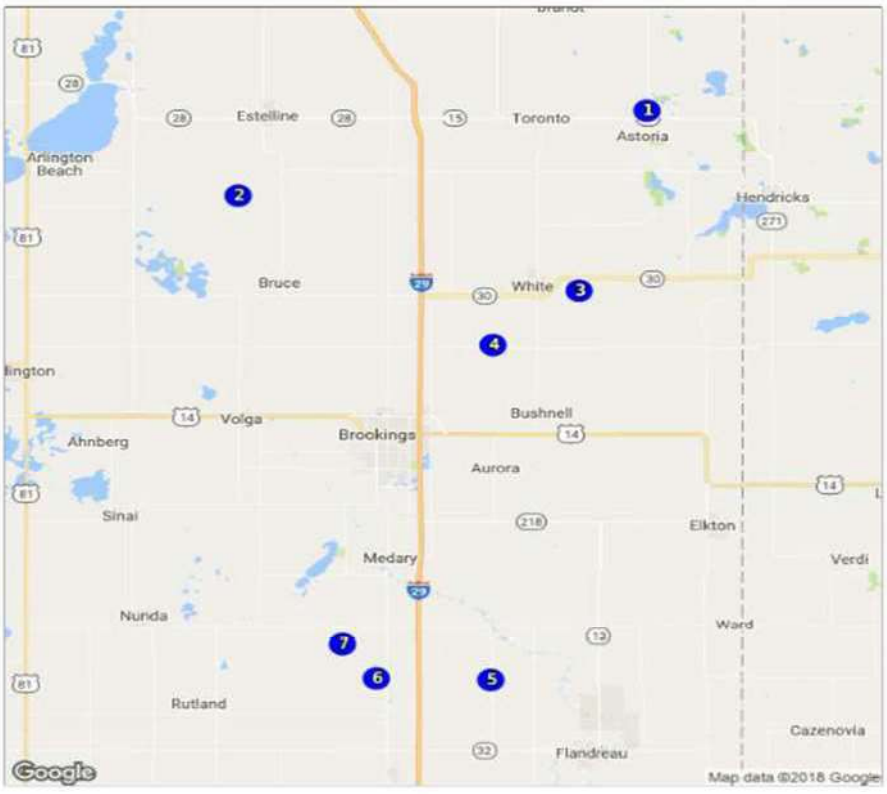
Interview Notes with Buyer:	The owner was not available during the site visit. I left a voice mail message; the owner did not return my phone call.

Market Sales Analysis:



Sales Analysis BK1									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK1	Elkton	2016	$183,000	2003	2,356	8	Ranch	Pole Buildings	
1	Astoria	2015	$186,000	1910	1,472	14	Story1/2	Outbuildings	**Comparable**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
2	Bruce	2015	$161,000	1952	1,134	6.44	Ranch	1-car garage	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Similar(=)*	*Similar(=)*	*Inferior (+)*	
3	White	2015	$250,000	2010	1,518	22.48	Ranch	Barn/Guest House	**Superior**
			Adjustments:	*Superior(-)*	*Inferior (+)*	*Superior(-)*	*Similar(=)*	*Superior(-)*	
4	Aurora	2016	$213,000	1910	1,140	12.37	Story 1/2	Pole Building/Barn	**Comparable**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Superior(-)*	*Similar(=)*	*Similar(=)*	
5	Colman	2015	$155,000	1979	1,568	3.13	Ranch	Quonset/Garage	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar(=)*	*Inferior(+)*	
6	*Colman*	*2015*	*$180,400*	*1961*	*2,240*	*10*	*Ranch*	*Barn/Outbuildings*	**Comparable**
			Adjustments:	*Similar(=)*	*Similar(=)*	*Similar(=)*	*Similar(=)*	*Similar(=)*	

Sale Location Map:



Legend	
1. 19367 483RD AVE, Astoria, SD 57213(13-122)	5. 22603 476th Ave., Flandreau, SD 57028(14-156)
2. 19851 464th Avenue, Bruce, SD 57220(15-394)	6. 47023 226th Street, Colman, SD 57071(15-368)
3. 20383 480TH AVE, White, SD 57276(15-434)	7. 22409 468th Avenue, Colman, SD 57017(15-39)
4. 47594 207th St, Aurora, SD 57002(16-467)	

Market Sales Analysis Conclusion:	Seven sales are from the market without the influence of a wind tower. All transactions have similar highest and best use and are bracketed by the market sales. Sales one, four and six have stronger similarities for comparison and bracket the range of BK1. The market evidence suggests the selling price was not affected by the proximity of the wind towers.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for BK1. The research and data suggest the proximity of the wind towers did not influence the selling price. Sale BK1 sold in 2009 and then resold in 2016 with a market appreciation rate within the range of other uninfluenced sales not in the proximity of a wind tower. Even though there are visual & noise effects observed during the site visit, the interview and market data suggest the proximity of the wind towers has not negatively influenced sale BK1.

SALES ANALYSIS BK2		
	SALE No.	BK2
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	10 Acres
Improvements:	1998 Story 1/2 design
Finished Area:	1,850 S.F. GLA, 1,004 S.F. Lower Level
Garage:	Attached 1-Stall
Features:	Treed shelter belt. Shed, storage building & hobby building
Access:	Paved highway linkage

Sales Analysis Data:

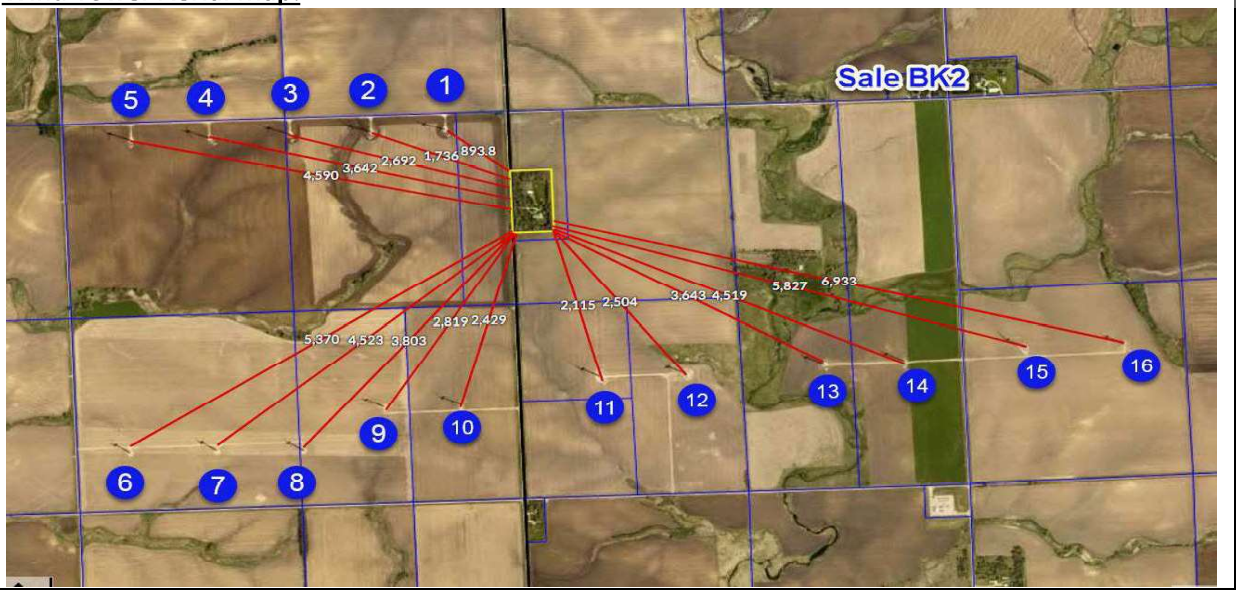
Date of Sale:	March 14, 2011
Market Exposure:	MLS
Listing Price:	$339,000
Sale Price:	$235,000
Verification:	Deed; Beacon; Interview with Buyer & Seller
Type:	Arm's Length Sale

Wind Project:

Project:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	399 feet
Property & Wind Tower Notes:	Encompassed by 16 wind turbines. Tower #1 890 +/- feet northwest. Tower #2 1,700 +/- feet northwest. Tower #3 2,700 +/- feet northwest. Tower #4 3,600 +/- feet northwest. Tower #5 4,600 +/- feet northwest. Tower #6 5,400 +/- feet southwest. Tower #7 4,500 +/- feet southwest. Tower #8 3,800 +/- feet southwest. Tower #9 2,800 +/- feet southwest. Tower #10 2,400 +/- feet south. Tower #11 2,100 +/- feet southeast.

	Tower #12 2,500 +/- feet southeast. Tower #13 3,600 +/- feet southeast. Tower #14 4,500 +/- feet. Tower #15 5,800 +/- feet southeast. Tower #16 7,000 +/- feet southeast.

Wind Tower Aerial Map:



Site Analysis:	
Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Buyer & Seller
Interview Date Buyer:	May 28, 2018
Interview Date Seller:	April 11, 2018

Interview Notes with Buyer:	The home was purchased with the assistance of a real estate agent. Towers were in place at the time of purchase. Turbines surrounding the property didn't affect purchase decision or price paid; although they would prefer not to have them. Some flicker effect and noise. Haven't noticed any health effects. When they purchased the home, there was an encumbrance on the title for a wind easement they had to work with the seller to clean up before closing.

Interview Notes with Seller:	(Interview performed by Northern Plains Appraisal) Sellers desired their privacy and would only allow an interview with NPA. Seller stated when they sold the house, they couldn't get the listing price of $339,000, the price was lowered and sold it for what they could. They also owned the adjoining land around the home. The buyer did not

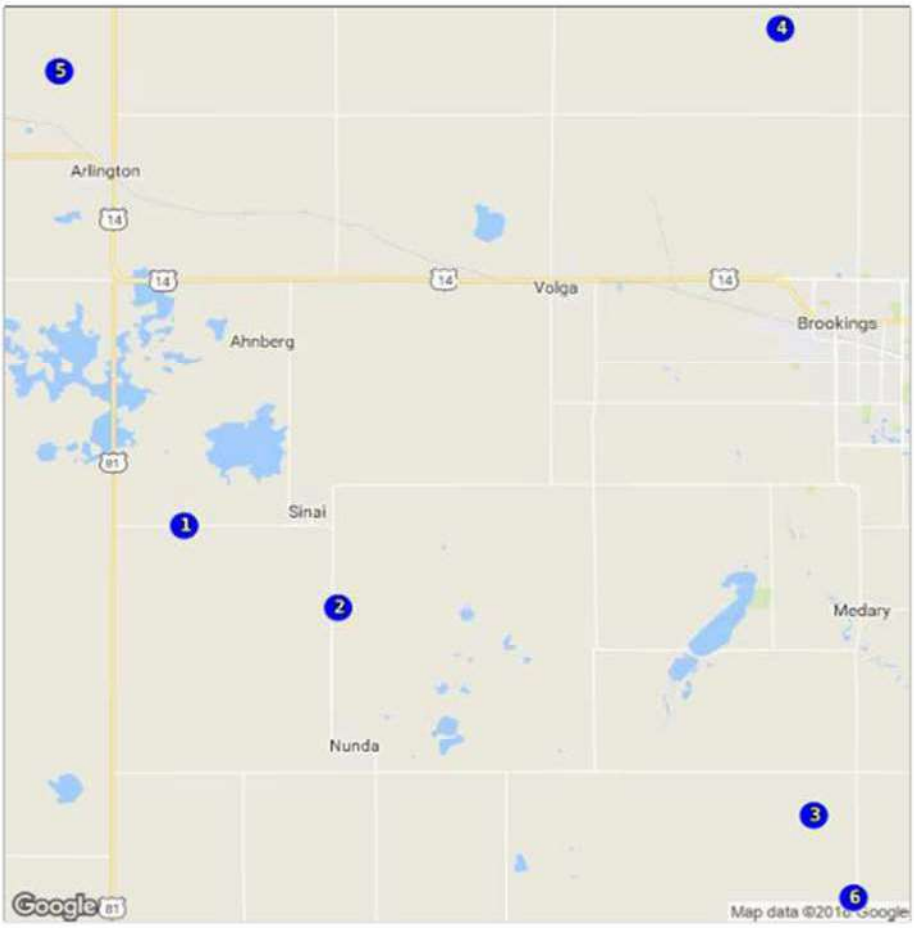
	want any wind towers near the house and therefore had a condition of sale not to sign a wind lease. Seller stated it was difficult to find a buyer, but they were satisfied with the purchase price. Seller stated you could feel the vibrations in the air and towers create issues with the body. They are glad they do not live around wind towers.

Market Sales Analysis:



Sales Analysis BK2									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK2	Toronto	2011	$239,000	1998	1,850	10	Story 1/2	Shed/Storage Bld	
1	Arlington	2009	$214,000	2007	1,748	13	Ranch	Barn/Shed/2car	Comparable
			Adjustments:	*Similar(=)*	*Similar(=)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Volga	2012	$240,000	1983	1,784	4.5	Ranch	Shed/Pole	Comparable
			Adjustments:	*Similar(=)*	*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar(=)*	
3	Colman	2009	$265,000	2006	1,500	9.88	Ranch	Barn/2Car/Shed	Superior
			Adjustments:	*Superior (-)*	*Inferior (+)*	*Similar(=)*	*Similar(=)*	*Superior(-)*	
4	Brookings	2011	$200,000	1949	1,344	9.75	Story1/2	Barn/Shed	Inferior
			Adjustments:	*Inferior(+)*	*Inferior (+)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
5	Arlington	2011	$180,000	1917	1,510	11.79	Story1/2	2cGarage/Sheds	Inferior
			Adjustments:	*Inferior(+)*	*Inferior(+)*	*Similar(=)*	*Similar(=)*	*Similar(=)*	
6	*Volga*	*2011*	*$187,000*	*1954*	*1,491*	*5*	*Story1/2*	*Outbuildings*	Inferior
			Adjustments:	*Inferior(+)*	*Inferior(+)*	*Inferior (+)*	*Similar(=)*	*Similar(=)*	

Sale Location Map:



Legend	
1. 45674 217th St, Arlington, SD 57002(09-653)	4. 46922 205TH ST, Brookings, SD 57006(11-219)
2. 45916 219TH ST, Volga, SD 57071(12-313)	5. 45279 206TH ST, Arlington, SD 57212(11-307)
3. 22406 470th Ave, Colman, SD 57017(09-852)	6. 22609 471ST AVE, Colman, SD 57017(11-511)

Market Sales Analysis Conclusion:	The analysis uses six sales from the Brookings market with similar highest and best use. All sales are without the influence of a wind tower in proximity to the property. Sales one and two are the most similar sales and bracket the selling price of the subject. The remaining sales provide further market support of the selling range of market substitutes. After analyzing the elements of comparison, sale BK2 is within the range of the uninfluenced market sales. The data suggests the wind towers did not negatively influence the selling price.

Overall Conclusion:	An interview analysis, site visit, and sales analysis have been completed for BK2. During the site visit, wind tower noise was present on the on the property. The buyer interview indicated this was not a factor during

	the buying process. There are inconsistencies between the seller interview and the buyer interview; however, the sales data and the buyer's interview comments are consistent. The evidence suggests the proximity of the wind towers did not negatively influence the purchase price.

SALES ANALYSIS BK3	SALE No.	BK3
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	14.28 Acres
Improvements:	1918 Story 1/2 design
Finished Area:	2,208 S.F. GLA
Garage:	Attached 2-Stall
Features:	Treed shelter belt. Shed, storage building
Access:	Paved highway linkage

Sales Analysis Data:

Date of Sale:	December 06, 2011
Market Exposure:	MLS
Listing Price:	$189,000
Sale Price:	$175,000
Verification:	Deed; Beacon; Interview with Buyer & Agent
Type:	Arm's Length Sale

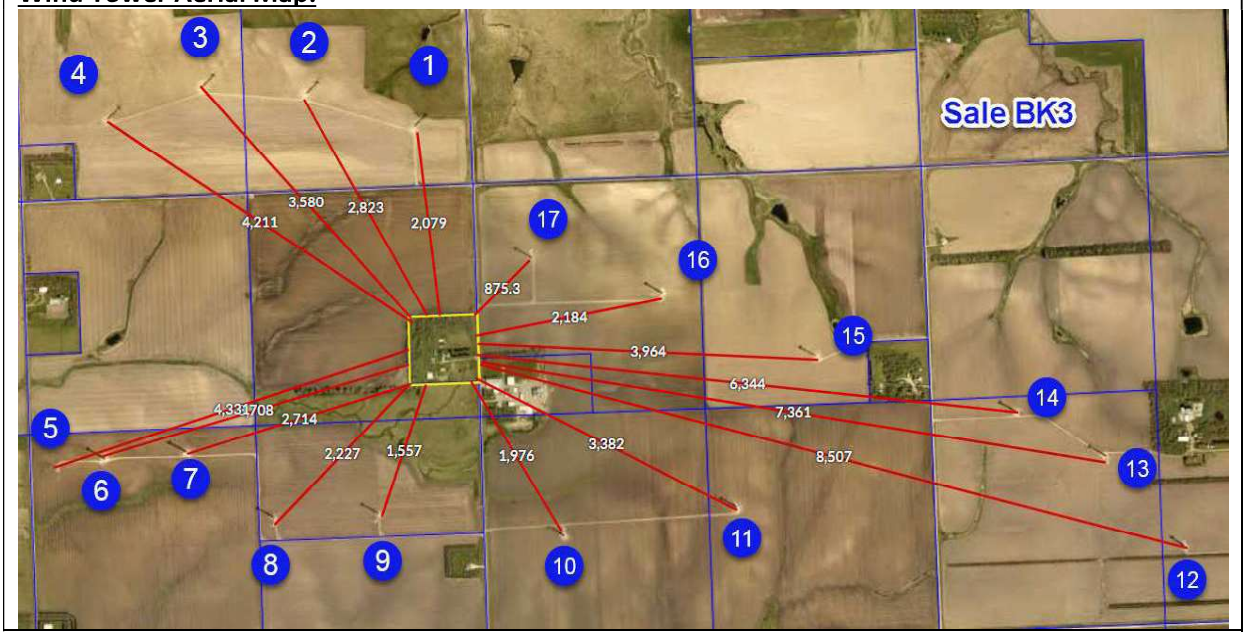
Wind Project:

Project:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter	78/87 meters
Height From Ground:	399 feet
Wind Tower Property Notes:	Tower # 1 2,000 +/- feet north. Tower #2 2,800 +/- feet northwest. Tower #3 3,600 +/- feet northwest. Tower #4 4,200 feet +/- northwest. Tower #5 4,300 +/- feet southwest. Tower #6 3,700 +/- feet southwest. Tower #7 2,700 +/- southwest. Tower #8 2,200 +/- feet southwest. Tower #9 1,500 +/- feet south. Tower #10 1,900 +/- feet southeast.

ADMINISTRATIVE RECORD - Scan 2 - Page 7 of 75

	Tower #11 3,400 +/- feet southeast. Tower #12 8,500 +/- southeast. Tower #13 7,400 +/- feet southeast. Tower #14 6,400 +/- feet east. Tower #15 4,000 +/- feet east. Tower #16 2,100 +/- northeast. Tower #17 875 +/- feet northeast.

Wind Tower Aerial Map:



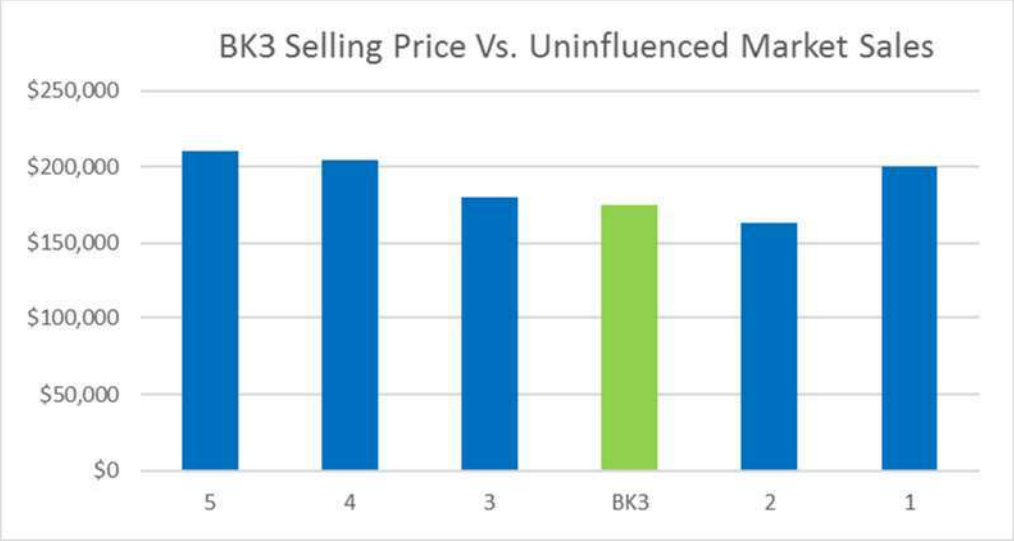
Site Analysis:	
Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Buyer & Agent
Interview Date:	May 23, 2018 (Buyer) May 28, 2018 (Agent)

Interview Notes with Buyer:	The buyer was interested in the property because of the proximity to work. When the agent showed the property, the wind towers were not a factor in their purchase decision. Paid the same even though they do not like the noise and could see the towers from the house. Buyer stated the wind towers could be loud when you are working in the yard.

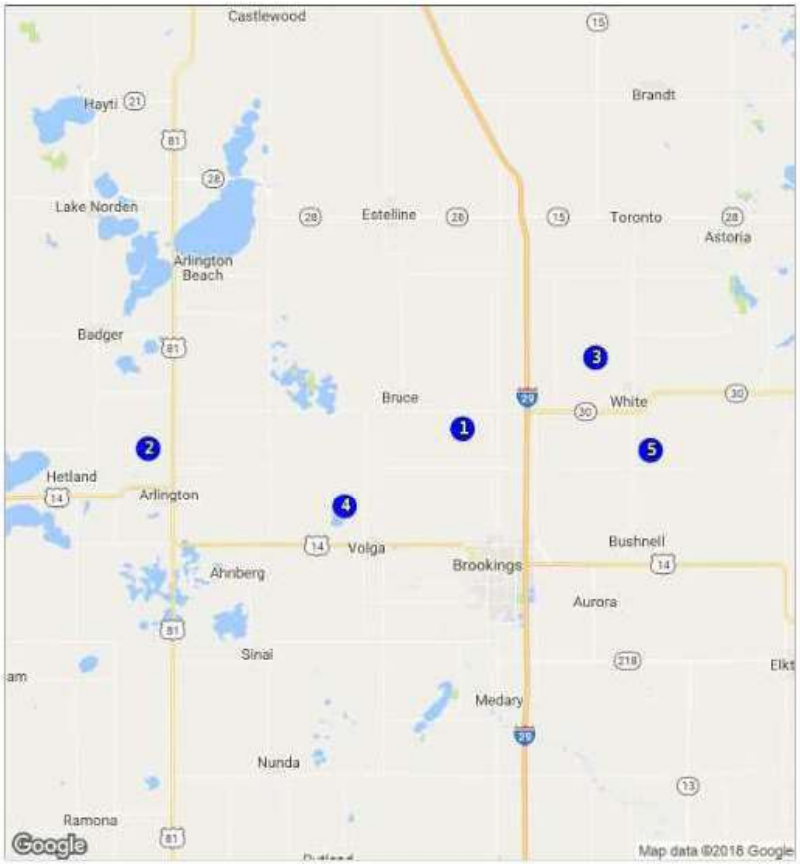
Interview Notes with Agent:	There is high demand for acreages in the Brookings market. Most buyers do not care about the wind towers. Buyers are looking for the features of an acreage. Although there have been potential buyers, some buyers refuse to look at a property near wind towers. The price seems unaffected by properties I've sold near wind towers.

Market Sales Analysis:



Sales Analysis BK3									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK3	**Elkton**	**2011**	**$175,000**	**1918**	**2,208**	**14.28**	**Story 1/2**	**Shed/Storage Bld**	
1	Brookings	2011	$200,000	1949	1,344	9.75	Story1/2	Barn/Shed	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
2	White	2009	$163,000	1910	1,762	3.84	Story 1/2	Barn/Shed	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
3	Arlington	2011	$180,000	1917	1,510	11.79	Story1/2	2cGarage/Sheds	**Comparable**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar(=)*	*Similar(=)*	
4	Volga	2011	$204,000	1910	2,294	12.65	Story1/2	Barn/Shed/2car	**Comparable**
			Adjustments:	*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
5	White	2012	$210,500	1938	2,405	17.12	Story1/2	Shed/Pole	**Superior**
			Adjustments:	*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar(=)*	*Similar(=)*	

Sale Location Map:



Legend
1. 46922 205TH ST, Brookings, SD 57006(11-219)
2. 45279 206TH ST, Arlington, SD 57212(11-307)
3. 47612 201ST ST, White, SD 57276(09-474)
4. 46306 209TH ST, Volga, SD 57071(11-436)
5. 20608 479th Ave., White, SD 57276(12-315)

Market Sales Analysis Conclusion:	Five sales are analyzed in the sales grid from the market area. All sales are uninfluenced by the proximity of a wind tower. Sales one and two are inferior sales and bracket the lower end of the range. Sale five is superior and brackets the higher end of the range. Sales three and four have stronger similarities. After considering the differences in the elements of comparison, the market evidence indicates the selling price was not negatively influenced by the proximity of the wind towers.

Overall Conclusion:	An interview analysis, site visit and sales analysis has been completed for BK3. Although the buyer commented about the noise and view obstructions, the market evidence is consistent with the interview comments. The evidence suggests the overall purchase price was not negatively influenced by the proximity of the wind tower.

SALES ANALYSIS BK4		
	SALE No.	BK4
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	13 Acres
Improvements:	1989 Story ½
Finished Area:	2,728 SF GLA; 4500 SF Finished (Updated)
Garage:	Attached 3-Stall
Features:	Treed shelter belt. 50x112 & 160x120 Commercial Building
Access:	Gravel road linkage; paved driveway

Sales Analysis Data:

Date of Sale:	November 21, 2013
Market Exposure:	MLS
Listing Price:	$569,000
Sale Price:	$530,000
Verification:	Deed; Beacon; Interview with buyer, seller & agent
Type:	Arm's Length Sale
DOM:	117 days

Wind Project:

Project:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	399 feet.
Property & Wind Tower Notes:	Tower #1 10,500 +/- feet east. Tower #2 9,200 +/- feet east. Tower #3 7,700 +/- feet southeast. Tower #4 6,500 +/- feet southeast. Tower #5 5,400 +/- feet southeast. Tower #6 4,100 +/- feet southeast. Tower #7

	3,100 +/- feet southeast. Tower #8 2,400 +/- feet southeast. Tower #9 1,800 +/- feet south, southeast.

Wind Tower Aerial Map:



Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:

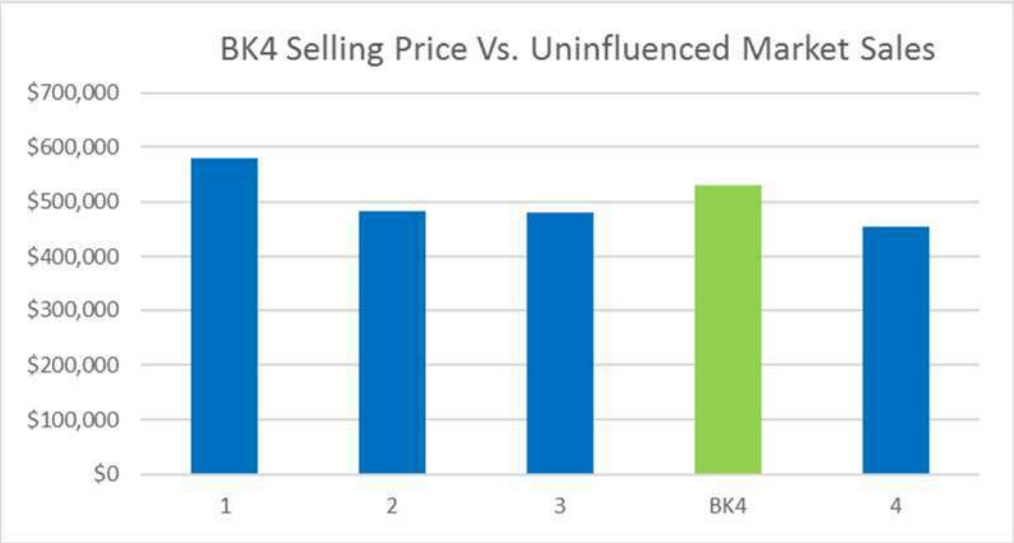
Interview Conducted by:	David Lawrence
Party Interviewed:	Buyer, Seller & Agent
Interview Date Buyer:	May 23, 2018
Interview Date Seller:	May 24, 2018
Interview Date Agent:	May 29, 2018

Interview Notes with Buyer:	Proximity to wind turbines didn't make a difference in the purchase. Paid the same. Purchased property because it had a perfect setup with a remodeled house and two metal buildings. Towers are south of the house, so it doesn't affect the view from the house. The towers make noise and you can hear them in the yard. Doesn't matter, happy with the purchase.

Interview Notes with Seller:	We moved because we were sick and tired of the wind tower noise. We thought it would matter when we sold, but a buyer purchased the house and never mentioned the wind towers. Didn't have any issues with closing or the appraisal. We are happy not to be living next to a wind tower.

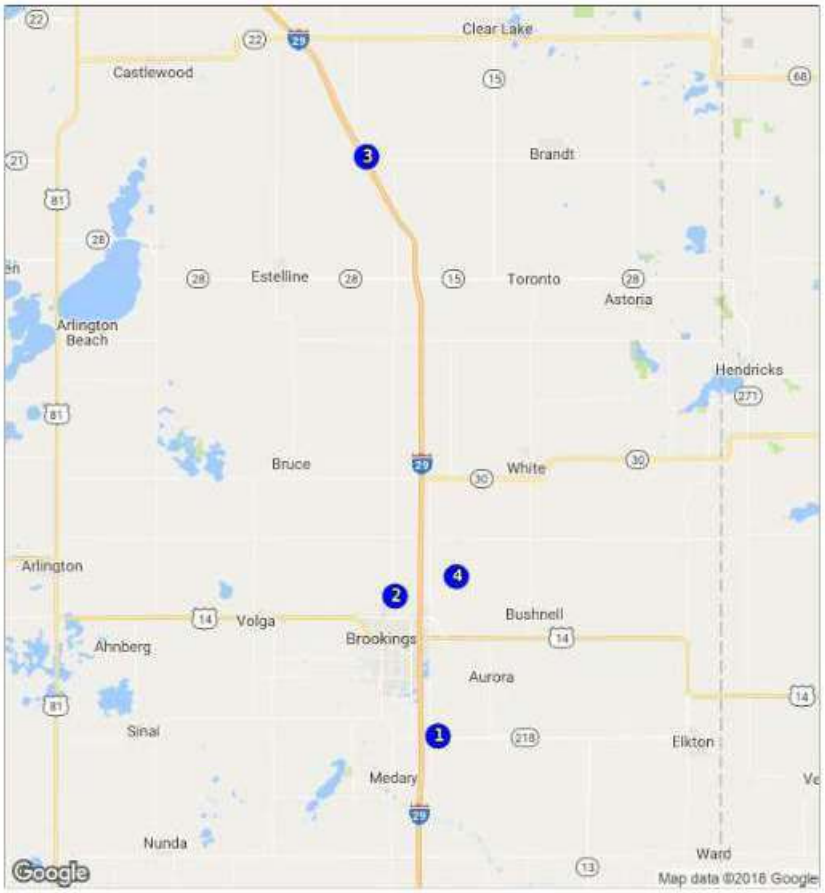
Interview Notes with Agent:	Although the sellers initially expressed concerns about the turbines, and it took four months to sell the property, the agent does not think there was any real effect with potential buyers and she did not hear that from any other realtors regarding this property. The home is an executive home and the market is smaller in that price range according to the agent.

Market Sales Analysis:



Sales Analysis BK4									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK4	**Elkton**	**2013**	**$530,000**	**1989**	**2,728**	**13**	**Story 1/2**	**(2) Metal Buildings**	
1	Brookings	2016	$578,264	1920	3,365	39.87	Story1/2	Barn/Shed	**Superior**
			Adjustments:	*Inferior(+)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
2	Brookings	2015	$482,500	2007	1,726	5	Ranch	Metal Building	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
3	Esteline	2016	$480,000	2003	2,651	4.99	Story1/2	Metal Buildings	**Inferior**
			Adjustments:	*Similar(=)*	*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar(=)*	
4	Aurora	2010	$455,000	1890	3,342	15	Story1/2	Barn/Shed/2car	**Inferior**
			Adjustments:	*Inferior(+)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Inferior(+)*	

Sale Location Map:



Legend
1. 47358 SD Highway 324, Brookings, SD 57006(16-276)
2. 1320 W 30TH ST, Brookings, SD 57006(14-381)
3. 46958 188TH ST, Estelline, SD 57234(15-251)
4. 47437 209th St, Aurora, SD 57002(10-196)

Market Sales Analysis Conclusion:	No sales could be found to bracket the selling price within the time of the transaction date; therefore, the sales search was expanded into 2017. Only one sale was found prior to the selling date in 2010. Sales one, two, and three occurred after the selling date in 2015 and 2016 and located near the city of Brookings. According the MLS data, BK4 was the highest sale price in 2013. The sale evidence suggests the selling price was not influenced by the proximity of the wind towers.

Overall Conclusion:	An interview analysis, site visit and sales analysis has been completed for BK4. The buyer's comments are consistent with the sales evidence. All evidence suggests the sale price was not affected by the proximity of the wind towers.

SALES ANALYSIS BK5		
	SALE No.	BK5
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	6.95 Acres
Improvements:	1936 Two-Story Design
Finished Area:	2,160 SF GLA. Basement 864 S.F.
Garage:	Attached 1-Stall
Features:	Treed shelter belt. Shed, storage building. Detached 1-Stall
Access:	Gravel linkage

Sales Analysis Data

Date of Sale:	March 26, 2014
Market Exposure:	MLS
Listing Price:	$219,000
Sale Price:	$190,000 (Previous sale 2010 $215,000)
Verification:	Deed; Beacon; Interview with Buyer
Type:	Arm's Length Sale

Wind Project:

Project:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	399 feet
Property & Wind Tower Notes:	Four turbines located east, north and west. Tower #1 2,000 +/- feet northeast. Tower #2 3,600 +/- feet north. Tower #3 745 +/- feet west. Tower #4 2,700 +/- feet west.

Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	None at time of site visit. (no wind present)

Wind Tower Aerial Map:



Interview Analysis:

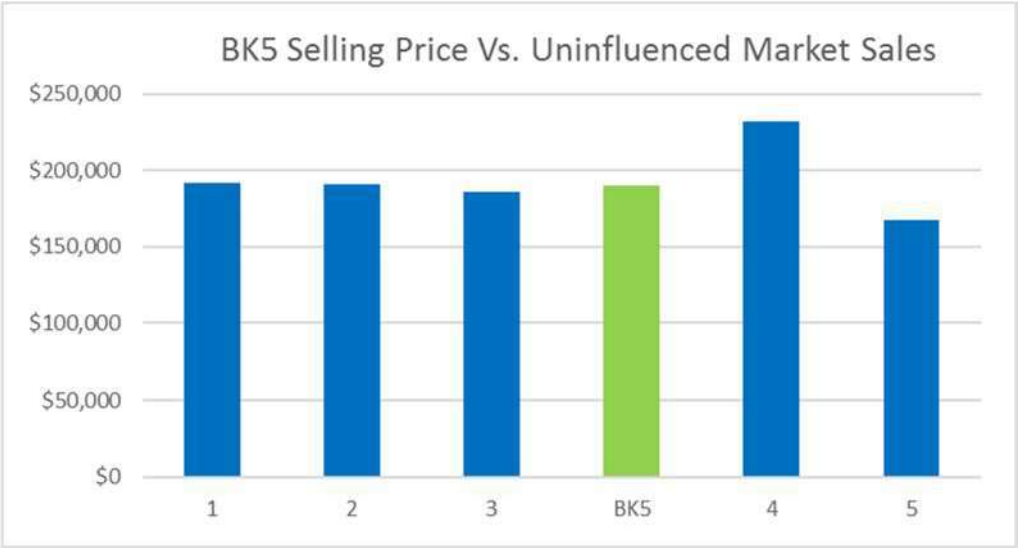
Interview Conducted by:	David Lawrence
Party Interviewed:	Buyer
Party Interviewed:	Agent
Interview Date:	May 23, 2018 (Buyer) May 30,2018 (Agent)

Interview Notes with Buyer:	Property was listed for 3 years and seller had two previous offers fall through; seller was living alone and motivated to sell. Made a good deal. Wind towers can be noisy but didn't matter to us when we bought the home. Really no issues, besides the noise. Doesn't seem to bother wild life, deer come in the yard while the turbines are running.

Interview Notes with Agent:	There are limited acreages within the Brookings market and if the property is in good condition with the features of an acreage, it sells. Lots of buyers looking for acreages. The price was reduced (BK5) because of a dysfunctional floor plan and seller motivations. The floor

	plan eliminated older buyers. Steep stairs. Old house and new house addition with weird layout. During the open house, buyers did not comment about the proximity of the wind towers, even though you can hear them in the yard. Distance from Brookings is what effects the price with acreages, not wind towers. If a property is past the 15-mile mark, price drops considerably. Price/distance relationship. Closer to Brookings prices increase. Acreage buyers are young people with kids. Lots of work to maintain an acreage. If it is too far from town, less buyers. No negative effects on purchase price from wind towers. Buyers did not seem to comment or raise concerns.

Market Sales Analysis:



Sales Analysis BK5									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK5	**Elkton**	**2014**	**$190,000**	**1936**	**2,160**	**6.95**	**Story 1/2**	**Shed/Storage Bld**	
1	Flandreau	2014	$191,900	1880	1,950	8.95	Story1/2	Barn/Shed	**Comparable**
			Adjustments:	*Similar(=)*	*Similar(=)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Volga	2015	$190,600	1918	1,680	15	Story 1/2	Barn/Shed	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Superior(-)*	*Similar (=)*	*Inferior(-)*	
3	Astoria	2014	$186,000	1910	1,472	14	Story1/2	Outbuildings	**Comparable**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar(=)*	*Similar(=)*	
4	Brookings	2013	$232,000	1912	2,075	30.59	Story1/2	Barn/Shed/2car	**Superior**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
5	Nunda	2013	$167,900	1922	1,198	14.63	Story1/2	Shed/Barn/Metal	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar(=)*	*Superior(-)*	

Sale Location Map:



Legend
1. 22603 476th Ave., Flandreau, SD 57028(14-156)
2. 19367 483RD AVE, Astoria, SD 57213(13-122)
3. 612 Wicklow Ln, Brookings, SD 57006(13-312)
4. 22125 457th Ave., Nunda, SD 57050(13-147)
5. 46464 218TH ST, Volga, SD 57071(14-579)

Market Sales Analysis Conclusion:	Five sales uninfluenced by the proximity of wind towers are used for the analysis. The sales have similar highest and best use as acreages in the Brookings rural market. Sale BK5 is bracketed by the market sales. Sales two and five are inferior sales. Sale four is a superior sale. Sales one and three are the most similar. The market evidence suggests the selling price of BK5 was not influenced by the proximity of the wind towers.

Overall Conclusion:	An interview analysis, site visit, and sales analysis have been completed for sale BK5. The buyer's comments indicated the purchase price was influenced by seller motivations and not by the presence of the wind towers. The market data is consistent with the interview analysis and suggests the proximity of the wind towers did not negatively influence the selling price of BK5

SALES ANALYSIS BK7		
	SALE No.	BK7
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	13.35 Acres
Improvements:	1992 Ranch
Finished Area:	1680 SF GLA; 1680 L.L.
Garage:	Attached 2-Stall
Features:	Treed shelter belt. Metal outbuilding
Access:	Gravel road linkage

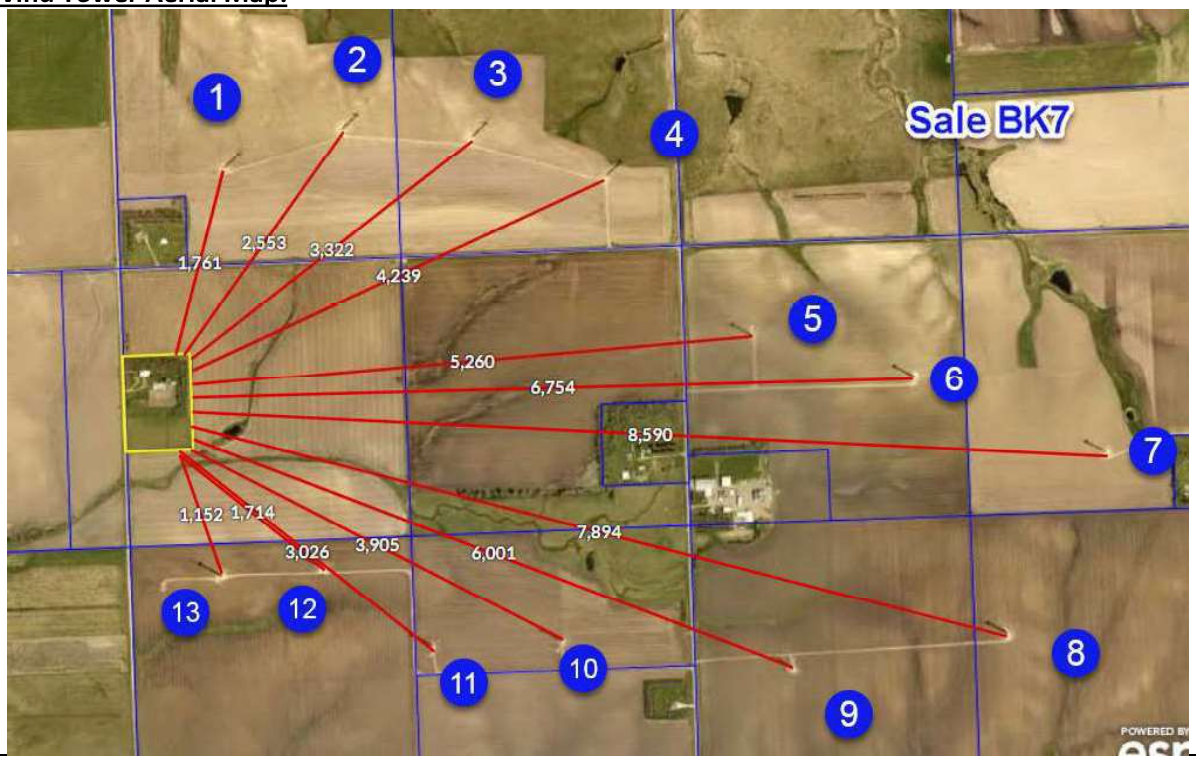
Sales Analysis Data:

Date of Sale:	August 4, 2010
Market Exposure:	Word of mouth
Sale Price:	$180,000
Verification:	Deed; Beacon; Interview with Buyer
Type:	Arm's Length Sale (estate sale, purchased based on appraisal)

Wind Project:

Project:	Buffalo Ridge
Hub Height/Rotor Diameter:	78/87 meters
Height from Ground:	399 feet
Wind Tower Property Notes:	Thirteen wind turbines surround the property. Tower #1 1,800 +/- feet north. Tower #2 2,500 +/- feet northeast. Tower #3 3,300 +/- feet northeast. Tower #4 4,200 +/- feet northeast. Tower #5 5,200 +/- feet northeast. Tower #6 6,700 +/- feet east. Tower #7 8,500 +/- feet east. Tower #8 7,900 +/- feet southeast. Tower #9 6,000 +/- feet southeast. Tower #10 3,900 +/- feet southeast. Tower #11 3,000 +/- feet southeast. Tower #12 1,700 +/- feet southeast. Tower #13 1,100 +/- feet south

Wind Tower Aerial Map:

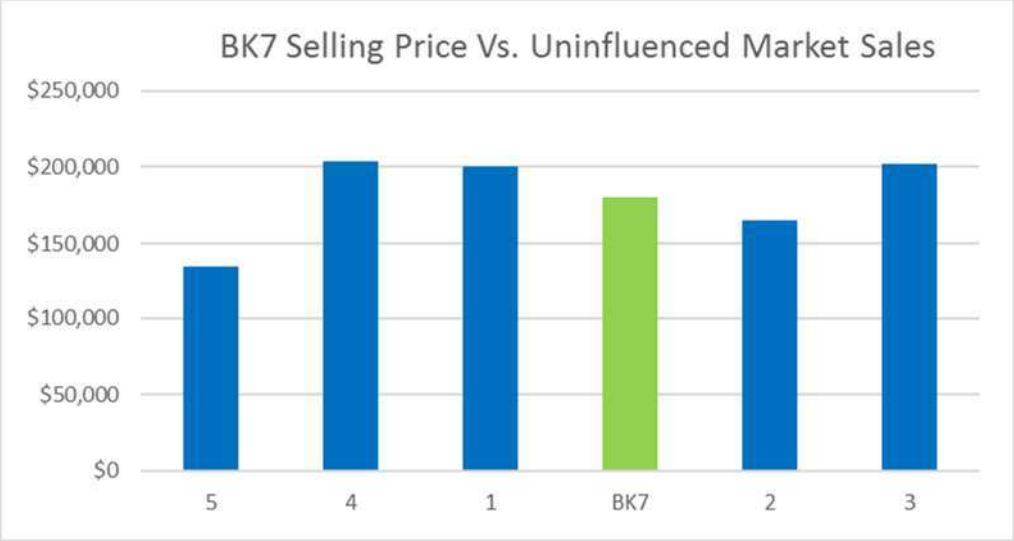


Site Analysis:	
Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interview:	Buyer
Interview Date Buyer:	May 30, 2018

Interview Notes with Buyer:	Property value has increased by at least $75,000 since purchase. No issues or concerns with living near wind towers. There is no effect on the value. No effect to the animals. Can hear a faint "swoosh" noise. No big deal.

Market Sales Analysis:



Sales Analysis BK7									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK7	**Elkton**	**2010**	**$180,000**	**1992**	**1,680**	**13.35**	**Ranch**	**Outbuild/2Car**	
1	Volga	2011	$200,000	2005	1,232	10	Ranch	Barn/2Car	**Superior**
			Adjustments:	*Superior(-)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
2	Colman	2009	$165,000	2001	910	22.03	Ranch	None	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior (+)*	*Superior(-)*	*Similar (=)*	*Inferior(-)*	
3	White	2010	$202,000	1967	1,304	12.78	Ranch	Metal Building/Shed	**Superior**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar(=)*	*Superior(-)*	
4	Volga	2011	$204,000	1910	2,294	12.65	Story1/2	Barn/Shed/2car	**Superior**
			Adjustments:	*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	
5	Brookings	2010	$135,000	1974	1,288	7.5	Ranch	Shed/2Car	**Inferior**
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	

Sale Location Map:



Legend	
1. 47005 225th St., Colman, SD 57017(09-595)	4. 46306 209TH ST, Volga, SD 57071(11-436)
2. 21935 461ST AVE, Volga, SD 57071(11-226)	5. 20456 469TH Ave, Brookings, SD 57006(09-581)
3. 20787 482ND AVE, White, SD 57276(10-599)	6. 47318 SD Highway 30, Brookings, SD 57006(10-430)

Market Sales Analysis Conclusion:	Six sales are utilized in the grid that is not influenced by the proximity of a wind tower. All sales share in highest and best use as a rural acreage and sold around the same time as BK7. After analyzing the elements of comparison, the market sales bracket the selling price of BK7 and suggest the selling price has not been negatively affected by the proximity of the wind tower.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for sale BK7. The market sales and buyer interview comments are consistent. The evidence suggests wind towers have not negatively impacted the selling price of BK7.

Rural Residential Transaction Summary Table						
Transaction Reference	**Property Type**	**Physical Evidence of Effects**	**Interview Evidence of Effects**	**Sales Evidence of Effects**	**Consistency of Sale Evidence with Interview Evidence**	**Overall Conclusion**
BK12	Rural/AG Residential	Yes	None	None	Consistent	No measurable effects
BK13	Rural Residential	Yes	None	None	Consistent	No measurable effects
BK14	Rural Residential	Yes	None	None	Consistent	No measurable effects
CD1	Rural Residential	*NA*	None	None	Consistent	No measurable effects
CD2	**Rural Residential**	***NA***	**Yes**	**Yes**	**Consistent**	***Possible effects***
DE1	Rural Residential	*NA*	Yes	None	Inconsistent	No measurable effects
DE2	Rural Residential	*NA*	None	None	Consistent	No measurable effects
DE3	Rural Residential	*NA*	None	None	Consistent	No measurable effects
DE4	Rural Residential	*NA*	None	None	Consistent	No measurable effects
DE5	Rural Residential	*NA*	None	None	Consistent	No measurable effects

NA=No wind towers installed at the time of sale

SALES ANALYSIS BK12		
	SALE No.	BK12
	STATE	South Dakota
	COUNTY	Brookings





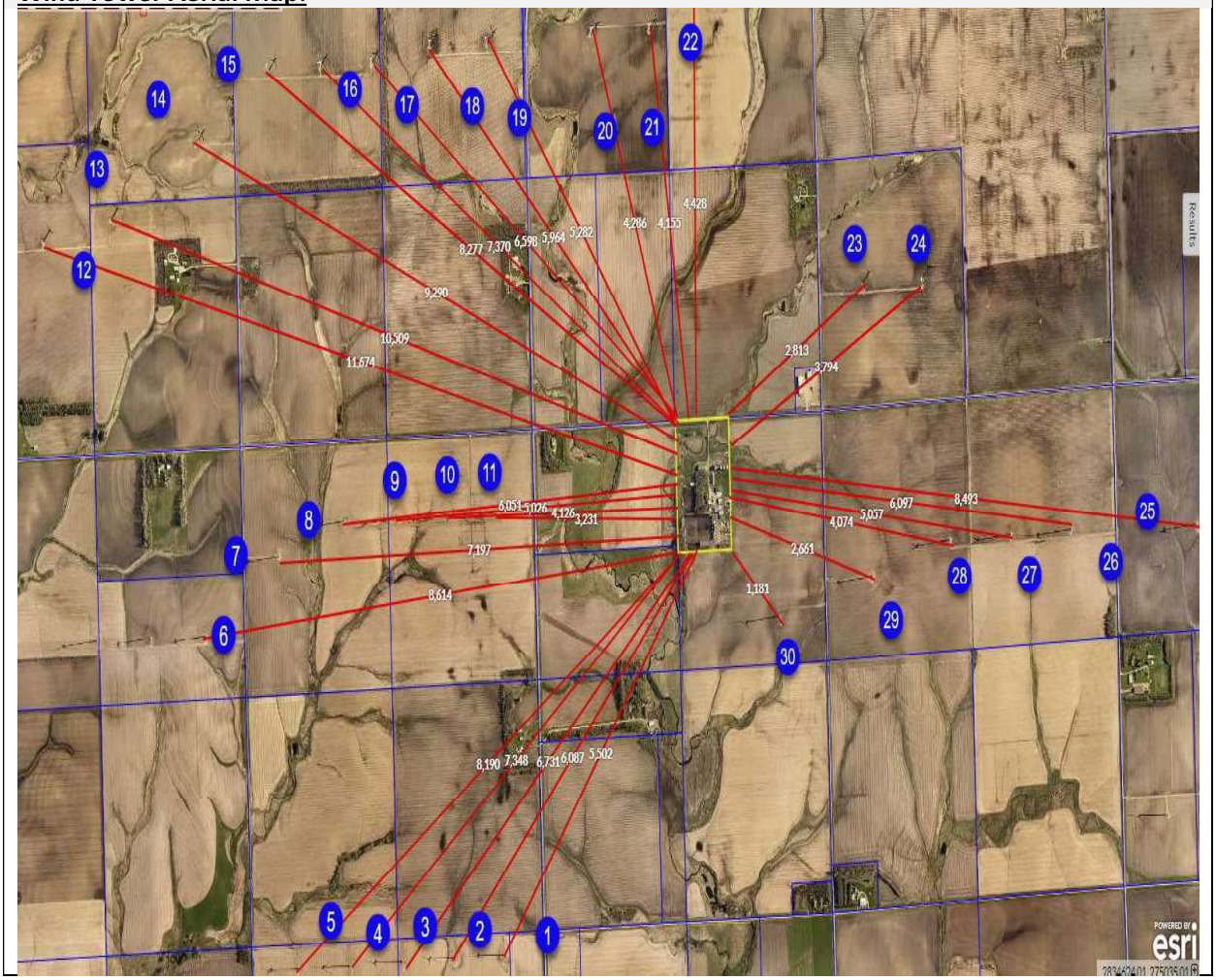
Property Characteristics:	
Highest & Best Use:	Rural acreage & 1,000 head cattle operation
Land Size:	30.00 Acres
Improvements:	1938 Updated Story ½
Finished Area:	2182 SF GLA; 584 L.L. & Crawl space
Garage:	Attached 2-Stall
Out buildings:	25x105, 128x50, 60x30, 62x30, 21,x80, 40x152 pole buildings, 42x66 flat barn, 40x60 Quonset, 5 grain bins, and misc. buildings.
Features:	Treed shelter belt, outbuildings, and rural setting
Access:	Paved road linkage; gravel driveway

Sales Analysis Data:	
Date of Sale:	May 5, 2019
Market Exposure:	Auction managed by First Bank
Sale Price:	$450,000
Verification:	Deed; Beacon; Interview with Buyer
Type:	Arm's Length Sale

Wind Energy Project:	
Development:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Roto Diameter:	78/87 meters
Height From Ground:	399 Feet per docket
Property & Wind Tower Notes:	Thirty wind turbines surround the property. Tower #1 5,502 +/- feet southwest. Tower #2 6,087 +/- feet southwest. Tower #3 6,731 +/- feet southwest. Tower #4 7,348 +/- feet southwest. Tower #5 8,190

	+/- feet southwest. Tower #6 8,614 +/- feet west. Tower #7 7,197 +/- feet west. Tower #8 6,051+/- feet west. Tower #9 5,026 +/- feet west. Tower #10 4,126 +/- feet west. Tower #11 3,231 +/- feet west. Tower #12 11,674 +/- feet northwest. Tower #13 10,509 +/- feet northwest. Tower #14 9,290 +/- feet northwest. Tower #15 8,277 feet northwest. Tower #16 7,370 +/- feet northwest. Tower #17 6,598 +/- feet northwest. Tower #18 5,964 feet +/- feet northwest. Tower #19 5,286 +/- feet north. Tower #20 4,286 +/- feet north. Tower #21 4,155 +/- feet north. Tower #22 4,428 +/- feet north. Tower #23 2,813 +/- feet northeast. Tower #24 3,794 +/- feet northeast. Tower #25 8,493 +/- feet east. Tower #26 6,079 +/- feet east. Tower #27 5,057 +/- feet east. Tower #28 4,074 +/- feet east. Tower#29 2,661 +/- feet southeast. Tower #30 1,181 +/- feet southeast.

Wind Tower Aerial Map:



Site Analysis:	
Site Visit Conducted by:	David Lawrence
Site Visit Date:	November 18, 2019
View Obstruction:	Wind towers within view of residence and all side of the property.
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:

Interview Conducted by: David Lawrence

Party Interview: Buyer

Interview Date Buyer: October 31, 2019

Interview Notes with Buyer: The property was managed by First Bank & Trust and sold by auction. According to the buyer interview, there were three competing parties that participated in the bidding process. Their motivation to purchase the property was to expand their farming operations and provide a residence for their parents. It was common knowledge the property was located near the Buffalo Ridge wind farm. The buyer explained when they looked at the property, it was surrounded by towers. The buyer explained that the wind towers were not a concern and didn't influence the price they paid for the property.

Site Photos:



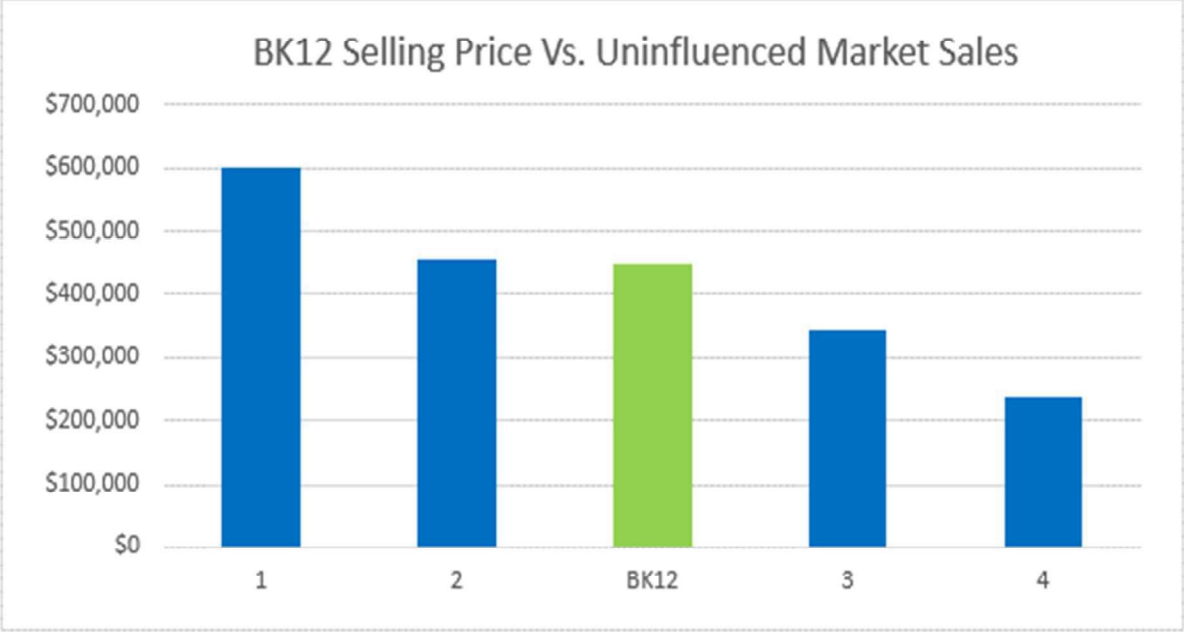






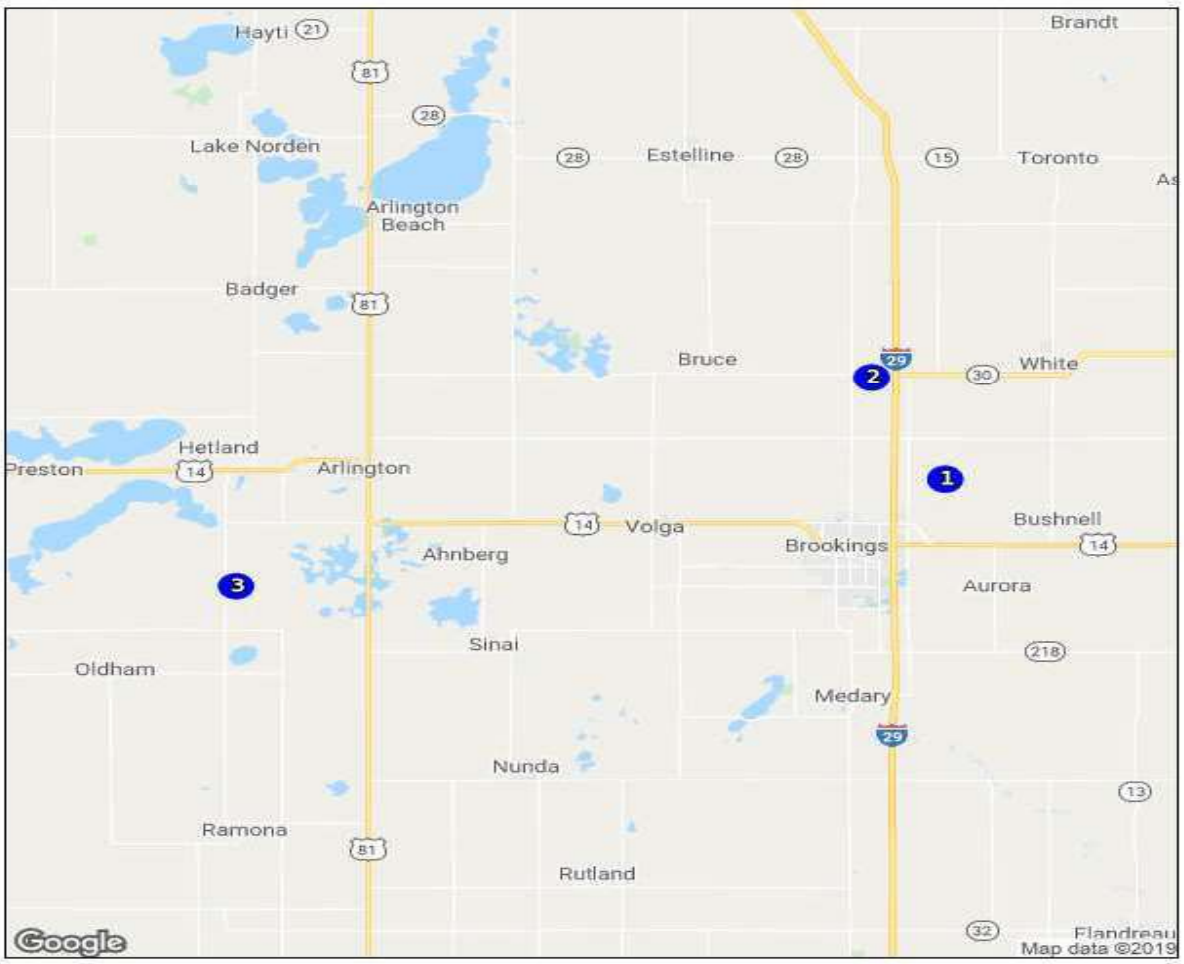


Market Sales Analysis:



Sales Analysis BK12									
Sale No.	Sale Date	Price	Location	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK12	2019	$450,000	White	1938	2,182	30.97	Story 1/2	6 Buildings	
1	2019	$600,000	Brookings	2016	1,792	10	Ranch	3 Bldpole/barn	Superior
		Adjustments:	*Superior(-)*	*Superior(-)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
2	2017	$455,000	Brookings	1920/Upd	2,085	15	Story1/2	Barn/2Bld	Superior
		Adjustments:	*Superior(-)*	*Superior(-)*	*Similar(=)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
3	2018	$342,000	Arlington	1900	1,860	42	Story1/2	3 Pole	Inferior
		Adjustments:	*Inferior(+)*	*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
4	2019	$239,000	Renville	1900	1,392	23.35	Story 1/2	4 Pole Bld	Inferior
		Adjustments:	*Inferior(+)*	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	

Sale Location Map:



Legend
1. 47437 209th Street, Aurora, SD 57002(10-196)
2. 20441 472nd Avenue, Brookings, SD 57006(19-120)
3. 44947 214th Street, Arlington, SD 57212(18-212)

Renville sale 4 not located on map

Market Sales Analysis Conclusion:	Four sales are utilized in the grid without influences from a wind turbine, tower or development. All sales are rural acreages within the market with similar features and outbuilding utility. Sales two and one are superior sales with proximity to Brookings; these are less comparable as acreages in proximity to Brookings and not operating cattle yards. Sale 3 has stronger similarities as a rural acreage and cattle yard. Sale 4 is not from the Brookings market; however, it provides a comparison sale for a 1,000 head cattle operation and rural residence. After analyzing the elements of comparison, the market sales bracket the selling price of BK12 and suggest the selling price has not been negatively affected by the proximity of the wind tower.

Overall Conclusion:	Evidence from the interview analysis, sales analysis, and site observation support the conclusion there is no negative affect on the selling price. The property was sold with competing bids with a selling price bracketed by uninfluenced sales. The buyer had knowledge of the wind towers prior to the sale and purchased the property within the range of the market comparables. The market data is consistent with the buyer's comments that the proximity of the wind towers had no influence on the price paid for the property. All evidence suggests there is no negative affect on the selling price.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS BK13	**SALE No.**	BK13
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural acreage
Land Size:	3.20 Acres
Improvements:	1975 Ranch
Finished Area:	1144 SF GLA; 1144 L.L. Finished
Garage:	Attached 1-Stall
Out buildings:	40x56 Pole Building
Features:	Treed shelter belt
Access:	Paved road linkage

2015 Sales Analysis Data:

Date of Sale:	September 9, 2015
DOM:	91
Market Exposure:	Advertised Sale
Sale Price:	$188,000
Verification:	Deed; Beacon; Interview with Buyer
Type:	Arm's Length Sale

2019 Sales Analysis Data:

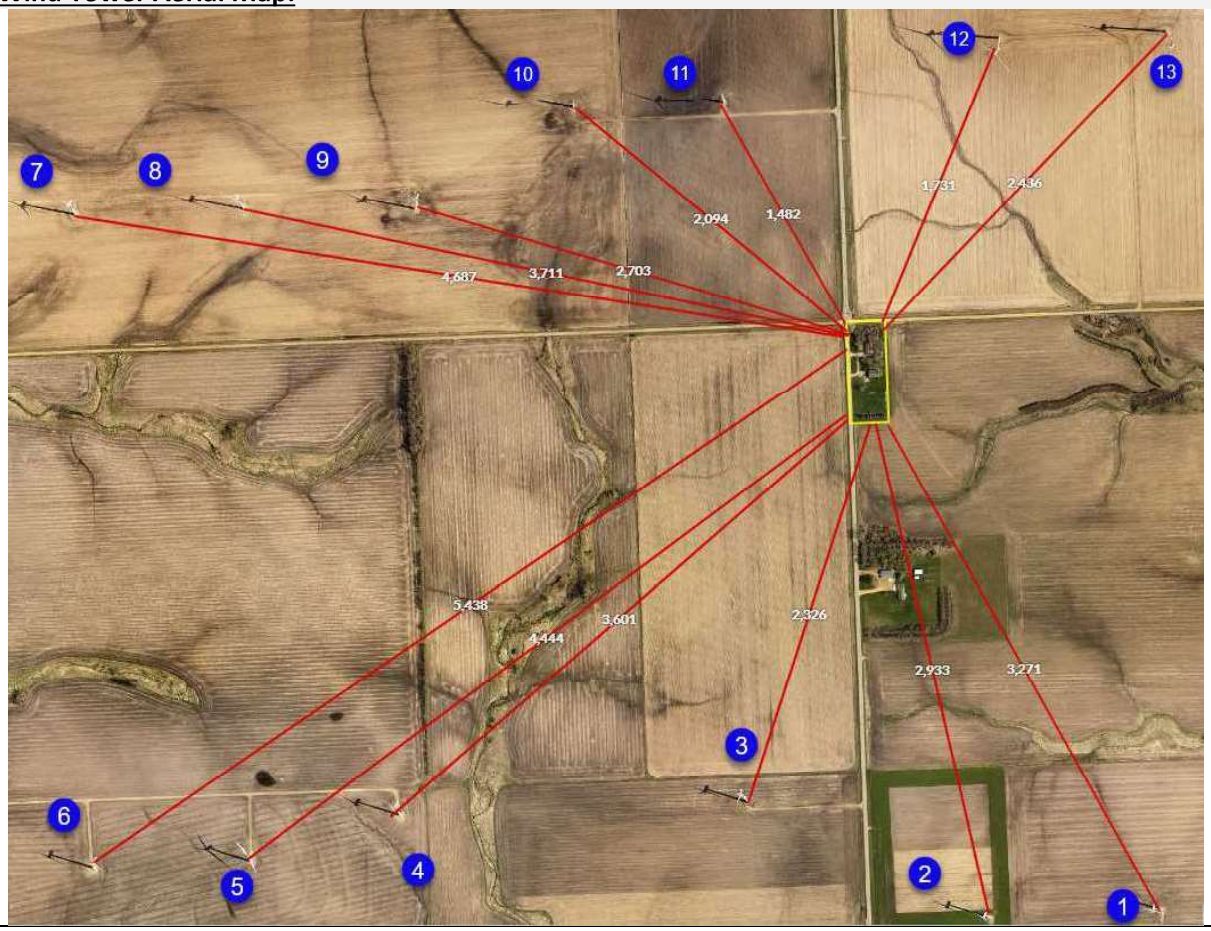
Date of Sale:	October 31, 2019
DOM:	25
Market Exposure:	Advertised Sale
Sale Price:	$237,000
Verification:	MLS, Interview with Seller (previous buyer in 2015)
Type:	Arm's Length Sale

Wind Energy Project:

Development:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW

Hub Height/Roto Diameter:	78/87 meters
Height From Ground:	399 Feet
Property & Wind Tower Notes:	Thirteen wind turbines surround the property. Tower #1 3,271 +/- feet southeast. Tower #2 2,933 +/- feet south. Tower #3 2,326 +/- feet south. Tower #4 3,601 +/- feet southwest. Tower #5 4,444 +/- feet southwest. Tower #6 5,438 +/- feet southwest. Tower #7 4,687 +/- feet northwest. Tower #8 3,711+/- feet northwest. Tower #9 2,703 +/- feet north. Tower #10 2,094 +/- feet north. Tower #11 1,482 +/- feet north. Tower #12 1,731 +/- feet northeast. Tower #13 2,436 +/- feet northeast.

Wind Tower Aerial Map:



Appreciation Analysis:

(Influenced by Tower) Sale 1 Bk13:	September 3, 2015	$188,000
(Influenced by Tower) Sale 2 BK13:	October 31, 2019	$237,000
	4.16 Years	$49,000
BK13 Appreciation:	**$11,778/Year**	**6.26%/Year**
(Uninfluenced) Sale 1 486th:	December 7, 2004	$133,000
(Uninfluenced) Sale 2 486th:	October 11, 2013	$145,000
	9.25 Years	$12,000
486th Appreciation:	**$1,298/Year**	**.98%/Year**

(Uninfluenced) Sale 213th:	August 10, 2013	$266,000
(Uninfluenced) Sale 213th:	May 24, 2018	$290,903
	4.62 Years	$24,906
213th Appreciation:	**$5,390/Year**	**2.02%/Year**

Conclusion: Sale BK13 has market appreciation at the higher end of the market sales that are not influenced by a wind tower, turbine or wind project.

Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	November 18, 2019
View Obstruction:	Wind towers within view of the residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:

Interview Conducted by:	David Lawrence
Party Interview:	2015 Buyer & 2019 Seller
Interview Date Buyer/Seller:	November 4, 2019
Interview Notes with Buyer:	The property was listed in 2014 and sold via the Brookings MLS system with 91 DOM. The buyer stated the wind towers were installed prior to their purchase with the closest tower 2,500 feet from the house. The buyer stated the towers can be noisy, and you can hear them inside the house. They experienced about 5-10 minutes a day of shadows from the towers depending on the time of year. South Dakota wind can make a lot of noise so the wind towers were less of a concern; however, they can't really find anything positive to say about living around wind towers. Not sure it affects the value of the property but having wind towers next to your property limits the buyer pool when you go to sell. There is a narrow group of people who want to live in rural S.D. and when you add wind towers to the proximity of a rural home, most people would prefer not to have them. The buyer stated If there was a choice between a rural property without the proximity of a wind tower, he would choose that property every time, but unfortunately, the market options are not readily available. The property was recently listed in September 2019 and sold within 25 DOM. The seller stated some of the prospective buyers didn't want to live in proximity to a wind tower.

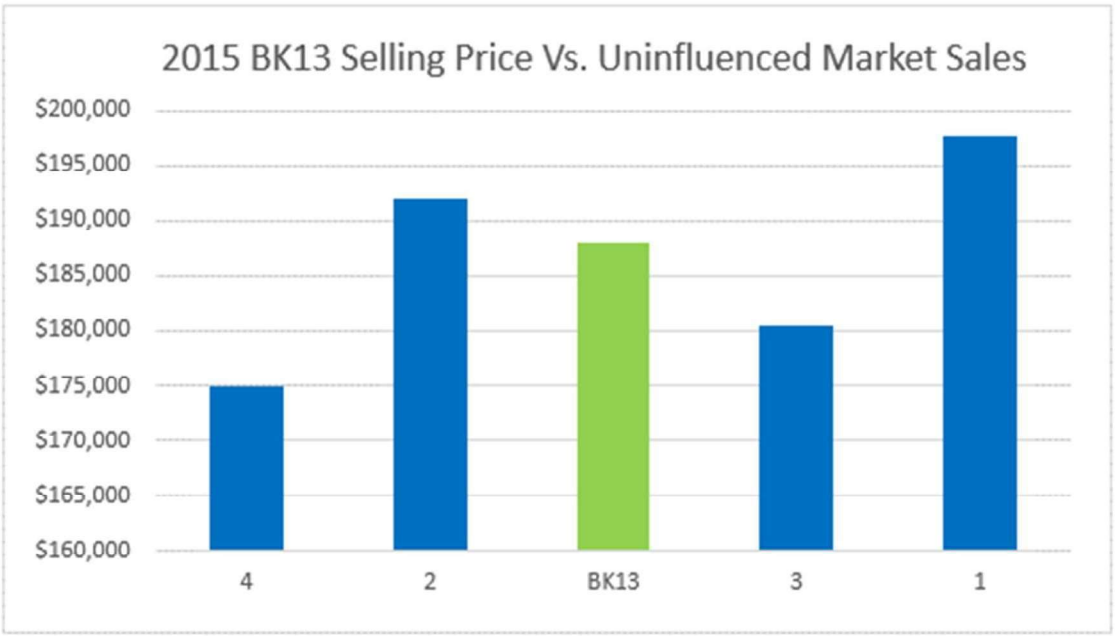
Site Photos:





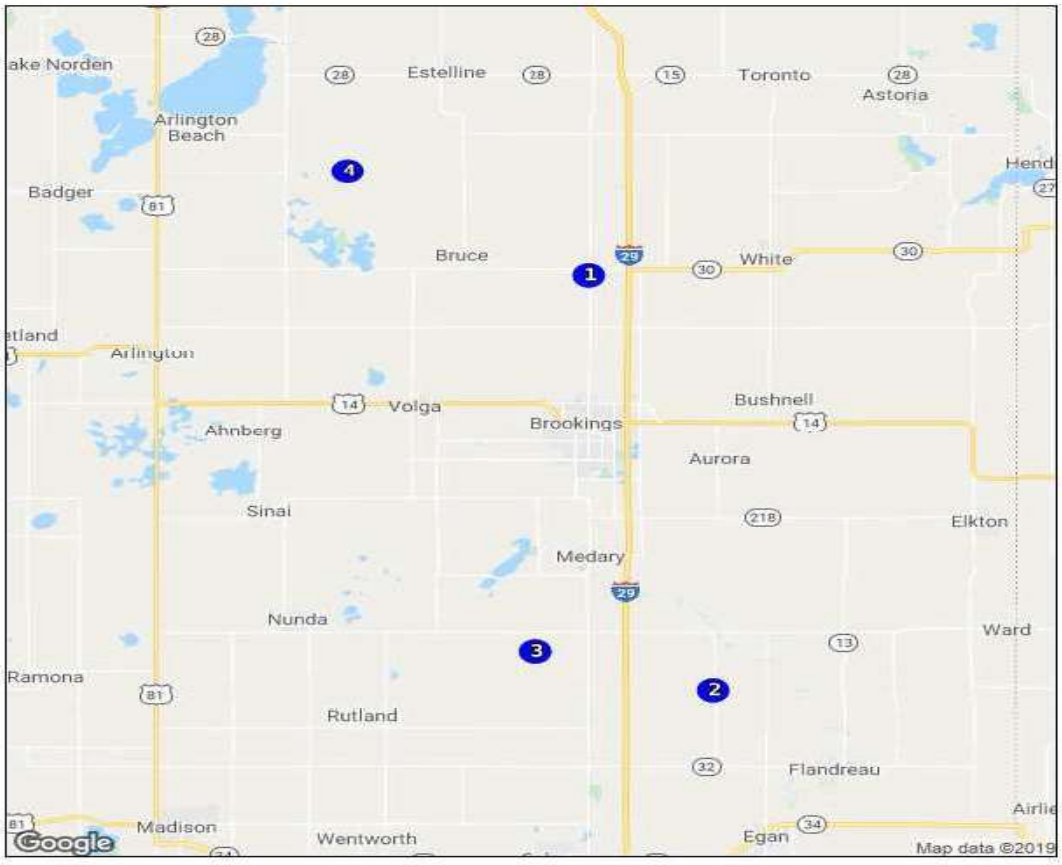


2015 Market Sales Analysis:



Sales Analysis BK13 -- 2015									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK13	Toronto	2015	$188,000	1975	1,144	3.2	Ranch	Pole Building	
1	Brookings	2014	$197,750	1975	1,534	2.02	Ranch	Barn/Shed	Comparlable
			Adjustments:	*Similar(=)*	*Superior(-)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
2	Flandreau	2014	$191,900	1880	1,250	8.95	Story1/2	Barn/Shed	Comparable
			Adjustments:	*Inferior(+)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar (=)*	
3	Colman	2015	$180,400	1961	1,440	10	Ranch	Shed/Bld	Superior
			Adjustments:	*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
4	Bruce	2015	$175,000	1961	1,392	4.6	Ranch	Bld/Barn	Comparable
			Adjustments:	*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	

2015 Sale Location Map:



Legend
1. 20444 471st Avenue, Brookings, SD 57006(14-284)
2. 22603 476th Avenue, Flandreau, SD 57028(14-156)
3. 22409 468th Avenue, Colman, SD 57017(15-39)
4. 46153 199TH Street, Bruce, SD 57220(15-350)

2019 Market Sales Analysis:



Sales Analysis BK13 -- 2019									
Sale No.	**Location**	**Sale Date**	**Price**	**Year/E.A.**	**GLA**	**Acres**	**Style**	**Outbuildings**	**Overall Analysis**
BK13	**Toronto**	**2019**	**$237,000**	**1975**	**1,144**	**3.2**	**Ranch**	**Pole Building**	
1	Volga	2019	$272,000	2003	1,576	2.08	Ranch	OutBld	**Superior**
		Adjustments:		*Superior(-)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Brookings	2018	$206,000	1974	1,460	2.37	Ranch	None	**Inferior**
		Adjustments:		*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Inferior(+)*	
3	White	2018	$195,000	2008	1,008	5	Ranch	None	**Inferior**
		Adjustments:		*Superior(-)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
4	Brookings	2018	$236,500	1976	1,300	5.29	Ranch	Shed/OS Garg	**Similar**
		Adjustments:		*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	

Market Sales Analysis Conclusion:	The data set includes eight market sales that are not influenced by the proximity of a wind tower, turbine or wind project. The analysis includes two sales of the BK13 between 2015 and 2019, with a market appreciation rate of 6.26%. The selling price of BK13 falls within the range of market substitutes. The value range of BK13 is bracketed by uninfluenced superior and inferior sales for both selling dates. The sales data is consistent with the interview comments. The market sales evidence supports the conclusion the proximity to the wind towers did not affect the selling price of BK13.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for sale BK13. The sale evidence suggests the proximity to the wind towers did not influence the selling price. Sale BK13 sold in 2015 and then in 2019 with a market appreciation rate on the higher end of the uninfluenced sales. Even though there is evidence of noise & visual effects from the interview analysis and site visit, the market data suggests the proximity to the wind towner has not negatively influenced sale BK13.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS BK14	**SALE No.**	BK14
	STATE	South Dakota
	COUNTY	Brookings





Property Characteristics:

Highest & Best Use:	Rural acreage
Land Size:	5.70 Acres
Improvements:	1988 Ranch
Finished Area:	1344 SF GLA; 806 L.L.
Garage:	Attached 2-Stall
Out buildings:	80x40 Pole Building
Features:	Treed shelter belt
Access:	Gravel road linkage

Sales Analysis Data:

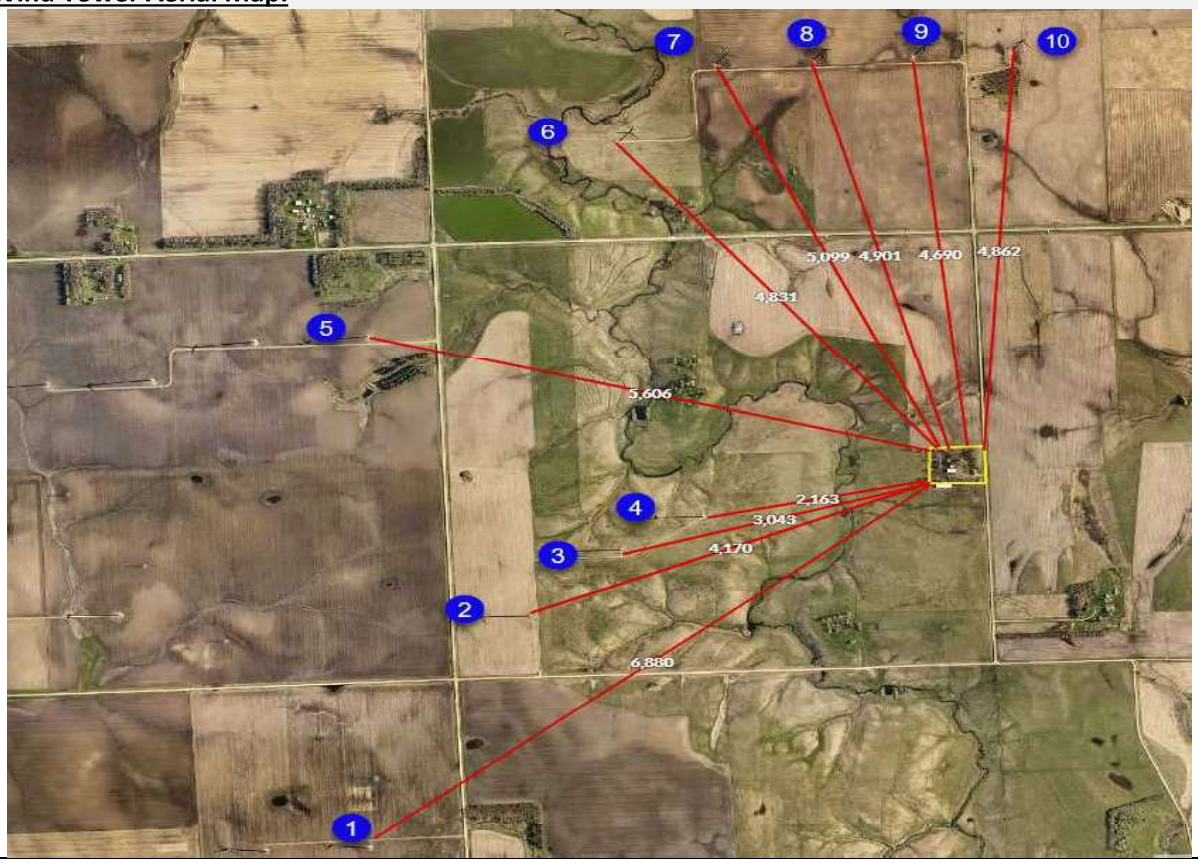
Date of Sale:	April 30, 2019
Market Exposure:	Auction managed by First Bank
Sale Price:	$165,000
Verification:	Deed; Beacon; Interview with Buyer
Type:	Arm's Length Sale

Wind Energy Project:

Development:	Buffalo Ridge
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Roto Diameter:	78/87 meters
Height From Ground:	399 Feet
Property & Wind Tower Notes:	Thirty wind turbines surround the property. Tower #1 5,502 +/- feet southwest. Tower #2 6,087 +/- feet southwest. Tower #3 6,731 +/- feet southwest. Tower #4 7,348 +/- feet southwest. Tower #5 8,190 +/- feet southwest. Tower #6 8,614 +/- feet west. Tower #7 7,197 +/- feet west. Tower #8 6,051+/- feet west. Tower #9 5,026 +/- feet west. Tower #10 4,126 +/- feet west. Tower #11 3,231 +/- feet west.

	Tower #12 11,674 +/- feet northwest. Tower #13 10,509 +/- feet northwest. Tower #14 9,290 +/- feet northwest. Tower #15 8,277 feet northwest. Tower #16 7,370 +/- feet northwest. Tower #17 6,598 +/- feet northwest. Tower #18 5,964 feet +/- feet northwest. Tower #19 5,286 +/- feet north. Tower #20 4,286 +/- feet north. Tower #21 4,155 +/- feet north. Tower #22 4,428 +/- feet north. Tower #23 2,813 +/- feet northeast. Tower #24 3,794 +/- feet northeast. Tower #25 8,493 +/- feet east. Tower #26 6,079 +/- feet east. Tower #27 5,057 +/- feet east. Tower #28 4,074 +/- feet east. Tower#29 2,661 +/- feet southeast. Tower #30 1,181 +/- feet southeast.

Wind Tower Aerial Map:



Appreciation Analysis:

(Influenced by Tower) Sale 1 Bk14:	December 08, 2015	$125,000
(Influenced by Tower) Sale 2 BK14:	April 30, 2019	$165,000
	3.39 Years	$40,000
BK14 Appreciation:	**$11,799/Year**	**9.43%/Year**
(Uninfluenced) Sale 1 486th:	December 7, 2004	$133,000
(Uninfluenced) Sale 2 486th:	October 11, 2013	$145,000
	9.25 Years	$12,000
486th Appreciation:	**$1,298/Year**	**.98%/Year**

(Uninfluenced) Sale 213th:	August 10, 2013	$266,000
(Uninfluenced) Sale 213th:	May 24, 2018	$290,903
	4.62 Years	$24,906
213th Appreciation:	**$5,390/Year**	**2.02%/Year**

Conclusion: Sale BK4 has market appreciation on the higher end of the range of the market sales that are not influenced by a wind tower, turbine or wind project.

Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	November 18, 2019
View Obstruction:	Wind towers within view of the residence
Noise Analysis:	Operational & blade noise present during site visit.

Interview Analysis:

Interview Conducted by:	David Lawrence
Party Interview:	Buyer
Interview Date Buyer:	October 31, 2019
Interview Notes with Buyer:	The property was purchased with knowledge of wind towers in proximity to the property. The buyer stated they have been trying to purchase the property for years. They sent an email to the bank and after four years the bank finally agreed to sell the property. The buyer thinks they paid too much but wanted to assemble the property into their pasture that is contiguous to the west. The buyer explained they are not very impressed with the wind company as they rent ground around the area and are always leaving the cattle gates open and had the cows get out on numerous occasions. The towers make all kinds of noise and leak grease everywhere. The property had to be cleaned up when we purchased it. We have tenants in the property but are eventually planning to move there soon. Do not know if it negatively effects the property; we paid a market price for the land and house. Towers destroy the rural view.

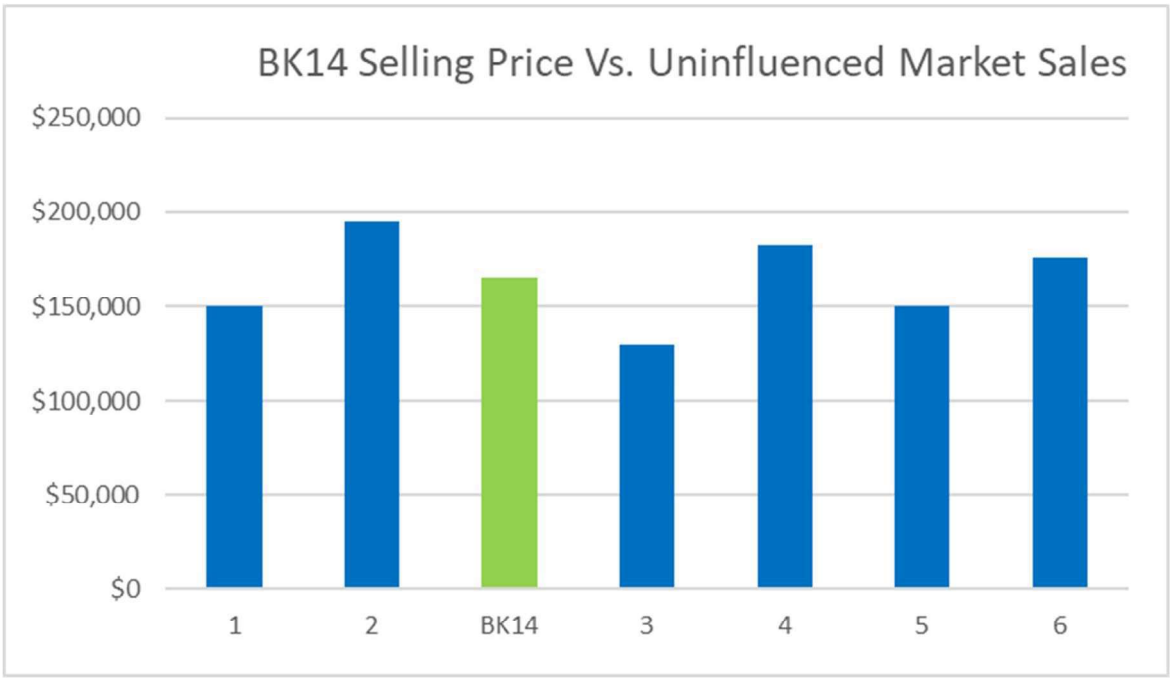
Site Photos:





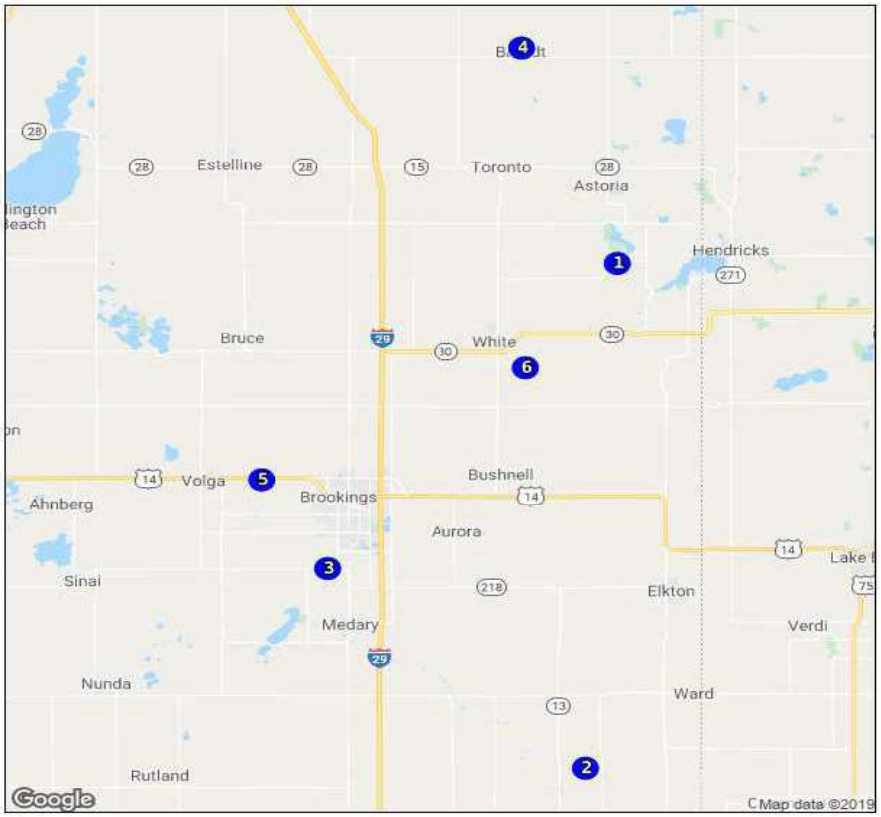


Market Sales Analysis:



Sales Analysis BK14									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
BK14	Astoria	2019	$165,000	1988	1,344	5.7	Ranch	Pole Building	
1	Brookings	2017	$150,000	1973	1,232	2.28	Ranch	None	Inferior
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
2	White	2018	$195,000	2008	1,008	5	Ranch	Pole Barn	Superior
			Adjustments:	*Superior(-)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
3	White	2017	$129,500	1994	1,404	13.8	Ranch	Pole Bld	Superior
			Adjustments:	*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
4	Flandreau	2018	$182,000	1978	1,976	7.01	Story1/2	Pole Blds/Barn	Superior
			Adjustments:	*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
5	Brandt	2017	$150,000	1977	1,162	2.14	Ranch	None	Inferior
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
6	Brookings	2017	$175,900	1990	1,660	4.55	Ranch	3 Pol Blds	Superior
			Adjustments:	*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	

Sale Location Map:



Legend	
1. 48360 199A Street, White, SD 57276(18-211)	4. 200 Madison Street, Brandt, SD 57218(17-375)
2. 48221 227th Street, Flandreau, SD 57028(18-266)	5. 21119 467 Avenue, Brookings, SD 57006(17-319)
3. 518 W 44th Street S, Brookings, SD 57006(17-324)	6. 47930 205th Street, White, SD 57276(17-359)

Market Sales Analysis Conclusion:	Five sales are utilized in the grid and uninfluenced by the proximity of a wind tower, turbine or project. All sales are rural acreages within the market. Sales 3 and 5 have proximity to Brookings. The remaining sales have inferior and superior features that bracket the selling price of the BK14. The buyer stated the property was purchased at a market price even though sale details mentioned a bank-owned property. After qualitatively analyzing the sales, the data suggests the wind towers did not negatively influence the selling price.

Overall Conclusion:	An interview, site, and sales analysis have been completed for BK14. During the site visit, the wind towers were observed within the proximity of the property. Buyer interview comments stated the price paid was not affect by the wind towers, although the buyer had negative comments regarding the wind towers. Although there are inconsistencies between interview comments and the market data, the selling price of BK14 is bracketed by uninfluenced market sales. The market evidence suggests there was no negative influence on the selling price of the property because of the proximity of the wind towers.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS CD1	**SALE No.**	CD1
	STATE	South Dakota
	COUNTY	Codington





Property Characteristics:	
Highest & Best Use:	Rural Acreage
Land Size:	1.91 Acres
Improvements:	1918 Story 1/2
Finished Area:	1,776 S.F. GLA
Garage:	Attached 1-Stall
Features:	Treed shelter belt. Shed/Detached Garage
Access:	Paved highway linkage

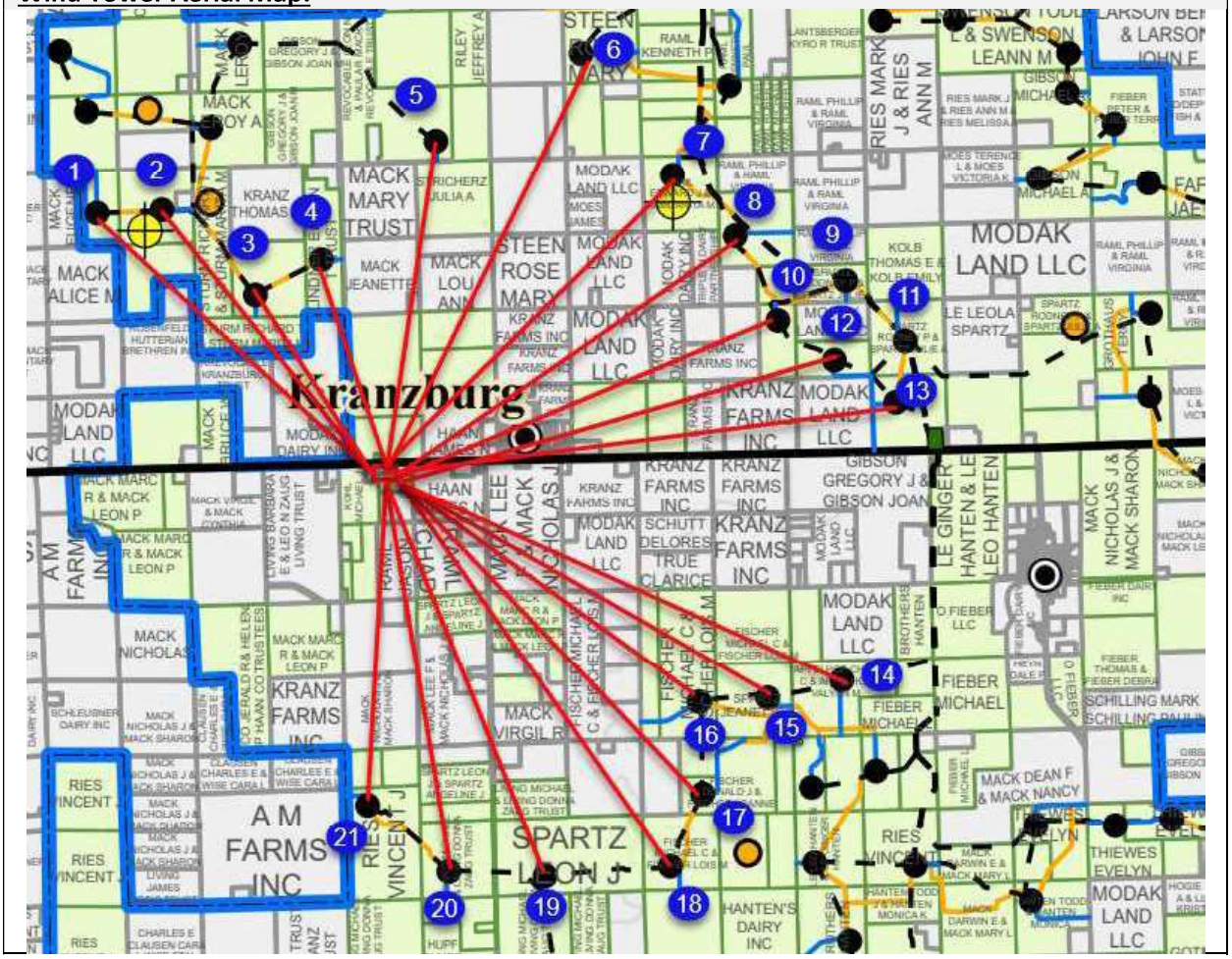
Sales Analysis Data:	
Date of Sale:	August 1, 2019
Market Exposure:	MLS
Listing Price:	$199,000
Sale Price:	$190,000
Verification:	MLS/Broker
Type:	Arm's Length Sale
DOM:	72

Wind Energy Project:	
Development:	Crowned Ridge Wind Farm
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	80/116 meters
Height From Ground:	150 meters or 500 feet +/- per PUC exhibit
Wind Tower Property Notes:	Crowned Ridge II wind Farm is in the permitting phase of the project. According to the turbine siting constraints map, twenty-one turbines will be in the proximity of the residence. The map shows the turbines to the northwest will be in closest proximity of approximately 4,000

ADMINISTRATIVE RECORD - Scan 2 - Page 47 of 75

feet. Site photos of the wind towers below are from Crown Ridge I by Waverly that are currently being constructed in the neighborhood. Towers 6-13, and 14-21 do not exist as of the effect selling date of CD1. Towers located northwest by Waverly are currently in the construction phase. According to the listing broker, he is was informed of the wind tower project in the neighborhood.

Wind Tower Aerial Map:



Appreciation Analysis:

(Influenced by Tower) Sale 1 CD1:	August 2, 2019	$190,000
(Influenced by Tower) Sale 2 CD1:	July 15, 2003	$116,000
	16 Years	$74.000
BK14 Appreciation:	**$4,625/Year**	**3.9%/Year**
(Uninfluenced) Sale 1 486th:	December 7, 2004	$133,000
(Uninfluenced) Sale 2 486th:	October 11, 2013	$145,000
	9.25 Years	$12,000
486th Appreciation:	**$1,298/Year**	**.98%/Year**

(Uninfluenced) Sale 213th:	August 10, 2013	$266,000
(Uninfluenced) Sale 213th:	May 24, 2018	$290,903
	4.62 Years	$24,906
213th Appreciation:	**$5,390/Year**	**2.02%/Year**

Conclusion: Sale BK4 has market appreciation on the higher end of the range of the market sales that are not influenced by a wind tower, turbine or wind project.

Site Analysis:

Site Visit Conducted by: David Lawrence

Site Visit Date: November 19, 2019

View Obstruction: Wind towers to the north, south, and east within distance view of the residence. Wind tower citing maps show the nearest tower less than a mile to the northwest.

Noise Analysis: NA

Site Photos:







Wind tower construction by Waverly November 2019



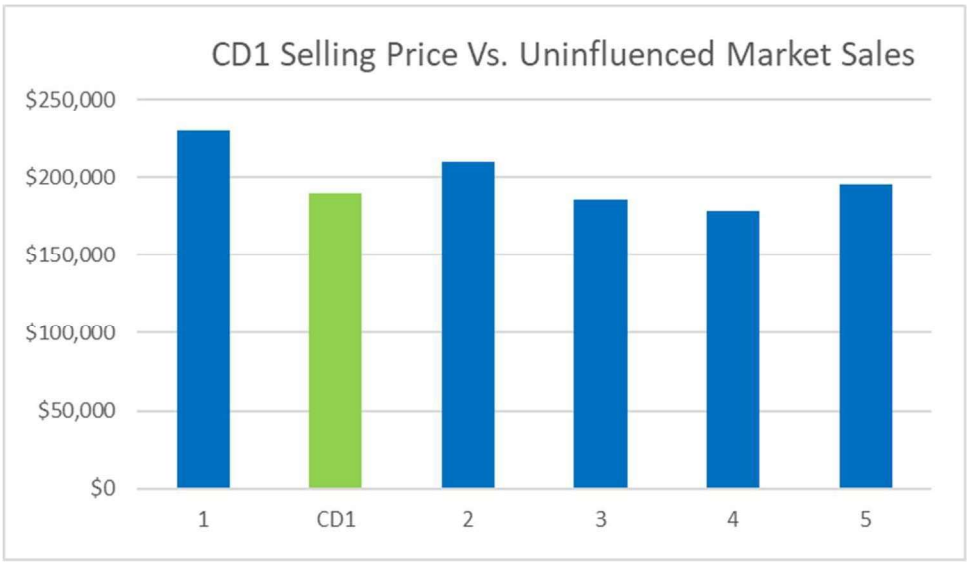
Wind tower construction by Waverly November 2019



Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker
Interview Date:	November 11, 2019
Interview Notes with Broker:	The property sold via the MLS within 72 days on the market. It is common knowledge in the market that wind towers are being constructed in the neighborhood. Obviously, there are some buyers that are sensitive to wind towers, but there were no motivating factors by either the buyer or seller that negatively affected the selling price because of the wind towers. This property has a sales

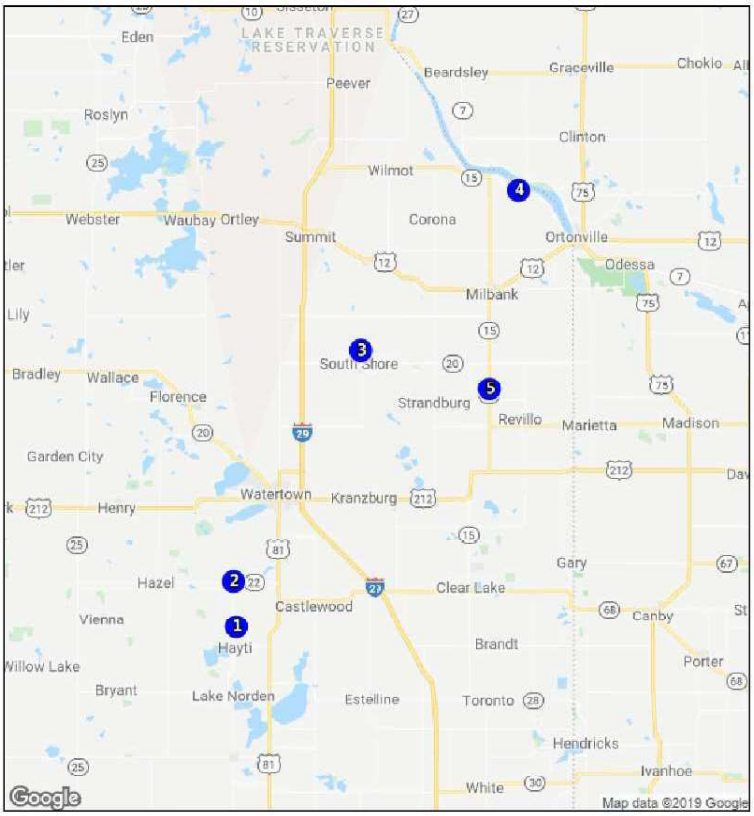
	history that supports an appreciating market with features that have continued to attract buyers for the property.

Market Sales Analysis:



Sales Analysis CD1									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
CD1	Kranzburg	2019	$190,000	1918	1,776	1.9	2-Story	Shed	
1	Labolt	2019	$230,000	1968	1,429	4.48	Ranch	Pole	Superior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
2	Vienna	2019	$210,000	1912	1,595	10	2-Story	Pole	Superior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
3	Hayti	2019	$186,000	1910	1,743	21.92	Story1/2	Pole Shed	Similar
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
4	S. South	2019	$178,250	1919	1,830	5	Story1/2	Pole Blds	Similar
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
5	Big Stone	2019	$195,000	1972	1,432	4.42	Ranch	Shed/Pole	Similar
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar(=)*	*Similar(=)*	

Sale Location Map:



Legend
1. 45049 186TH STREET, Hayti, SD 57241(30-3598)
2. 45019 SD-22 HIGHWAY, Hayti, SD 57241(17-18)
3. 15582 464TH AVENUE, South Shore, SD 57263(35-217)
4. 48115 SD-109 HIGHWAY, Big Stone City, SD 57216(35-222)
5. 16002 SD-15 HIGHWAY, LaBolt, SD 57246(35-136)

Market Sales Analysis Conclusion:	The sales analysis uses five market sales that are not influenced by a wind tower, turbine or project. Sales one and two are within similar proximity to Watertown, with sales five, four and three in similar proximity to Millbank. The selling price of CD1 falls within the range of the uninfluenced sales with sales three, four and five the stronger market substitutes. The sales evidence suggests there was no negative influence on the selling price of the sale CD1.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for CD1. The research and data suggest the proximity of the future wind towers and the announcement of the project did not influence the selling price. Interview comments were consistent with the sales evidence that showed there was no effect on the selling price. Even though the wind project construction is not complete, the data support the proximity to the future wind towers and the announcement of the project has not negatively influenced the sale transation for CD1.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS CD2	**SALE No.**	CD2
	STATE	South Dakota
	COUNTY	Codington



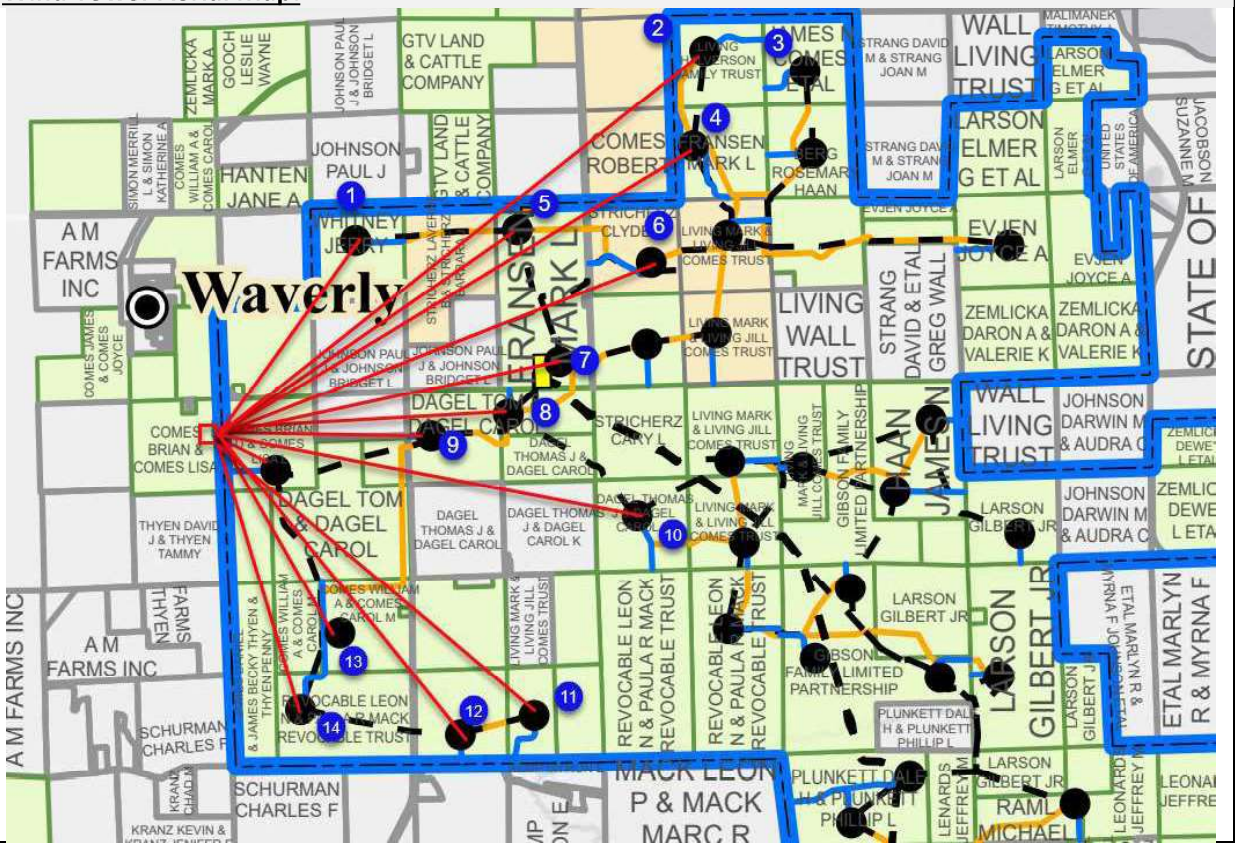


Property Characteristics:	
Highest & Best Use:	Rural Acreage
Land Size:	2.65 Acres
Improvements:	2001
Finished Area:	1,570 SF GLA 1544 SF L.L. Finished
Garage:	Attached 2-Stall
Features:	Treed shelter belt. 60x57 Modern pole barn with concrete
Access:	Gravel road – Shared driveway per broker and aerial

Sales Analysis Data:	
Date of Sale:	August 8, 2019
Market Exposure:	MLS
Listing Price:	$329,000
Sale Price:	$275,000
Verification:	MLS/Broker/Seller/CRV/Codington GIS/Site Visit
Type:	Arm's Length Sale
DOM:	189

Wind Energy Project:	
Development:	Crowned Ridge Wind Project
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	80/116 meters
Height from Ground:	150 meters or 500 feet +/- per PUC exhibit
Wind Tower Property Notes:	Crowned Ridge Wind Farm is in the construction phase of the project. According to the turbine siting constraints map, fifteen turbines will be in the proximity of the residence, with the nearest turbine CRII-134 within 2,000 feet of the property.

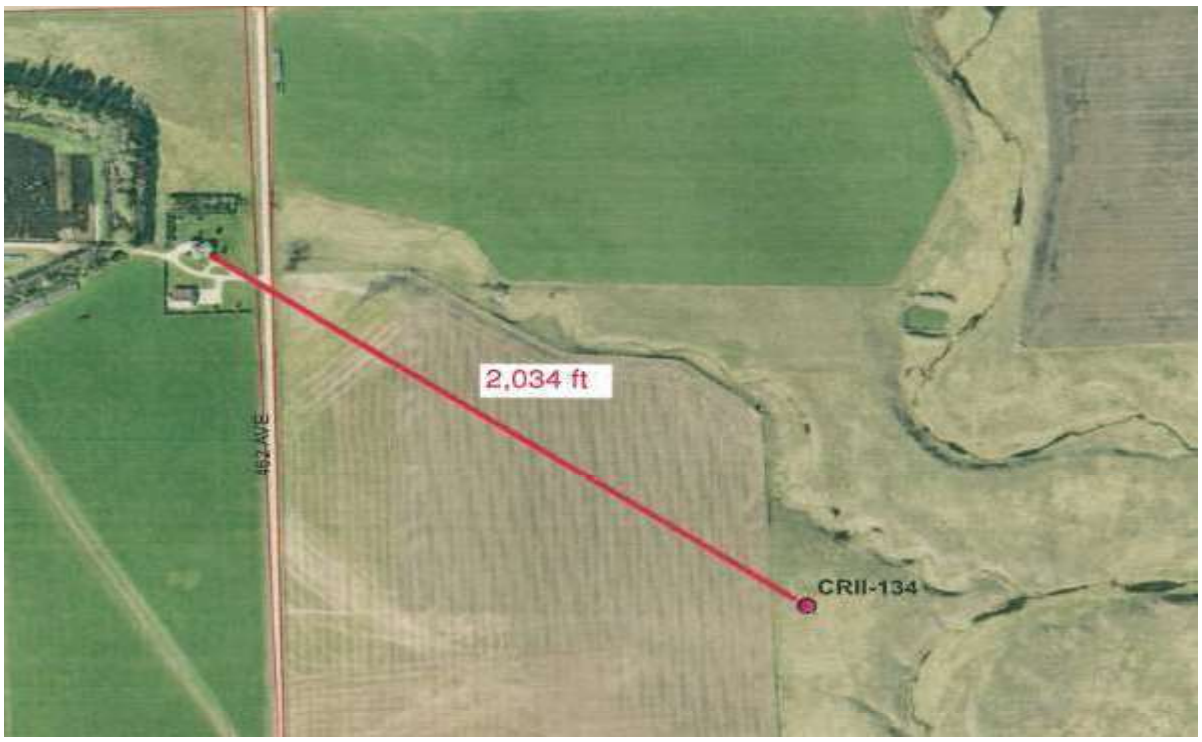
Wind Tower Aerial Map:



Site Analysis:

Site Visit Conducted by: David Lawrence
Site Visit Date: November 19, 2019
View Obstruction: None – wind towers under construction around the Waverly market area
Noise Analysis: NA – wind towers not operational at time of site visit
Site Photos:

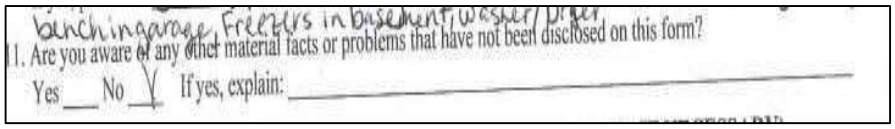
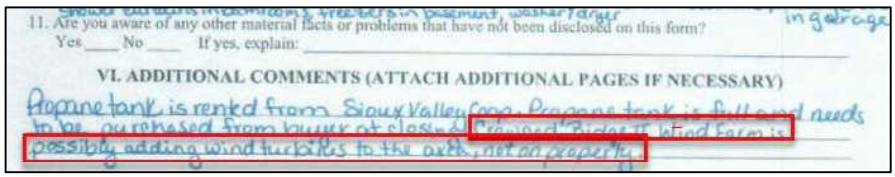



2,034 ft
462 AVE
CRII-134

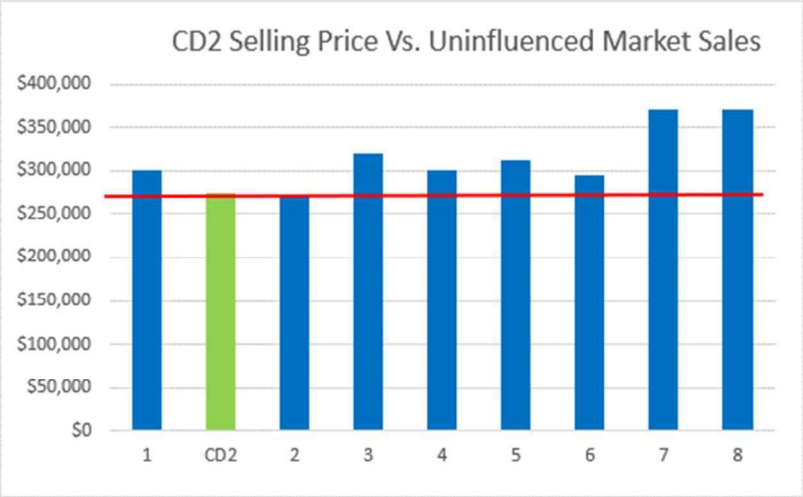




Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker-1/Broker-2/Seller/Buyer
Interview Date:	November 11, 2019
Interview Notes with Broker-1:	Broker-1 listed the property in June of 2018 for $424,900. After 26 days on the market, the listing price was reduced to $409,000. After 20 days the listing price was reduced to $398,500. After a total of 93 days on the market, the listing expired. Per broker-1 the listing price was not supported by the market. The June 2, 2018 disclosure statement did not disclose the wind project or location of the tower within 2,000 of the residence.
Interview Notes with Broker-2:	Broker-2 was contacted by the owner in April of 2019. Prior to the listing, broker-2 had the seller complete a disclosure statement on April 25, 2019; the wind project was not disclosed. The property was listed at $379,900, which the agent admitted was most likely on the higher end of the market range. After 60 days on the market, the price was lowered to $369,900. On July 30, 2019, buyer-1 submitted a written offer for $350,000. The offer was accepted by the seller; however, broker-2 updated the disclosure form on July 30, 2019, to include statements about the Crowned Ridge Wind Farm. After receiving the updated disclosure statement, the offer was rescinded by buyer-1. On August 21, 2019, the listing price was reduced to $329,000. After approximately 183 days buyer-2 submitted an offer with the knowledge of the wind project and wind towers for $275,000. The seller accepted the offer. According to broker-2 the disclosure of the wind

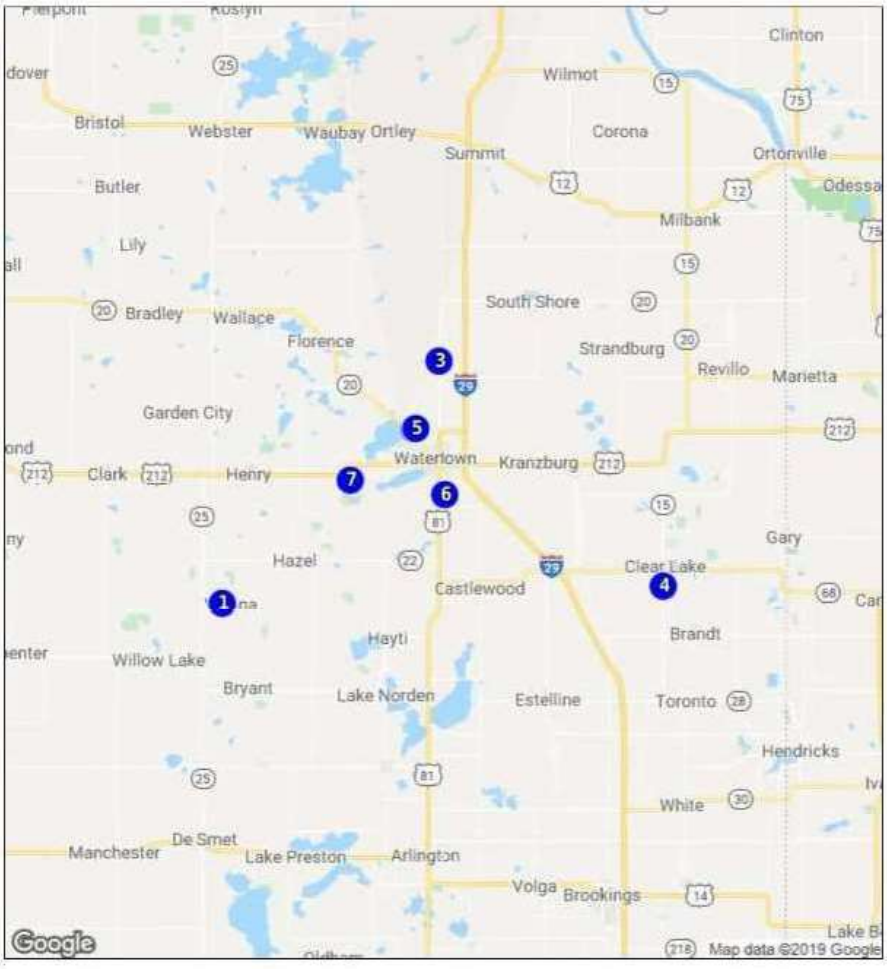
	project and wind tower within 2,000 of property resulted in a $75,000 or 27% difference to the seller (the difference between buyer-1 before disclosure and buyer-2 after disclosure). Broker-2 stated as evident with the CD2 transaction and experiences with selling real estate in S.D., residential property values are negatively affected by wind towers. Broker-2 stated wind towers will continue to be an issue for property owners as more and more towers are built. There is a segment of the market that refuses to look at properties near wind towers. Broker-2 recently built a house by Waverly prior to any knowledge of the project and will soon be living in the middle of the Crowned Ridge project. Broker-2 strongly believes their investment of a rural residence will be negatively affected by towers surrounding their home and will result in a segment of the market that will have less interest in the property when it comes time to sell.
Interview Notes with Seller:	The seller had a signed purchase agreement for $350,000. After talking with broker-2, the seller decieded to update the disclosure statement to include information about the wind project. Buyer-1 recinded the offer after facts of the wind project were disclosed. Broker-2 relisted the property with full disclosure of the wind project. Buyer-2 knowlegable of the wind project and towers offered $275,000, which the seller accepted. The seller stated the proximity of the Crown Ridge Wind Farm reduced the value of the property by $75,000 and is supported by the facts and documents of the transaction.
Interview Notes with Buyer-1	The seller would not provide contact information or documents at this time because of pending litigation.
Interview Notes with Buyer-2	During my site vist on November 18, 2019, I knocked on the front door to talk with the buyer; no one answered the door. I left my card. I was unsucessfull in obtaining a working phone number to contact the buyer.
June 2018 Disclosure Statement:	 bench in garage, Freezers in basement, Washer/Dryer 11. Are you aware of any other material facts or problems that have not been disclosed on this form? Yes ___ No ✓ If yes, explain: ___
March 2019 Disclosure Statement:	 freezers in basement, bench in garage, fridge in garage, washer/dryer, kitchen appliances. 11. Are you aware of any other material facts or problems that have not been disclosed on this form? Yes ___ No ✓ If yes, explain: ___
2019 Updated Disclosure Statement:	 11. Are you aware of any other material facts or problems that have not been disclosed on this form? in garage Yes ___ No ___ If yes, explain: ___ VI. ADDITIONAL COMMENTS (ATTACH ADDITIONAL PAGES IF NECESSARY) Propane tank is rented from Sioux Valley Coop. Propane tank is full and needs to be purchased from buyer at close. Crowned Ridge II wind farm is possibly adding wind turbines to the area, not on property.

Market Sales Analysis:



Sales Analysis CD2									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
CD2	Waverly	2019	$275,000	2001	1,570	2.6	Split	Pole Building	
1	Watertown	2019	$300,000	1976/upd	1,106	3.21	Split	Pole Bld	Comparable
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Watertown	2018	$270,000	2005	1,920	5	Ranch	None	Comparable
		Adjustments:		*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
3	Vienna	2019	$275,000	1980	1,400	8.16	Ranch	None	Inferior
		Adjustments:		*Inferior(+)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
4	Watertown	2019	$319,000	1974/upd	1,476	9.46	Ranch	Pole Blds	Superior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
5	Clear Lake	2019	$301,000	1952/upd	1,556	8.9	Ranch	Pole Blds	Comparable
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
6	Watertown	2019	$312,500	1970	1,352	5.63	Ranch	Sheds	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
7	Watertown	2019	$295,000	1976	1,440	1.88	Ranch	None	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Inferior(+)*	
8	Watertown	2019	$370,000	2000	1,556	12.01	Ranch	Pole Blds	Superior
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	

Sale Location Map:



Legend	
1. 18509 435TH AVENUE, Vienna, SD 57271(20-8178)	**5.** 2217 STADHEIM DRIVE, Watertown, SD 57201(42-9)
2. 2502 STADHEIM DRIVE, Watertown, SD 57201(24-6016)	**6.** 45581 175TH STREET, Watertown, SD 57201(98-91)
3. 16276 455TH AVENUE, Watertown, SD 57201(28-1048)	**7.** 17375 447TH AVENUE, Watertown, SD 57201(24-6249)
4. 18215 SD 15 HIGHWAY, Clear Lake, SD 57226(24-6243)	

Market Sales Analysis Conclusion:	Eight sales are from the market without the influence of a wind tower, project or turbine. All transactions have similar highest and best use as a rural acreage and located within the market area. Sales one, two, and five are most similar to CD2. Sales two, five and six are inferior sales. Sale three has slightly superior site size and outbuildings. The market evidence suggests the bracketed market range for CD2 should fall within $275,000 to $370,000 as demonstrated by the uninfluenced market sale transactions. The selling price at $275,000 is at the low end of the market range suggesting there could be an influence on the selling price of CD2 as a result of the anticipation of the wind project,

	the proximity of the wind tower near the property and/or disclosure of the wind project. To further provide a substantiate conclusion, a detailed site inspection, investigation, and appraisal would need to be completed. A review of the sales data suggests there is some type of negative influence or motivating factor for the sale transaction for CD2 resulting in a sale price that is on the lower end of the market range.

Overall Conclusion:	This is the first transaction in South Dakota that has been identified with possible negative influences from the announcement of a wind project and/or influences from a wind tower in proximity to a rural residential property. During the listing of CD2, the project was announced with a location of a wind tower southeast of the property. Buyer-1 submitted a written offer that was accepted by the seller for $350,000. The offer was rescinded by Buyer-1 when the seller disclosed the wind project. Buyer-2 submitted a written offer for $275,000, with knowledge and consideration given from the future influence of the wind towers. Both the buyer and seller acted prudently, knowledgeably and for self-interest. The difference between Buyer-1 uninfluenced offer and Buyer-2 influenced offer is $75,000. The sales data and interview analysis are consistent to support the evidence there was some type of motivating factor or market penalty due to the future location of the wind tower; however, what makes this sale transaction difficult to substantiate loss in market value is that a wind tower did not exist at the time of the sale; only the perception regarding the project and location of a wind tower near the property. The disclosure statement provides vague information about tower locations with no direct relation to CD2. The disclosure statement just says, “Crown Ridge II is possibly adding wind towers to the area, not on property.” Maybe additional information was provided to the Buyer-1, but the vague information seems to provide some initial stigma or influence on the decision making of Buyer-1? As concluded in the sale analysis, an on-site inspection, interview investigation, and appraisal are required to further substantiate the facts presented by the seller, and broker to support the change in market value before and after the disclosure of the wind project. Based on completed researched within the Buffalo Ridge wind development in Brookings County, I have not found market evidence to support an adverse impact on the selling price of rural residential properties in proximity to an existing wind tower, turbine or wind project. This sale transaction might be the first sale in South Dakota to document a negative influence on the selling price due to the anticipation of the project or initial project stigma, resulting from the management of the listings. The details of the transaction are consistent with market participant comments showing there is a segment of the market that is sensitive to living in proximity to wind towers, turbines and wind development.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS DE1	**SALE No.**	DE1
	STATE	South Dakota
	COUNTY	Deuel





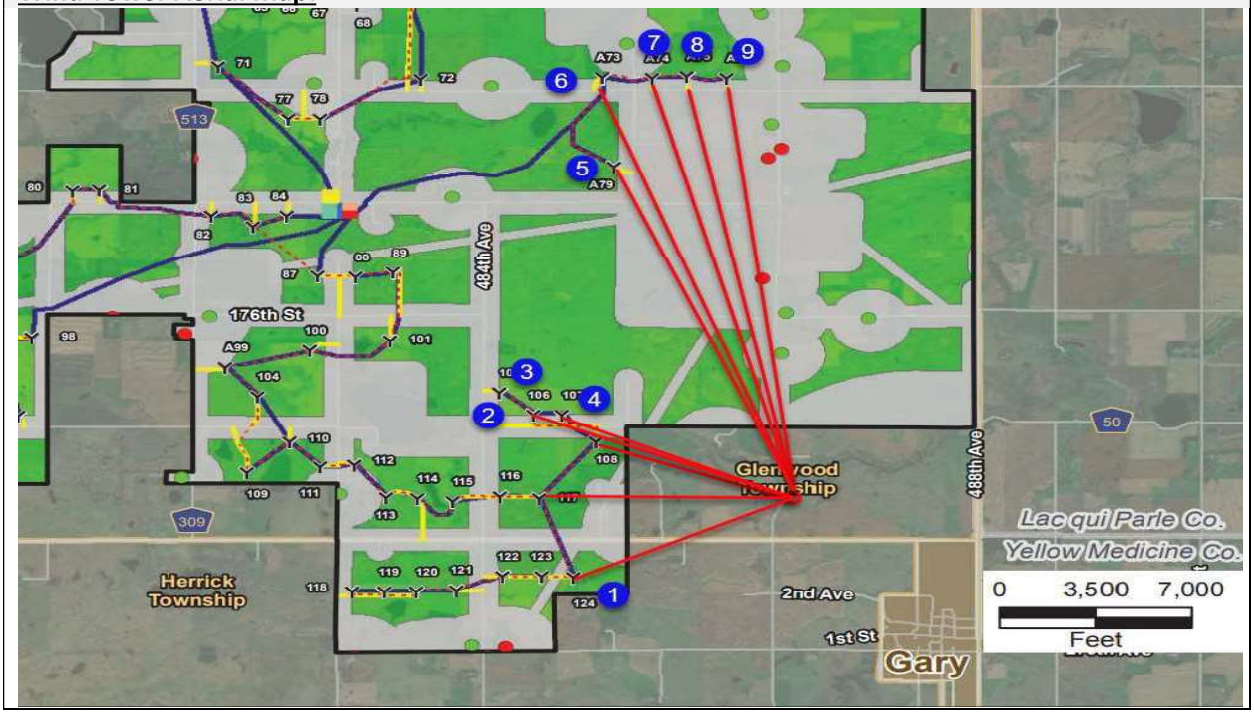
Property Characteristics:	
Highest & Best Use:	Rural Acreage
Land Size:	30.00 Acres
Improvements:	2008
Finished Area:	2,640 GLA
Garage:	Attached
Features:	Treed valley, running creek and hills. Detached garage.
Access:	Paved highway linkage and paved driveway

Sales Analysis Data:	
Date of Sale:	February 28, 2019
Market Exposure:	MLS
Listing Price:	$549,900
Sale Price:	$517,000
Verification:	MLS/Broker/Seller/Site Visit
Type:	Arm's Length Sale
DOM:	245

Wind Energy Project:	
Development:	Deuel Harvest
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	150 meters or 500 feet +/- ground to blade height per PUC exhibit
Wind Tower Property Notes:	Deuel Harvest is a permitted wind development that is currently in the construction phase of the project. Nine wind towers will be in proximity west of the property. Distances from the residence range

	from 3,500 feet to over 10,000 feet. The turbines are north, northwest, west, and southwest of the property.

Wind Tower Aerial Map:

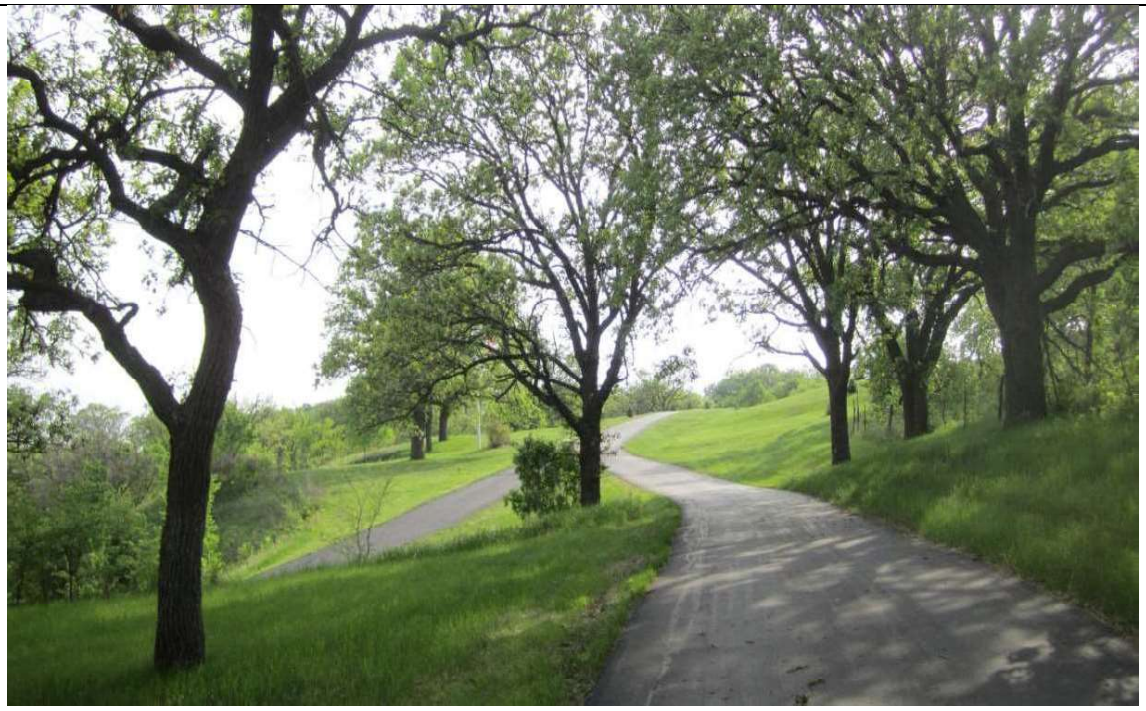


Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018 & November 18, 2019
View Obstruction:	NA – Deuel Harvest is a permited wind project; however, construction has not yet started so there are no towers constructed within the project area. DE1 is located in a treed valley that is protected by the varying topography and landscape. The location is unique and highly desirable for a rural acreage in South Dakota. The features of the treed valley would protect any future view obstructions within the property boundaries, including if any towers would be constructed within the minimum zoning setbacks of 2,000 feet.
Noise Analysis:	NA -- There are no existing towers within the neighborhood at this time.
Site Photos:	







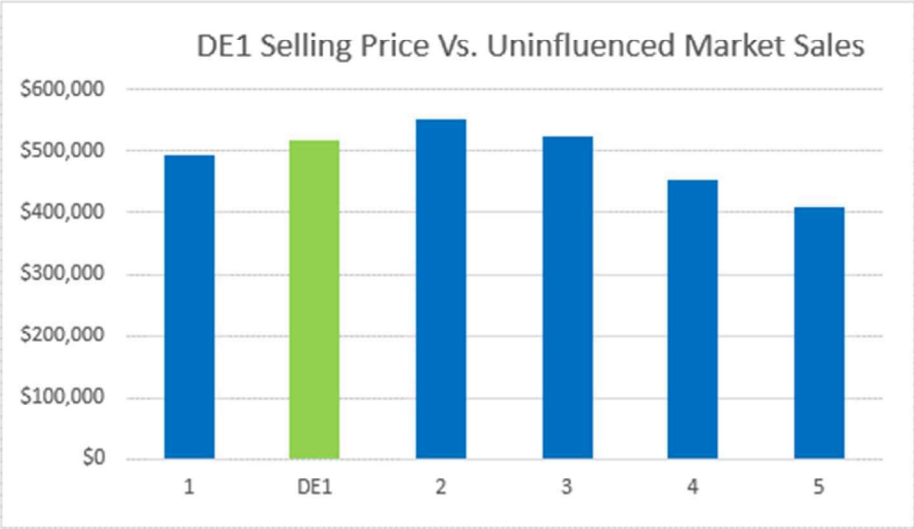


Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker/Seller
Interview Date:	November 18, 2019

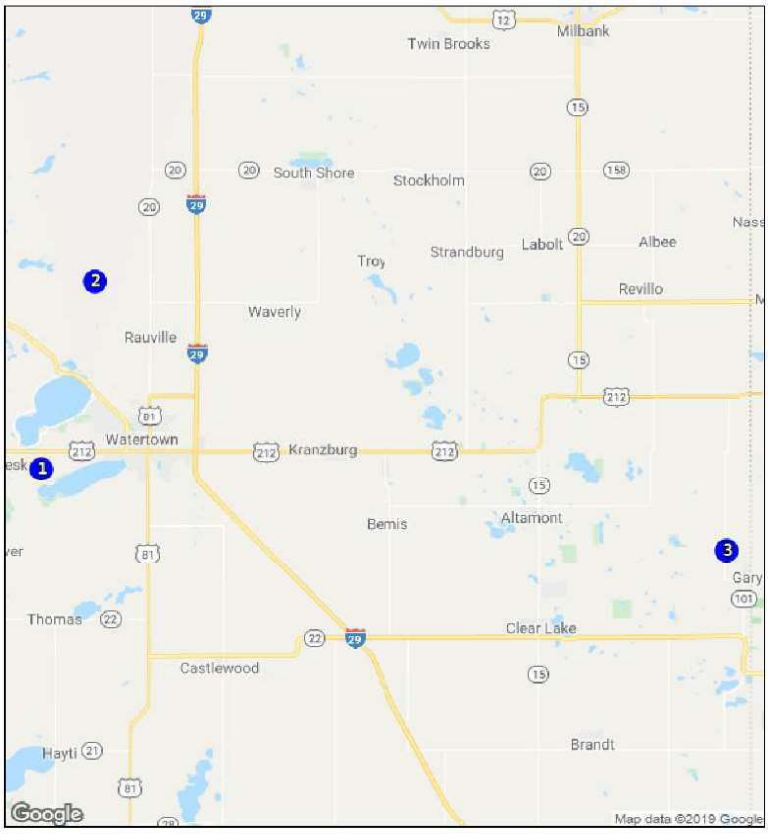
Interview Notes with Broker:	The property was listed for sale for $549,900. This very unique property prompted interest from the market. We had an offer at $500,000 and the seller countered $535,000. The negoiations ended without a signed purchased agreement. The seller believes the parties backed out because of the wind tower; however, the agent explained there could be other motivitating factors. The agent has listed a number of properties in the immediate neighborhood and the wind project was not a reason they were selling. It seems the fear of the project has subsided as there has been a number of new buyers in the neighborhood purchasing property around the project area. The property sold for $517,000 to a buyer who previously looked at the property. The agent stated the property took about 6 months to sell which is typical of property in this price range at the higher end of the market.
Interview Notes with Seller:	The seller explained that disclosing the wind project caused the offer to fall through and believes property values are affected by wind development in the rural area.

Market Sales Analysis:

Sales Analysis DE1									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
DE1	Gary	2019	$517,000	2008	2,640	30	Ranch	Outbuilding	
1	Watertown	Active	$495,000	2007	1,428	32	Ranch	Barn/Blgs	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Watertown	Active	$549,900	2007	1,428	32	Story1/2	Barn/Pol	Similar
		Adjustments:		*Inferior(+)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	
3	Watertown	2017	$525,000	2012	1,832	44	Ranch	Pole	Superior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Similar)=)*	
4	Watertown	2018	$454,900	2015	1,440	15	Ranch	Pole/Shed	Inferior
		Adjustments:		*Superior(-)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
5	Gary	2018	$410,000	2005	1,928	34	Story1/2	Pole	Similar
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	



Sale Location Map:



Legend
1. 44928 173RD STREET, Watertown, SD 57201(26-8625)
2. 16297 452ND AVENUE, Watertown, SD 57201(26-8761)
3. 17724 486TH AVENUE, Gary, SD 57237(24-6100)

Market Sales Analysis Conclusion:	Five sales are from the market without the influence of a wind tower, with exception to sale five. All transactions have similar highest and best use and from the rural Watertown market area. DE1 has a selling price on the higher end of the market range and active listings were used to support a bracketed market range. Sales one and two are active listings. Sale three is slightly superior. Sale four is an inferior sale. Sale one and two also have locations in proximity to Watertown. Sale five is a contiguous sale just to the north of the subject and is a strong market substitute yet has a much lower selling price than DE1. The sales data does not suggest the selling price of DE1 was negatively impacted by the permitting of the Deuel Harvest Wind Project. All sale evidence suggests the sale was a market transaction.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for DE1. The sales evidence does not support the seller's comments there was a negative effect on the selling price because of the announcement of the Deuel Harvest Wind Project. There was no observed effect from a future view of a wind tower due to the secluded valley location of the residence and distance from the tower locations to the west. Although there are inconsistencies with the seller's statements about negative impacts from the wind project, the sales evidence suggests just the opposite.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS DE2	**SALE No.**	DE2
	STATE	South Dakota
	COUNTY	Deuel





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	10 Acres
Improvements:	1979 Story ½
Finished Area:	1,792 SF GLA; 2,700 SF Finished (Updated)
Garage:	Attached 2-Stall
Features:	Treed shelter belt. Outbuilding
Access:	Paved HWY linkage; gravel & concrete driveway

Sales Analysis Data:

Date of Contract:	October 9, 2019
Market Exposure:	Word of Mouth – Told neighbors and friends it was for sale
Listing Price:	$300,000
Sale Price:	$275,000
Verification:	Purchase Contract/Seller/Appraiser
Type:	Arm's Length Sale
DOM:	45+/-

Wind Energy Project:

Development:	Tatanka Ridge Wind Project
Turbine Type:	Gamesa G82.127
Hub Height/Rotor:	88.60 meters/ 116 meters
Height From Ground:	148 meters or 485 feet
Property & Wind Tower Notes:	The property is located north of the Tatanka Ridge wind development. Two wind towers will be constructed to the southwest. Tower F2 and F4 will be within 2.5 miles. Future towers will be north of home within 1 mile reported by the owner. Invenergy Wind Development LLC has been granted a wind easement and memorandum of wind lease granted by the

property owner on August 11, 2016. Deuel County setbacks from the rural residence limit any type of wind development within the 10 acres. The agreement is for 25 years. (See interview comments)

Memorandum of Wind Agreement

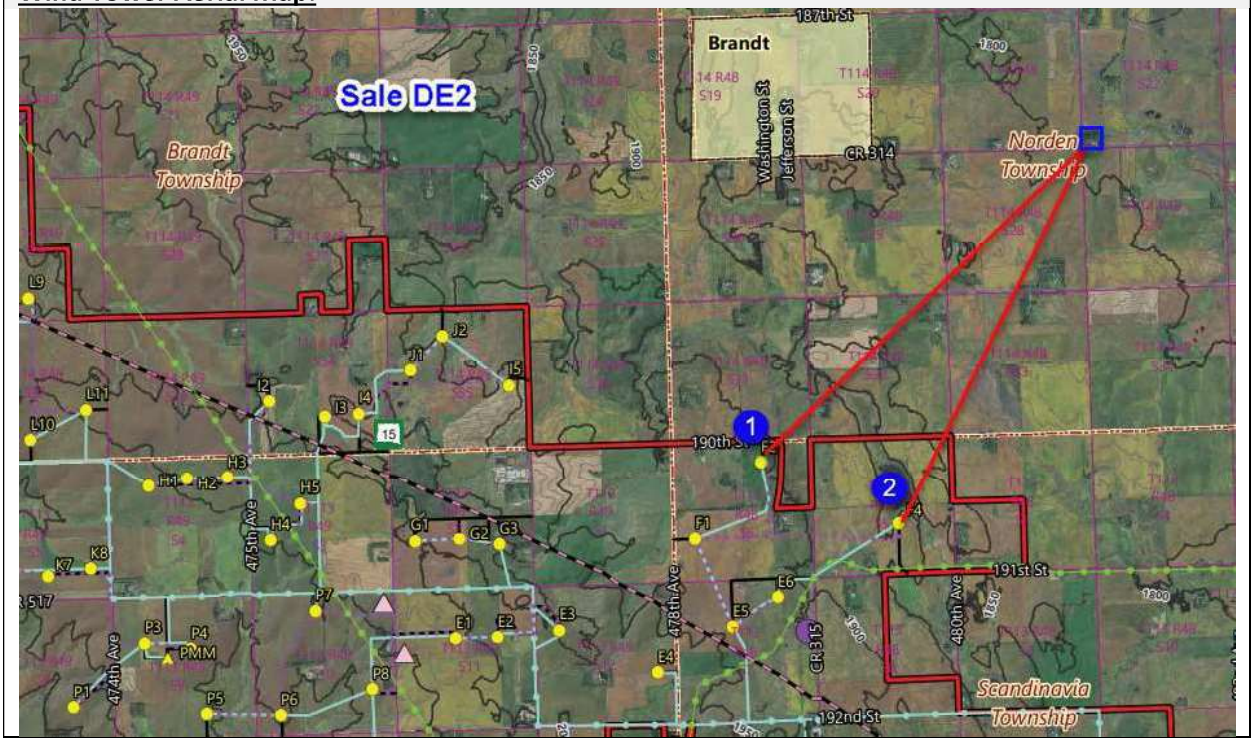
Drafted by and after recording return to:
Invenergy Wind Development LLC
Attn: Land Administration
One South Wacker Drive
Suite 1800
Chicago, Illinois 60606

MEMORANDUM OF WIND LEASE AND EASEMENT AGREEMENT

THE STATE OF SOUTH DAKOTA §
§ KNOW ALL PERSONS BY THESE PRESENTS:
COUNTY OF DEUEL §

THIS MEMORANDUM OF WIND LEASE AND EASEMENT AGREEMENT (this "Memorandum"), is made, dated and effective as of August 11, 2016 (the "Effective Date"), between
a (together with its successors, assigns and heirs, "Owner"), whose address is
and **Invenergy Wind Development LLC**, a Delaware limited liability company (together with its transferees, successors and assigns, "Grantee"), whose address is One South Wacker Drive, Suite 1800, Chicago, IL 60606, with regards to the following:

Wind Tower Aerial Map:



Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	November 18, 2019
View Obstruction:	None. Proposed wind development and construction are common knowledge among property owners and residences within the neighborhood.
Noise Analysis:	NA – no towers constructed at the time of site visit

Site Photos:

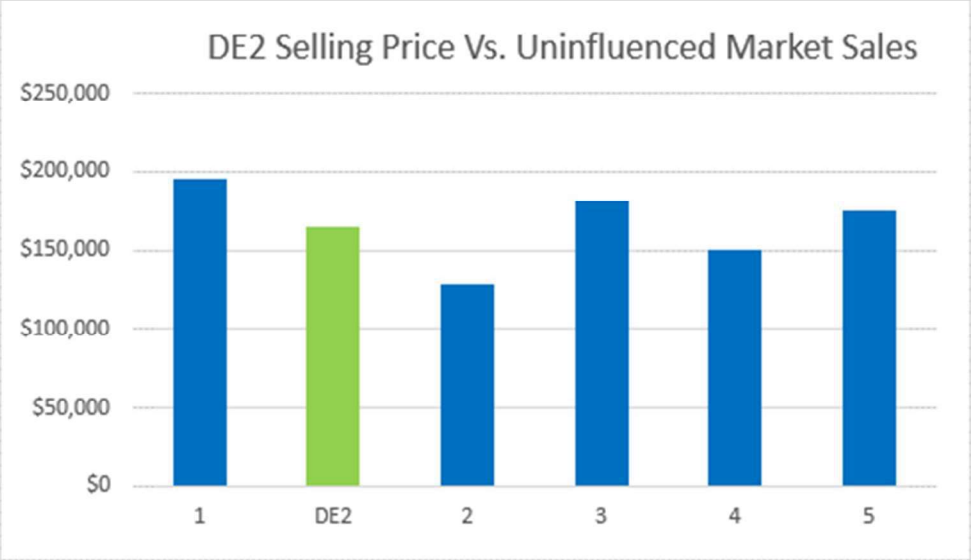






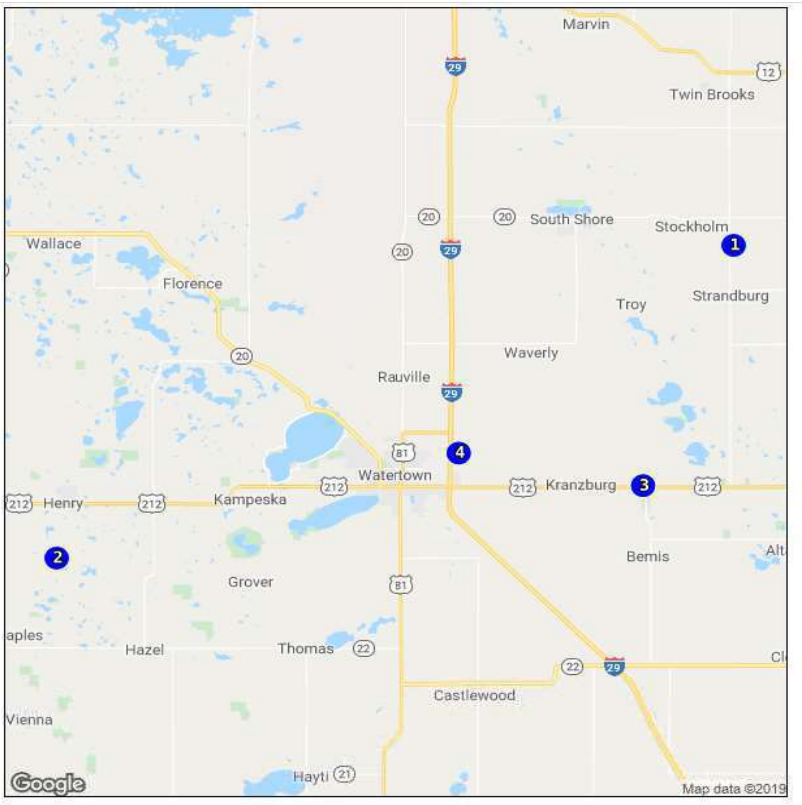
Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Seller/Property Owner
Interview Date Seller:	November 18, 2019
Interview Notes with Seller:	The seller has been a mailman in the area for the last ten years. The wind company approached him with a "hush payment" so he wouldn't complain about the wind towers. The agreement was $500 for the first 5 years and $1,500 per year for the remaining 25 years. The seller explained that he knew he couldn't stop the wind project and agreed to the lease. The seller decided he didn't want to live around the wind towers and listed the property for sale. The property was purchased by a buyer who had family just up the road. The price was not influenced by the proximity of the wind project. The seller stated that he agreed to pass on the wind lease payments to the buyer, and the buyer was happy to have them to cover the property taxes.
Interview Notes with Buyer:	The buyer is fully aware of the lease agreement and terms. His parents own the acreage directly to the west of the subject and they also have a wind lease agreement with the same company. The buyer understands the lease to be a payment for having to look at the blinking lights on the wind towers and is aware more towers could be placed in the area. The closest a tower could be located to the property is 1,500 feet in Deuel. These factors were not significant motivators for the purchase of the property, rather location and proximity to family.

Market Sales Analysis:



Sales Analysis DE2									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
DE2	Brandt	2019	$275,000	1976	1,792	10	Story 1/2	Building	
1	Henry	2019	$285,000	1900	1,820	12	2-Story	Barn	Superior
			Adjustments:	*Inferior(+)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
2	Stockholm	2019	$200,000	1900	2,690	9.94	Story1/2	Barn/Pol	Inferior
			Adjustments:	*Inferior(+)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	
3	Henry	2019	$298,500	1953	1,620	10	Story1/2	Pole (2)	Superior
			Adjustments:	*Similar(=)*	*Similar(=)*	*Similar(=)*	*Similar (=)*	*Superior(-)*	
4	Goodwin	2018	$210,000	1976	1,752	5	Ranch	Shed	Inferior
			Adjustments:	*Similar(=)*	*Similar(=)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
5	Watertown	2018	$250,000	1977	1,120	2	Ranch	Shed	Inferior
			Adjustments:	*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	

Sale Location Map:



Legend
1. 47225 159TH STREET, Stockholm, SD 57264(24-6197)
2. 17632 437TH AVENUE, Henry, SD 57243(33-1582)
3. 46754 US-212 HIGHWAY, Goodwin, SD 57238(30-3694)
4. 4221 12TH AVENUE NE, Watertown, SD 57201(22-1879)

Market Sales Analysis Conclusion:	Six market sales are selected for the analysis without influences from a wind project, tower or turbine. The sales share similar features of rural acreages. All sales are market transactions and advertised on the MLS system. Sales one and three are slightly superior sales, while sales two and five are slightly inferior. The selling price of DE2 falls within the market range of uninfluenced sales. An interview with the seller provided consistent comments, stating the wind tower easement was not a factor to the buyer or price negotiated. The sales data suggests there was no influence from the wind project or wind easement on the selling price of the property.

Overall Conclusion:	A sales analysis, site visit, and interview analysis have been completed for DE2. The sales data and interview comments are consistent and support the conclusion there was no affect from the wind easement or announcement of the wind project on the selling price of the property. The market evidence leads to the conclusion the purchase price was not affected and, in this case, the wind payment could be a benefit to the property according to the seller.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS DE3	**SALE No.**	DE3
	STATE	South Dakota
	COUNTY	Deuel





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	7.42 Acres
Improvements:	1912 Story ½
Finished Area:	1,680 S.F. GLA
Garage:	Detached
Features:	Treed shelter belt. 40x60 Pole building shed and grain bin
Access:	Highway linkage

2018 Sales Analysis Data:

Date of Sale:	May 25, 2018 (Influenced Sale)
Market Exposure:	MLS
Listing Price:	$184,900
Sale Price:	$183,000
Verification:	MLS/Broker
Type:	Arm's Length Sale
DOM:	123

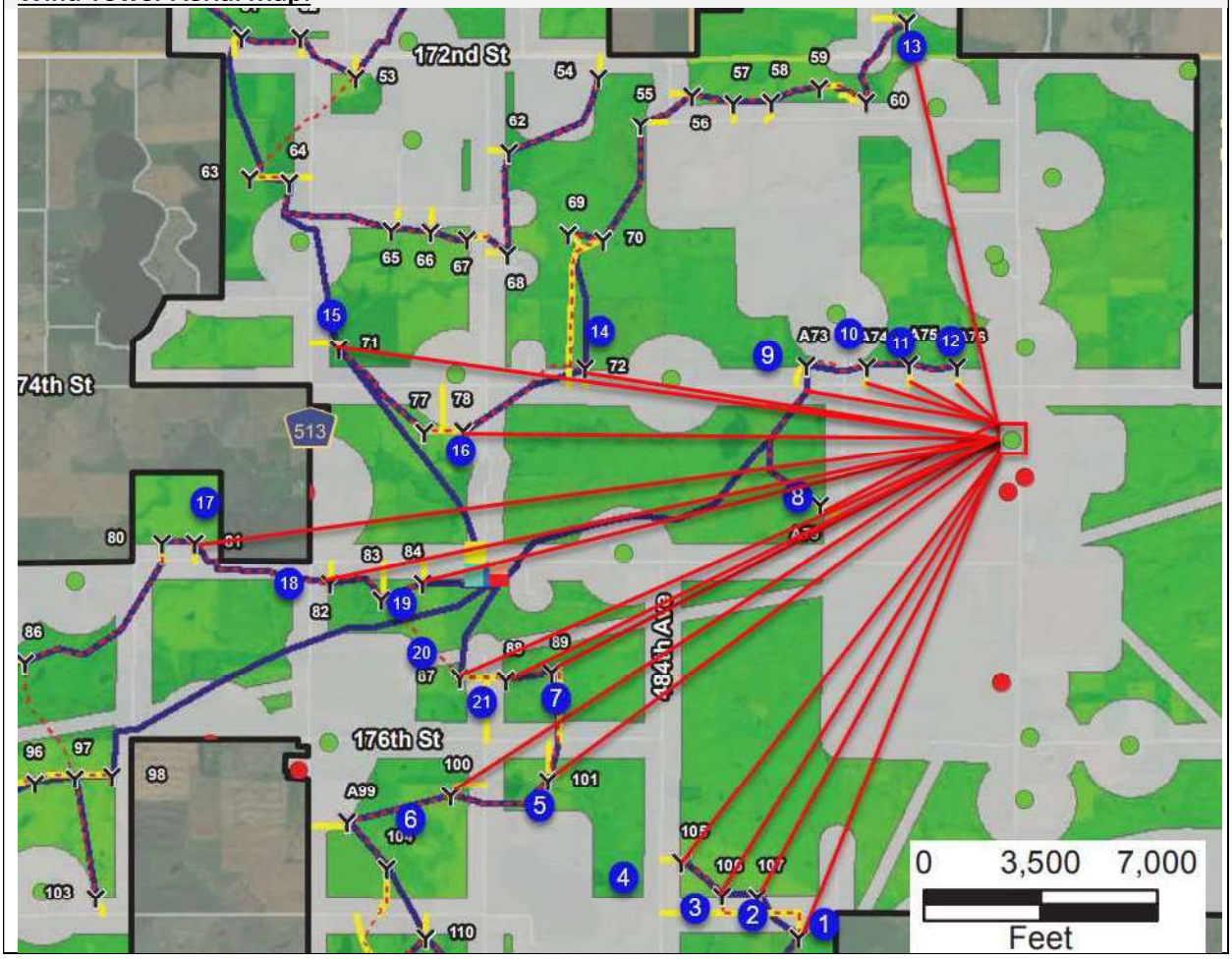
2016 Sales Analysis Data:

Date of Sale:	September 1st, 2016 (Influenced Sale)
Listing Price:	NA
Sale Price:	$164,000
Verification:	Deed/County Records
Type:	Arm's Length Sale
DOM:	NA

2007 Sales Analysis Data:	
Date of Sale:	October 1, 2007 (Uninfluenced Sale)
Market Exposure:	MLS
Listing Price:	$75,000
Sale Price:	$64,000
Verification:	MLS/Broker
Type:	Arm's Length Sale
DOM:	81

Wind Energy Project:	
Development:	Deuel Harvest
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	150 meters or 500 feet +/- ground to blade height per PUC exhibit
Wind Tower Property Notes:	Deuel Harvest is a permitted wind development that is currently in the construction phase of the project. Twenty-one wind towers will be in proximity to the residence. Distances from the residence range from 1,600 feet to over 5,000 feet. The turbines are north, northwest, west, southwest, and south of the property.

Wind Tower Aerial Map:



Appreciation Analysis:		
2007 Sale 1 DE3:	October 01, 2007	$64,000 (Uninfluenced by Lease)
2016 Sale 2 DE3:	September 1, 2016	$164,000 (Influenced by Lease)
	5.31 Years	$100,000
DE3 Appreciation	**$18,832/Year**	**29%/Year**
2016 Sale 2 DE3:	September 1, 2016	$164,000 (Influenced by Lease)
2018 Sale 3 DE3	May 19, 2018	$183,000
	1.74 years	$19,000
DE3 Appreciation:	**$10,919/Year**	**6.65%/Year**
(Uninfluenced) Sale 1 486th:	December 7, 2004	$133,000
(Uninfluenced) Sale 2 486th:	October 11, 2013	$145,000
	9.25 Years	$12,000
486th Appreciation:	**$1,298/Year**	**.98%/Year**
(Uninfluenced) Sale 213th:	August 10, 2013	$266,000
(Uninfluenced) Sale 213th:	May 24, 2018	$290,903
	4.62 Years	$24,906
213th Appreciation:	**$5,390/Year**	**2.02%/Year**

Conclusion: DE3 sold in 2007, 2016 and 2018. On June 21, 2016, a wind memorandum was signed by owner-1. In 2016 DE3 sold with a recorded wind agreement. According to the broker and MLS DE3 remodeled condition affected the sale price and appreciation rates from 2007 to 2016 at 29%. The 2016 and 2018 were influenced by the recorded wind agreement and had market appreciation rates at 6.65% a year which is on the higher end of the market scale. The appreciation rates of DE3 are well-above the market average and the data shows there was no negative influence from the recorded wind agreement. It is important to note that at the time of the sale transactions no wind towers were constructed in the neighborhood or project area.

Site Analysis:	
Site Visit Conducted by:	David Lawrence
Site Visit Date:	May 23, 2018
View Obstruction:	Wind towers within view of the residence
Noise Analysis:	Operational & blade noise present during site visit.
Site Photos:	



Interview Analysis:

Interview Conducted by:	David Lawrence
Party Interviewed:	Broker
Interview Date:	November 18, 2019
Interview Notes with Broker:	The property was listed by Exit Realty Connection and sold within 123 DOM. The property was recently updated. The property was being sold because of a job relocation, not because of the wind project. The seller's disclose statement did not disclose the wind project; however, according to the agent, there was a wind lease recorded with the property and future location of the turbines that will be in proximity to the residencs. The buyers had full knowledge of the project and lease and it did not affect the selling price or buyer's decision to purchase the property. The broker explained that in his experience the proximty to wind towers affects some buyers and they do not want to live around wind development.
Wind Memorandum:	

Deuel Harvest Wind Energy LLC
1 S. Wacker Dr., Suite 1800
Chicago, IL 60606

ASSIGNMENT AND ASSUMPTION AGREEMENT

THIS **ASSIGNMENT AND ASSUMPTION AGREEMENT** (this "Assignment") is made as of October 22, 2019, by Invenergy Wind Development LLC, a Delaware limited liability company ("**Assignor**") and Deuel Harvest Wind Energy LLC, a Delaware limited liability company ("**Assignee**").

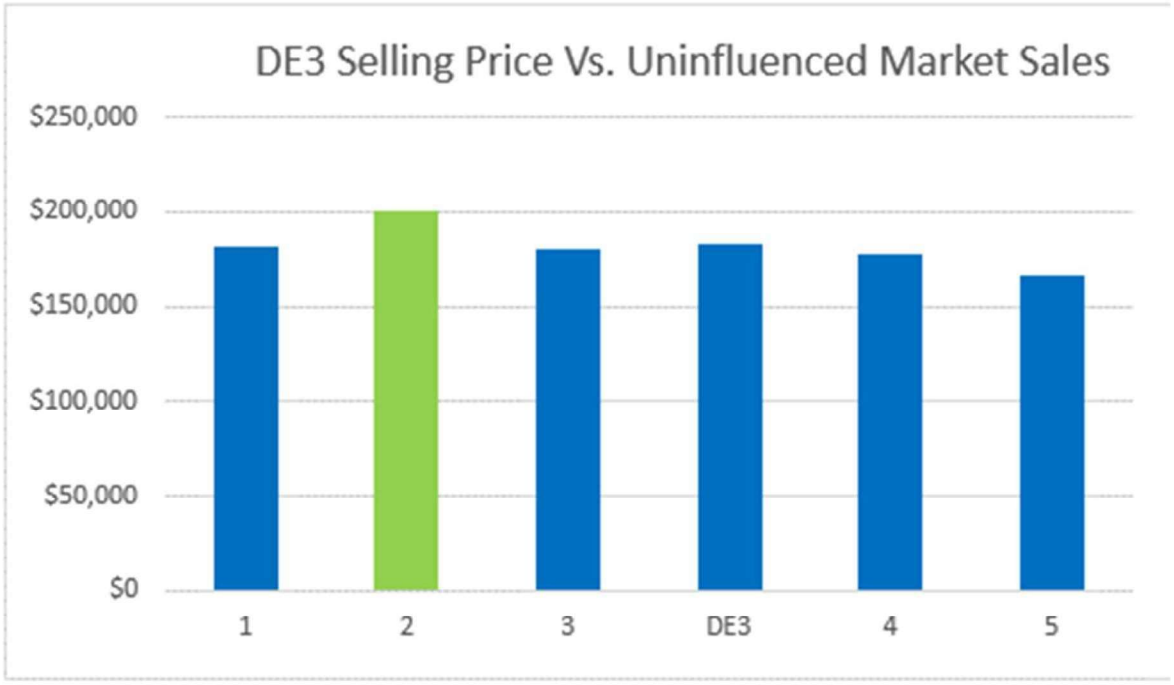
Lease 125 **WSDNDC0171**

Wind Lease and Easement Agreement dated June 21, 2016 by and between [redacted] and Invenergy Wind Development LLC as evidenced by that Memorandum of Wind Lease and Easement Agreement recorded on August 30, 2016 in Book 2016 Page 3381 in the Official Public Records of Deuel County, South Dakota.

Legal Description:

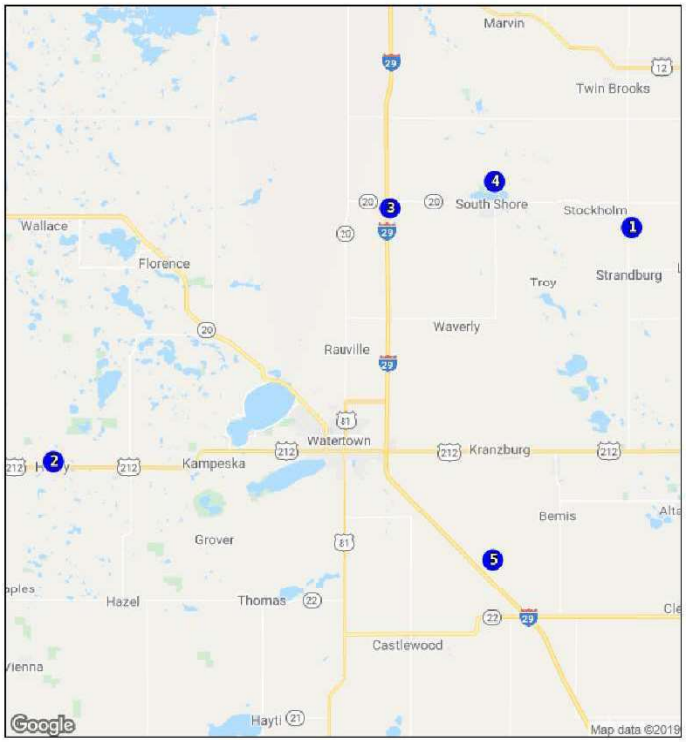
Block One (1) Jacobson Addition, located in the Southeast Quarter of the Northeast Quarter (SE1/4NE1/4 in Section Seventeen (17), Township One Hundred Sixteen (116) North, Range Forty-seven (47), West of the 5th P.M., Deuel County, South Dakota.

Market Sales Analysis:



Sales Analysis DE3									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
DE3	Gary	2018	$183,000	1910	1,680	7.42	Story 1/2	Pole Building	
1	Henry	2018	$182,000	1915	2,384	6.89	2-Story	Shed	Similar
		Adjustments:		Inferior(+)	Superior(-)	Similar(=)	Similar (=)	Inferior(+)	
2	Stockholm	2018	$200,000	1900	2,690	9.94	Story1/2	Barn/Pol	Superior
		Adjustments:		Similar(=)	Superior(-)	Similar(=)	Similar (=)	Superior(-)	
3	S. Shore	2018	$180,000	1956	1,390	17.1	Story1/2	None	Inferior
		Adjustments:		Similar(=)	Inferior(+)	Superior(-)	Similar (=)	Inferior(+)	
4	S. Shore	2019	$178,250	1919	1,830	5	Story1/2	Pole Blds/Barn	Similar
		Adjustments:		Similar(=)	Superior(-)	Inferior(+)	Similar (=)	Similar(=)	
5	Goodwin	2018	$166,500	1998	2,400	2.85	Ranch	None	Inferior
		Adjustments:		Superior(-)	Superior(-)	Inferior(+)	Similar (=)	Inferior(+)	

Sale Location Map:



Legend
1. 47225 159TH STREET, Stockholm, SD 57264(24-6197)
2. 107 N PINE STREET, Henry, SD 57243(30-3617)
3. 15753 458TH AVENUE, South Shore, SD 57263(38-95)
4. 15582 464TH AVENUE, South Shore, SD 57263(35-217)
5. 17857 464TH AVENUE, Goodwin, SD 57238(30-3740)

Market Sales Analysis Conclusion:	Five sales are from the market without the influence of a wind tower. All transactions have similar highest and best use and are bracketed by the market sales. Sale two is slightly superior with a larger acreage and GLA. Sales three and five are slightly inferior, with sales one and four having more similarities. The market evidence suggests the selling price was not affected by the proximity of the wind towers as evident by the uninfluenced bracketed range.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for DE3. The research and data suggest the proximity of the proposed wind towers and the project did not influence the selling price. Sale DE3 sold in 2007, 2016 and then resold in 2018 with market appreciation rates on the higher end of the market range. The agent reported the buyer was aware of the wind project and that it didn't affect the purchase price. The sales data is consistent with the interview analysis and does not show any negative affect on the selling price.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS DE4	**SALE No.**	DE4
	STATE	South Dakota
	COUNTY	Deuel



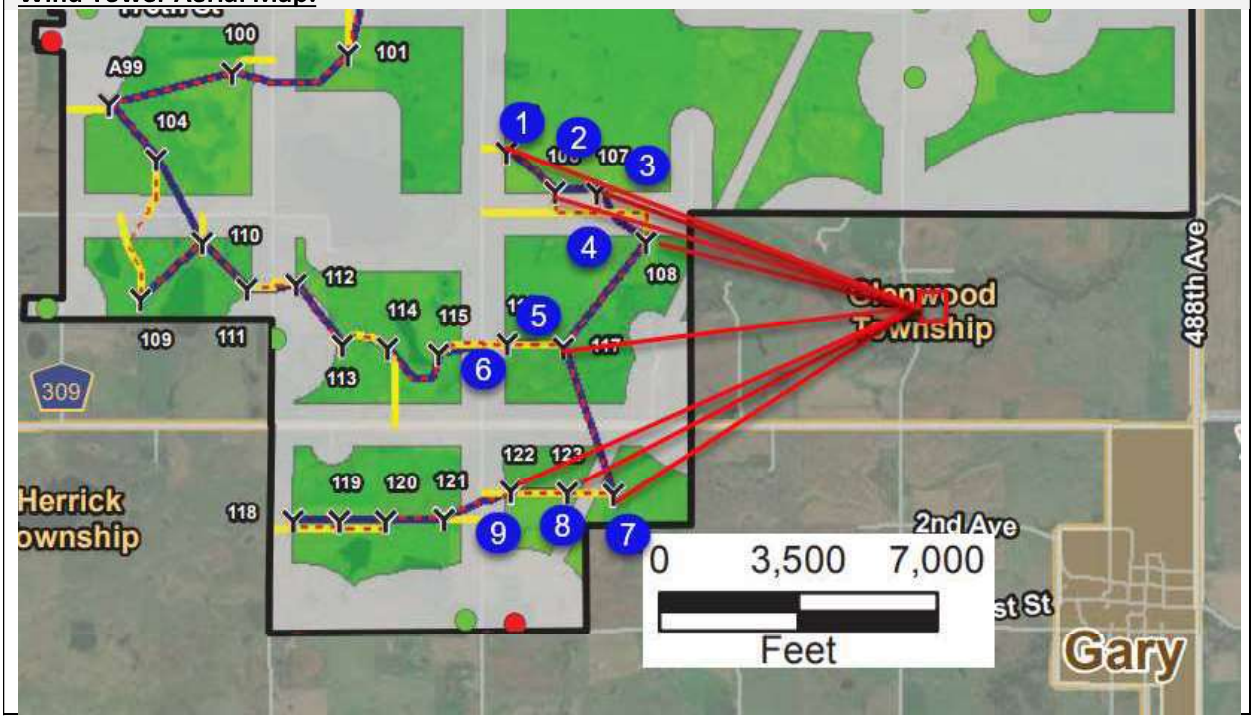


Property Characteristics:	
Highest & Best Use:	Rural Acreage
Land Size:	34 Acres
Improvements:	2005 Story 1/2
Finished Area:	1,928 S.F. GLA, 1,160 S.F. Lower Level
Garage:	Tuck-under 2-Stall
Features:	Treed shelter belt. (2) Pole buildings 30x56, 24x36
Access:	Gravel road linkage

Sales Analysis Data:	
Date of Sale:	March 15, 2019
Market Exposure:	MLS
Listing Price:	$434,900
Sale Price:	$410,000
Verification:	MLS/Broker
Type:	Arm's Length Sale
DOM:	242

Wind Energy Project:	
Development:	Deuel Harvest
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	150 meters or 500 feet +/- ground to blade height per PUC exhibit
Wind Tower Property Notes:	Deuel Harvest is a permitted wind development and in the construction phase of the project. Nine wind towers will be located west of the DE4, within proximity of 5,000 to 6,000 feet per the Invenergy turbine siting constraints map.

Wind Tower Aerial Map:



Site Analysis:

Site Visit Conducted by: David Lawrence

Site Visit Date: November 13, 2019 & May 23, 2018

View Obstruction: Wind towers to the west within distance view of the residence.

Noise Analysis: NA

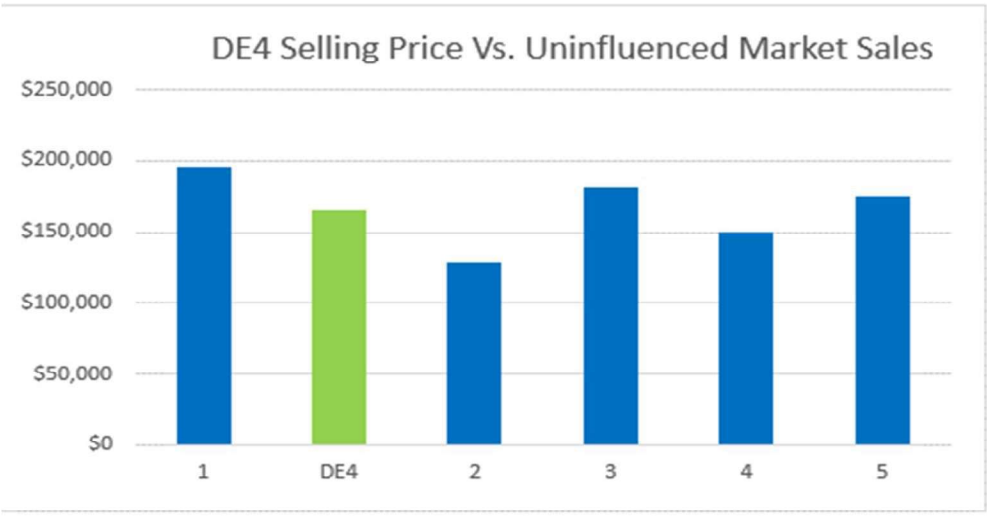
Site Photos:





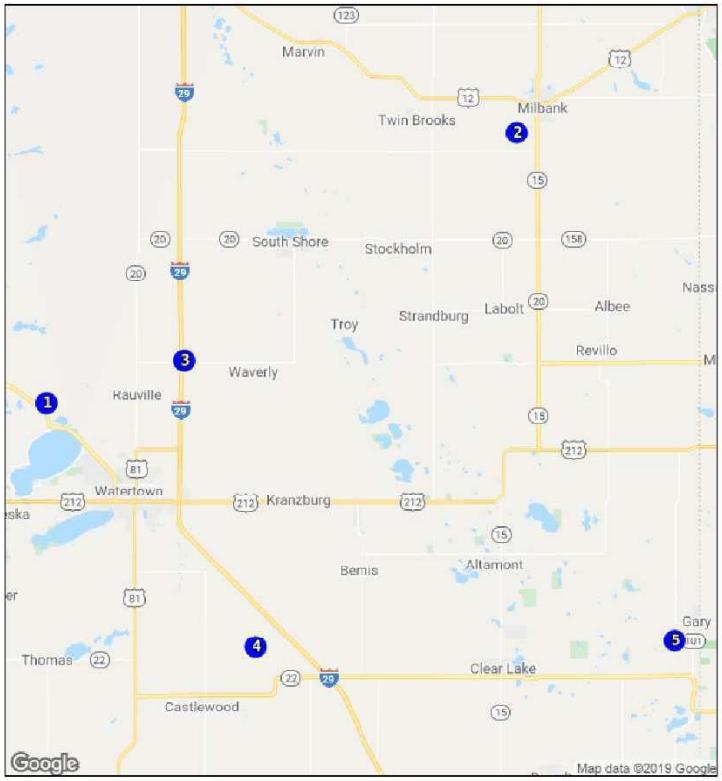
Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker
Interview Date:	November 11, 2019
Interview Notes with Broker:	The property was listed for sale because the owner was being relocated to Minnesota. The wind project was not a concern or a motivating factor to sell the property. The sellers were satisfied with the transaction and market price. There was no influence from the wind project on the selling price. The buyers were from Nebraska and previously lived around a wind project. They purchased the property with knowledge of the wind project, and it did not affect the price paid or purpose decision.

Market Sales Analysis:



Sales Analysis DE4									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
DE4	Gary	2019	$410,000	2005	1,928	34	Story 1/2	Building	
1	Watertown	2019	$430,000	1915upd	2,857	8.54	2-Story	Barn/Pole	Superior
		Adjustments:		*Similar(=)*	*Superior(-)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
2	Millbank	2019	$395,000	2011	2,728	19.9	Ranch	Barn	Inferior
		Adjustments:		*Similar(=)*	*Superior(-)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
3	Watertown	2019	$390,000	1999	2,288	8.08	Story1/2	Pole/Barn	Similar
		Adjustments:		*Similar(=)*	*Superior(-)*	*Inferior(+)*	*Similar (=)*	*Similar(=)*	
4	Castlewood	2019	$360,000	2010	1,845	16.45	Ranch	Barn	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Inferior(+)*	*Similar (=)*	*Inferior(+)*	
5	Gary	2019	$517,000	2008	2,640	30	Ranch	Garage	Similar
		Adjustments:		*Similar(=)*	*Superior(-)*	*Similar(=)*	*Similar (=)*	*Inferior(+)*	

Sale Location Map:



Legend
1. 16641 450TH AVENUE, Watertown, SD 57201(30-3623)
2. 47695 151ST STREET, Milbank, SD 57252(35-174)
3. 45776 164TH STREET, Watertown, SD 57201(26-8785)
4. 18037 462ND AVENUE, Castlewood, SD 57223(28-1037)
5. 17752 486TH AVENUE, Gary, SD 57237(24-6031)

Market Sales Analysis Conclusion:	Five sales are from the market without the influence of a wind tower. All transactions have similar highest and best use and are bracketed by the market sales. The selling price of the subject is supported by the uninfluenced sales suggesting there was no influence from the wind project or future location of wind towers.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for DE4. The broker stated the buyers were knowledgeable of the wind project and the purchase price was not influenced. Although no tower was constructed at the time of the sale, the wind tower exhibits show the nearest wind towers more than 4,000 feet to the west. The sales data is consistent with the interview comments and support the conclusion the sale price was not affected by the wind project or future tower locations.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS DE5	**SALE No.**	DE5
	STATE	South Dakota
	COUNTY	Deuel





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	9.45 acres
Improvements:	2008 Pole designed Ranch
Finished Area:	1,024 SF GLA
Garage:	Attached 2-stall
Features:	Treed shelter belt.
Access:	Gravel road linkage

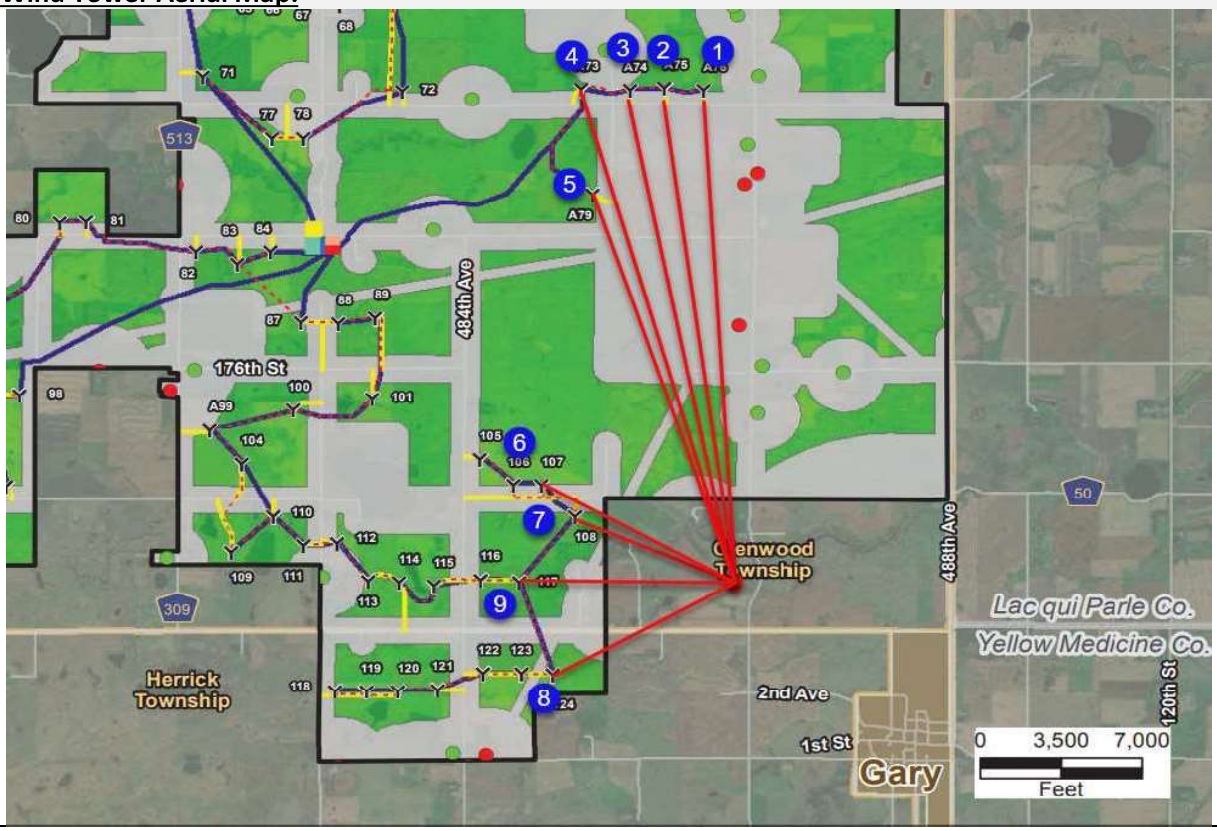
Sales Analysis Data:

Date of Sale:	March 08, 2019
Market Exposure:	MLS
Listing Price:	$169,000
Sale Price:	$163,000
Verification:	MLS/Broker
Type:	Arm's Length Sale
DOM:	296

Wind Energy Project:

Development:	Deuel Harvest
Turbine Type:	Gamesa G87 2.0 MW
Hub Height/Rotor Diameter:	78/87 meters
Height From Ground:	150 meters or 500 feet +/- ground to blade height per PUC exhibit
Wind Tower Property Notes:	Deuel Harvest is a permitted wind development and in the construction phase of the project. Nine wind towers will be located west of the DE5, within proximity of 4,000 to 6,000 feet per the Invenergy turbine siting constraints map.

Wind Tower Aerial Map:



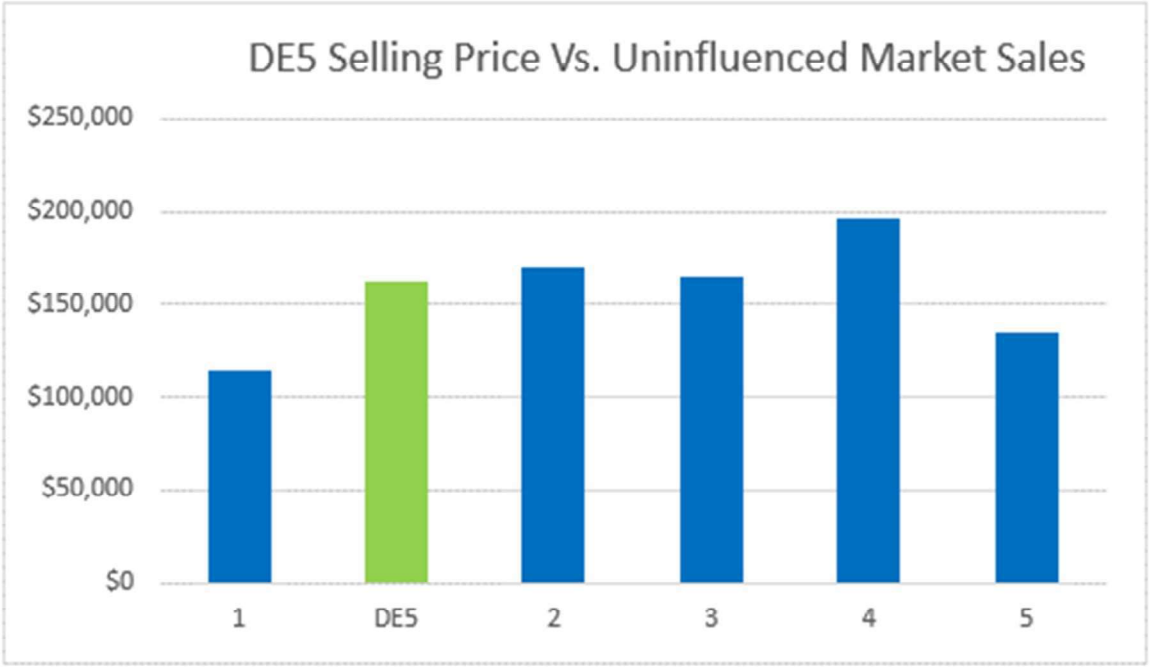
Site Analysis:

Site Visit Conducted by: David Lawrence
Site Visit Date: November 13, 2019 & May 23, 2018
View Obstruction: Future wind towers to the west within distant view of the residence.
Noise Analysis: NA – No wind tower constructed as the time of site visit
Site Photos:



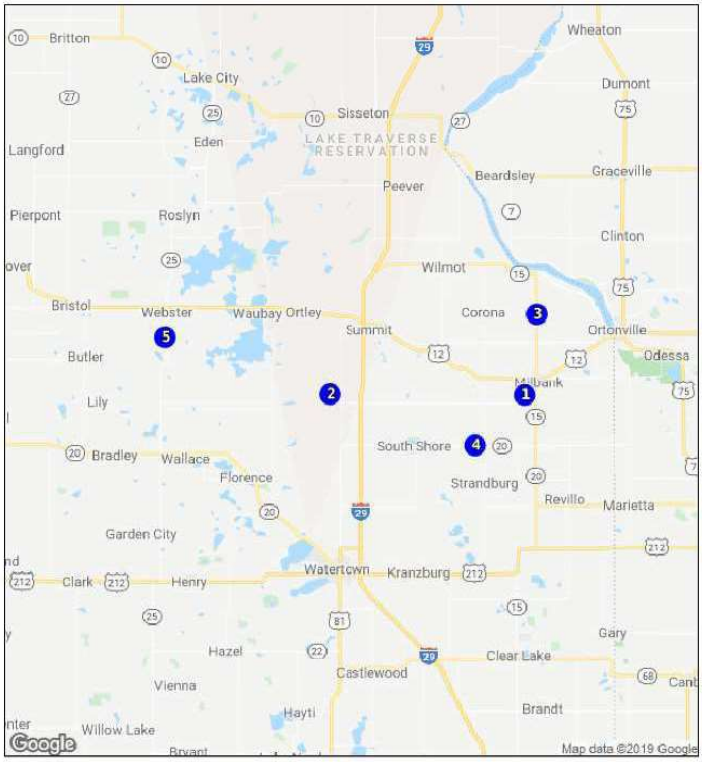
Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker
Interview Date:	November 25, 2019
Interview Notes with Broker:	The buyer did not have concerns about the possibilities of wind towers being built in the neighborhood. The property offered the features the buyer was looking for within the price range. The agent commented that when the Deuel Harvest project was first announced many residences had concerns about property values, but that has seemed to go away and the market has moved forward. There have been three other properties sold in the neighborhood within the last 12 months near the project area.

Market Sales Analysis:



Sales Analysis DE5									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
DE5	Gary	2019	$163,000	2008	1,024	9.45	Ranch	Attached	
1	Milbank	2019	$114,000	2014	1,260	3.2	Ranch	None	Inferior
		Adjustments:		Similar(=)	Superior(-)	Inferior(+)	Similar (=)	Similar(=)	
2	Stockholm	2019	$170,000	2016	1,008	5	Ranch	None	Similar
		Adjustments:		Similar(=)	Similar(=)	Inferior(+)	Similar (=)	Similar(=)	
3	Milbank	2019	$165,000	1930	864	4.66	Ranch	Barn	Inferior
		Adjustments:		Inferior(+)	Inferior(+)	Inferior(+)	Similar (=)	Superior(-)	
4	Webster	2019	$197,000	1971	1,288	26.9	Ranch	Barn/Pole	Superior
		Adjustments:		Inferior(+)	Superior(-)	Superior(-)	Similar (=)	Superior(-)	
5	Summit	2019	$135,000	1890	1,390	10	Ranch	Old Barn	Inferior
		Adjustments:		Inferior(+)	Superior(-)	Similar(=)	Similar (=)	Similar(=)	

Sale Location Map:



Legend
1. 47687 151ST STREET, Milbank, SD 57252(35-207)
2. 45366 151ST STREET, Summit, SD 57266(24-6131)
3. 14190 SD 15 HIGHWAY, Milbank, SD 57252(35-201)
4. 47211 SD-20 HIGHWAY, Stockholm, SD 57264(24-6203)
5. 14447 SD-25 HIGHWAY, Webster, SD 57274(26-8769)

Market Sales Analysis Conclusion:	The market analysis includes six sales that are not influenced by the proximity of a wind tower, turbine or development. The selected sales for the analysis include similar rural properties with features of an acreage. The uninfluenced sales present a bracketed range for the DE5. Sales three, five and one are inferior sales. Sale two has is stronger for comparison, with sale four bracketing the higher end of the range. The market evidence suggests the selling price was not affected by the proximity of the wind towers.

Overall Conclusion:	An interview analysis, site observation, and sales analysis were completed for DE5. The broker comments were consistent with the sales evidence the proximity to the wind towers did not negatively influence the selling price. Although the towers were not constructed as of the date of the site visit, the future location of the towers was over 4,000 feet to the west. The sales data and interview analysis suggest there was no influence on the selling price.

SELLER'S PROPERTY CONDITION DISCLOSURE STATEMENT

(This disclosure shall be completed by the seller. This is a disclosure required by law. If you do not understand this form, seek legal advice.)

Seller_____ Property Address_____

This Disclosure Statement concerns the real property identified above situated in the City of _____
County of _____ , State of South Dakota.

THIS STATEMENT IS A DISCLOSURE OF THE CONDITION OF THE ABOVE DESCRIBED PROPERTY IN COMPLIANCE WITH § 43-4-38. IT IS NOT A WARRANTY OF ANY KIND BY THE SELLER OR ANY AGENT REPRESENTING ANY PARTY IN THIS TRANSACTION AND IS NOT A SUBSTITUTE FOR ANY INSPECTIONS OR WARRANTIES THE PARTIES MAY WISH TO OBTAIN.

Seller hereby authorizes any agent representing any party in this transaction to provide a copy of this statement to any person or entity in connection with any actual or anticipated sale of the property.

IF ANY MATERIAL FACT CHANGES BEFORE CONVEYANCE OF TITLE TO THIS PROPERTY, THE SELLER MUST DISCLOSE SUCH MATERIAL FACT WITH A WRITTEN AMENDMENT TO THIS DISCLOSURE STATEMENT.

I. LOT OR TITLE INFORMATION

1. When did you purchase or build the home? _____

If the answer is yes to any of the following, please explain under additional comments or on an attached separate sheet.

2. Were there any title problems when you purchased the property? Yes ____ No ____
3. Are there any recorded liens or financial instruments against the property, other than a first mortgage? Yes ____ No ____
4. Are there any unrecorded liens or financial instruments against the property, other than a first mortgage; or have any materials or services been provided in the past one hundred twenty days that would create a lien against the property under chapter 44-9? Yes ____ No ____ Unknown ____
5. Are there any easements which have been granted in connection with the property (other than normal utility easements for public water and sewer, gas and electric service, telephone service, cable television service, drainage, and sidewalks)? Yes ____ No ____ Unknown ____
6. Are there any problems related to establishing the lot lines/boundaries? Yes ____ No ____ Unknown ____
7. Do you have a location survey in your possession or a copy of the recorded plat? If yes, attach a copy. Yes ____ No ____ Unknown ____
8. Are you aware of any encroachments or shared features, from or on adjoining property (i.e. fences, driveway, sheds, outbuildings, or other improvements)? Yes ____ No ____
9. Are you aware of any covenants or restrictions affecting the use of the property in accordance with local law? If yes, attach a copy of the covenants and restrictions. Yes ____ No ____
10. Are you aware of any current or pending litigation, foreclosure, zoning, building code or restrictive covenant violation notices, mechanic's liens, judgments, special assessments, zoning changes, or changes that could affect your property? Yes ____ No ____
11. Is the property currently occupied by the owner? Yes ____ No ____
12. Does the property currently receive the owner occupied tax reduction pursuant to SDCL 10-13-39? Yes ____ No ____
13. Is the property currently part of a property tax freeze for any reason? Yes ____ No ____ Unknown ___
14. Is the property leased? Yes ____ No ____
15. If leased, does the property use comply with local zoning laws? Yes ____ No ____
16. Does this property or any portion of this property receive rent? Yes ____ No ____
    If yes, how much $____ and how often ____?

III. SYSTEMS/UTILITIES INFORMATION

	None/Not Included	Working	Not Working
1. 220 Volt Service			
2. Air Exchanger			
3. Air Purifier			
4. Attic Fan			
5. Burglar Alarm & Security System			
6. Ceiling Fan			
7. Central Air – Electric			
8. Central Air – Water Cooled			
9. Cistern			
10. Dishwasher			
11. Disposal			
12. Doorbell			
13. Fireplace			
14. Fireplace Insert			
15. Garage Door/Opener Control(s)			
16. Garage Wiring			
17. Heating System			
18. Hot Tub, Whirlpool, and Controls			
19. Humidifier			
20. Intercom			
21. Light Fixtures			
22. Microwave/Hood			
23. Plumbing and Fixtures			
24. Pool and Equipment			
25. Propane Tank			
26. Radon System			
27. Sauna			
28. Septic/Leaching Field			
29. Sewer Systems/Drains			
30. Smoke/Fire Alarm			
31. Solar House – Heating			
32. Sump Pump(s)			
33. Switches and Outlets			
34. Underground Sprinkler and Heads			
35. Vent Fan			
36. Water Heater – Electric or Gas			
37. Water Purifier			
38. Water Softener – Leased or Owned			
39. Well and Pump			
40. Wood Burning Stove			

IV. HAZARDOUS CONDITIONS

Are you aware of any existing hazardous conditions of the property and are you aware of any tests having been performed?

	Existing Conditions		Tests Performed	
	Yes	No	Yes	No
1. Methane Gas				
2. Lead Paint				
3. Radon Gas (House)				
4. Radon Gas (Well)				
5. Radioactive Materials				
6. Landfill, Mineshaft				
7. Expansive Soil				
8. Mold				
9. Toxic Materials				
10. Urea Formaldehyde Foam Insulations				
11. Asbestos Insulation				
12. Buried Fuel Tanks				
13. Chemical Storage Tanks				
14. Fire Retardant Treated Plywood				
15. Production of Methamphetamines				

If the answer is yes to any of the questions above, please explain in additional comments or on an attached separate sheet.

17. Do you pay any mandatory fees or special assessments to a homeowners' or condominium association?
Yes ____ No ____
If yes, what are the fees or assessments? $ ____ per ____ (i.e. annually, semi-annually, monthly)
Payable to whom: _____ For what purpose? _____

18. Are you aware if the property has ever had standing water in either the front, rear, or side yard more than forty-eight hours after heavy rain? Yes ____ No ____

19. Is the property located in or near a flood plain? Yes ____ No ____ Unknown ____

20. Are wetlands located upon any part of the property? Yes ____ No ____ Unknown ____

21. Are you aware of any private transfer fee obligations, as defined pursuant to § 43-4-48, that would require a buyer or seller of the property to pay a fee or charge upon the transfer of the property, regardless of whether the fee or charge is a fixed amount or is determined as a percentage of the value of the property?
Yes ____ No ____ Unknown ____
If yes, what are the fees or charges? $_____ per _____ (i.e. annually, semi-annually, monthly)

II. STRUCTURAL INFORMATION

If the answer is yes to any of the following, please explain under additional comments or on an attached separate sheet.

1. Are you aware of any water penetration problems in the walls, windows, doors, basement, or crawl space?
Yes ____ No ____

2. What water damage related repairs, if any, have been made? _____
If any, when? _____

3. Are you aware if drain tile is installed on the property? Yes ____ No ____

4. Are you aware of any interior cracked walls or floors, or cracks or defects in exterior driveways, sidewalks, patios, or other hard surface areas? Yes ____ No ____
What related repairs, if any, have been made? _____

5. Are you aware of any roof leakage, past or present? Yes ____ No ____
Type of roof covering: _____ Age: _____
What roof repairs, if any, have been made, when and by whom? _____
_____
Describe any existing unrepaired damage to the roof: _____

6. Are you aware of insulation in:
the ceiling/attic? Yes ____ No ____ the walls? Yes ____ No ____ the floors? Yes ____ No ____

7. Are you aware of any pest infestation or damage, either past or present? Yes _____ No _____

8. Are you aware of the property having been treated for any pest infestation or damage?
Yes ____ No ____ If yes, who treated it and when? _____

9. Are you aware of any work upon the property which required a building, plumbing, electrical, or any other permit?
Yes ____ No ____ If yes, describe the work: _____
Was a permit obtained? Yes _____ No _____ Was the work approved by an inspector? Yes _____ No _____

10. Are you aware of any past or present damage to the property (i.e. fire, smoke, wind, floods, hail, or snow)?
Yes ____ No ____ If yes, describe _____
Have any insurance claims been made? Yes ____ No ____ Unknown ____
Was an insurance payment received? Yes ____ No ____ Unknown ____
Has the damage been repaired? Yes ____ No ____ If yes, describe in detail: _____
_____

11. Are you aware of any problems with sewer blockage or backup, past or present? Yes _____ No _____

12. Are you aware of any drainage, leakage, or runoff from any sewer, septic tank, storage tank, or drain on the property into any adjoining lake, stream, or waterway? Yes _____ No_____ If yes, describe in detail:
_____
_____

V. MISCELLANEOUS INFORMATION

1. Is the street or road located at the end of the driveway to the property public or private?
   Public ____ Private ____
2. Is there a written road maintenance agreement? Yes ____ No ____
   If yes, attach a copy of the maintenance agreement.
3. When was the fireplace/wood stove/chimney flue last cleaned?_____
4. Within the previous twelve months prior to signing this document, are you aware of any of the following occurring on the subject property?
   a. A human death by homicide or suicide? Yes ____ No ____
   If yes, explain:_____
   b. Other felony committed against the property or a person on the property? Yes ____ No ____
   If yes, explain: _____
5. Is the water source (select one) _____ public or _____ private?
6. If private, what is the date and result of the last water test? _____
7. Is the sewer system (select one) _____public or _____ private?
8. If private, what is the date of the last time the septic tank was pumped? _____
9. Are there broken window panes or seals? Yes ____ No ____
   If yes, specify: _____
10. Are there any items attached to the property that will not be left, such as: towel bars, mirrors, swag lamps and hooks, curtain rods, window coverings, light fixtures, clothes lines, swing sets, storage sheds, ceiling fans, basketball hoops, mail boxes, etc. Yes ____ No ____
    If yes, please list _____
11. Are you aware of any other material facts or problems that have not been disclosed on this form?
    Yes ____ No ____ If yes, explain: _____

VI. ADDITIONAL COMMENTS (ATTACH ADDITIONAL PAGES IF NECESSARY)

_____
_____
_____

CLOSING SECTION

The Seller hereby certifies that the information contained herein is true and correct to the best of the Seller's information, knowledge, and belief as of the date of the Seller's signature below. If any of these conditions change before conveyance of title to this property, the change will be disclosed in a written amendment to this disclosure statement.

_____ _____ _____ _____
Seller Date Seller Date

THE SELLER AND THE BUYER MAY WISH TO OBTAIN PROFESSIONAL ADVICE AND INSPECTIONS OF THE PROPERTY TO OBTAIN A TRUE REPORT AS TO THE CONDITION OF THE PROPERTY AND TO PROVIDE FOR APPROPRIATE PROVISIONS IN ANY CONTRACT OF SALE AS NEGOTIATED BETWEEN THE SELLER AND THE BUYER WITH RESPECT TO SUCH PROFESSIONAL ADVICE AND INSPECTIONS.

I/We acknowledge receipt of a copy of this statement on the date appearing beside my/our signature(s) below. Any agent representing any party to this transaction makes no representations and is not responsible for any conditions existing in the property.

_____ _____ _____ _____
Buyer Date Buyer Date

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. EL19-027

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN THE COUNTIES OF DEUEL, GRANT AND CODINGTON SOUTH DAKOTA, FOR THE CROWNED RIDGE WIND II PROJECT

Supplemental Testimony of David Lawrence
On Behalf of the Staff of the South Dakota Public Utilities Commission
January 23, 2020



Q: State your name.

A: My name is David Lawrence.

Q: Did you provide Direct Testimony in the Docket on December 6, 2019?

A: Yes.

Q: What is the purpose of your Supplemental Testimony?

A: The purpose of my Supplemental Testimony is to provide updates to the sales analysis and research that was completed since my direct testimony on December 6, 2019.

Q: What additional Research have you completed?

A: Since my December 6, 2019, direct testimony I continued to investigate transactional details relating to CD2. I completed additional interviews with parties to the transaction including both sellers who had a 50/50 ownership interest in the property, the potential buyer that made an offer that was cancelled after disclosure of the location of the wind tower, and an interview with the purchaser of the property who currently resides at the property. I was not presented with the opportunity for a detailed site inspection of the property and improvements. Results of the research have been updated within the sales analysis and can referenced as Exhibit_DAL-4.

Q: Does the additional research for CD2 change your opinion regarding the impacts on the selling prices to rural residences in proximity to a wind tower, turbine or development?

A: Overall it does not; however, the CD2 transaction does show there could be situations where a rural residence could be negatively influenced by a wind tower, turbine or proposed wind project. In total, I have analyzed sixteen sale transactions of South Dakota rural residences in proximity to a wind turbine and this is the first market sale that my research has identified with factors that show a negative influence due to the prospective location of a wind tower. It is my opinion the influence due to the prospective wind tower in proximity to CD2 are specific to the details of the transaction and it would be difficult to generally apply the results of one sale to all rural residences in proximity to a wind turbine or tower at this time. The research from CD2 suggests three interesting conclusions: (1) there is growing segment of the market (including buyers, sellers, and brokers) in Eastern South Dakota that are becoming evidently aware of and sensitive to the development of wind towers and turbines within the rural neighborhoods, (2) there is a segment of the potential buyer pool of rural residences that do not want to live in proximity to a wind turbine, tower or development, and (3) depending on how the legal question is interpreted for the South Dakota disclosure form, there could be a situation in which a seller of a rural residence in proximity to wind development could limit potential buyers by disclosing material facts of a proposed wind tower. It continues to be my opinion that even though the majority of market evidence supports the overall presumption that the selling prices of rural residences have

not been influenced by the presence of a wind tower, turbine or project, it does not rule out the fact that there could be certain situations where there could be potential negative influences to the selling price of rural residences as evident by the analysis of CD2. The research that I have completed in South Dakota continues to indicate that increasing the distance relationship from a wind turbine and a rural residence is the best measure to avoid any potential negative impacts on rural residential property values from a wind tower, turbine or development. Any rural residence that shows some type of factors that might have negatively influenced the selling price, should be analyzed on a case-by-case basis with a consistent scope of work for the analysis.

Q: Are you aware of any additional information that has been presented to you for the research you completed in Deuel County?

A: Yes, on January 8, 2020, I received information from the property owner of sale DE1. The information provides additional information for DE1, DE4, and DE5. I have considered the new information to be helpful for consistency within the data and the information that is measured within the analysis. However, the additional information does not change the results of the comparable sales analysis performed for these properties that showed no negative influence. This additional information can be found in Exhibit_DAL-5.

Q: Does this conclude your supplemental testimony?

A: Yes.

Wind Energy Development Analysis – Rural Residential		
SALES ANALYSIS CD2	**SALE No.**	CD2 Updated January 15, 2020
	STATE	South Dakota
	COUNTY	Codington





Property Characteristics:

Highest & Best Use:	Rural Acreage
Land Size:	2.65 Acres
Improvements:	2001
Finished Area:	1,570 SF GLA 1544 SF L.L. Finished
Garage:	Attached 2-Stall
Features:	Treed shelter belt. 60x57 Modern pole barn with concrete
Access:	Gravel road – Shared driveway per broker and aerial
Zoning:	AG

MLS Photos:













Sales Analysis Data:

Date of Sale: August 8, 2019
Market Exposure: MLS
Listing Price: $329,000 (See complete listing history below)
Sale Price: $275,000
Verification: MLS/Broker/Seller/CRV/Codington GIS/Site Visit/Buyer
Type: Arm's Length Sale
DOM: 189
MLS Listing History:

MLS #	Status	Price	% Change	Date	DOM
32-1666	Expired	$398,500		09/01/2018	93
+	Status	$398,500		09/02/2018	
+	Documents	$398,500		08/06/2018	26
+	Price Change	$398,500	-2.8%	07/01/2018	62
+	Price Change	$409,900	-3.5%	06/14/2018	79
+	Text, etc.	$424,900		06/05/2018	88
+	Photos, etc.	$424,900		06/04/2018	89
+	New	$424,900		06/01/2018	92

MLS #	Status	Price	% Change	Date	DOM
39-103	Expired	$329,000		10/22/2019	183
+	Status	$329,000		10/23/2019	
+	Price Change	$329,000	-6.0%	08/21/2019	62
+	Documents	$350,000		07/30/2019	84
+	Price Change	$350,000	-5.4%	07/15/2019	99
+	Price Change	$369,900	-2.6%	06/25/2019	119
+	Documents	$379,900		06/25/2019	119
+	Photos	$379,900		04/25/2019	180
+	New	$379,900		04/24/2019	181

Property Transfer History:

Transfer 1: November 23, 2005, James & Joyce Comes to Brian & Lisa Comes in Book 415 at Page 927 for $500. Transfer of acreage lot.

Transfer 2: August 8, 2005, Chad & Heidi Comes to Gregory & Anita Richter in Book 415 at Page 449 for $145,000. Transfer of improvements & land.

Transfer 3: October 31, 2005, Brian Comes and Lisa Comes to Gregory & Anita Richter in Book 415 at page 928 for $500. Additional land purchase for accessory pole building.

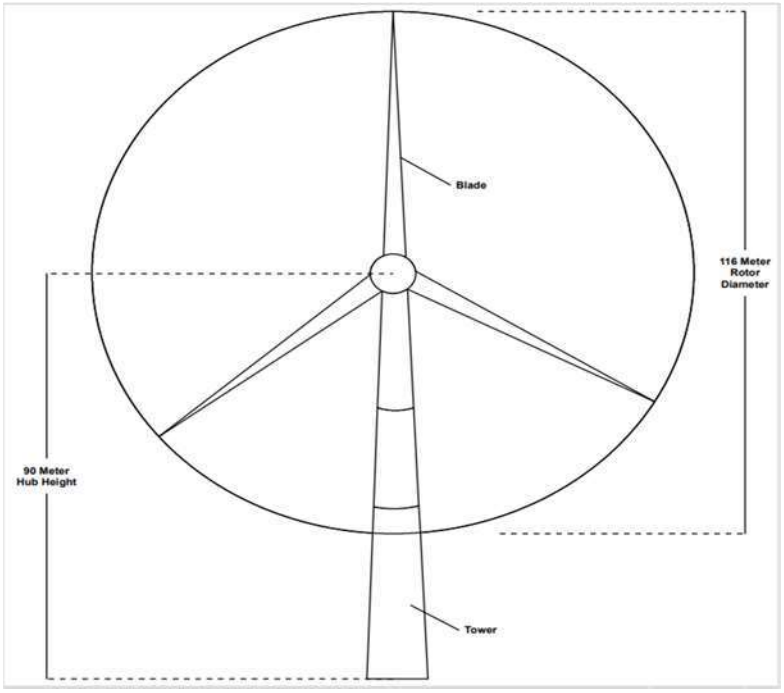
Transfer 4: October 25, 2019, Gregory Richter and Anita Richter to Robert and Kelli Johnson in Book 425 at page 4619 for $275,000. Transfer of improvements & land.

Wind Energy Project:

Development: Crowned Ridge Wind Project
Turbine Type: Gamesa G87 2.0 MW
Hub Height/Rotor Diameter: 80/116 meters

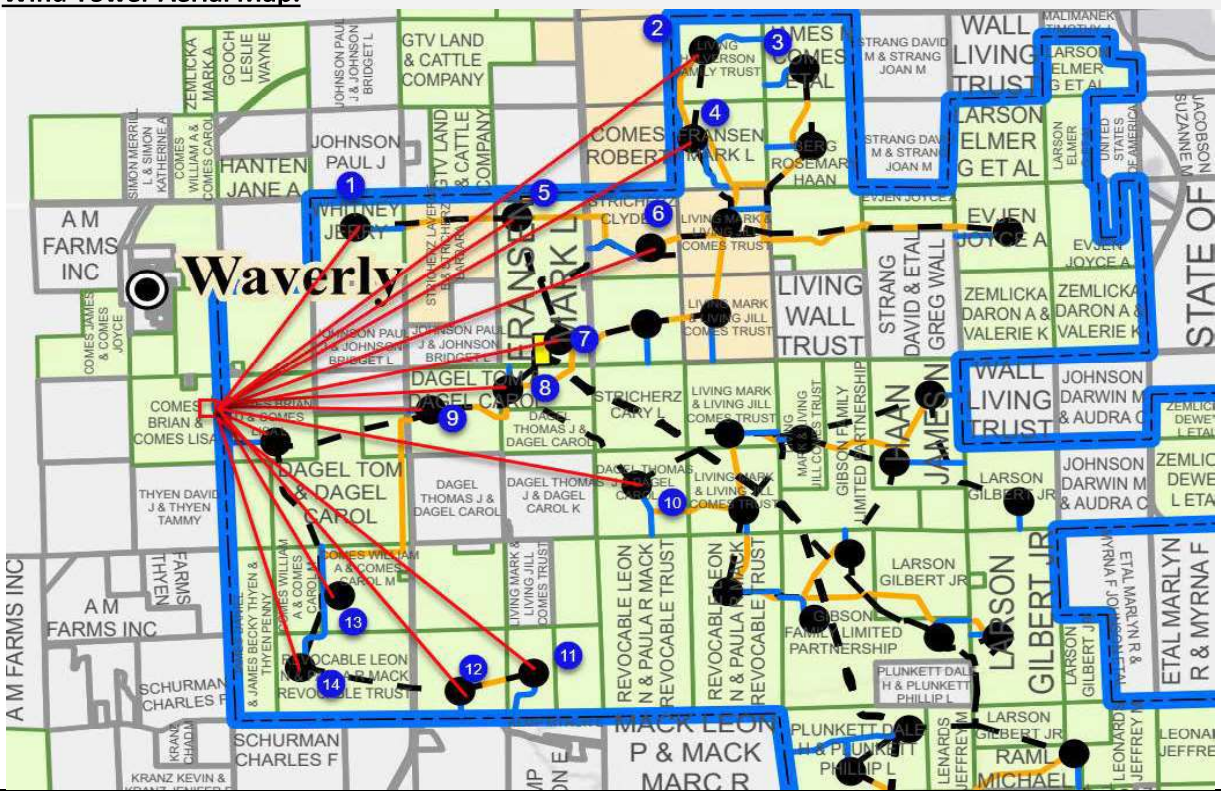
Height from Ground: 150 meters or 500 feet +/- per PUC exhibit

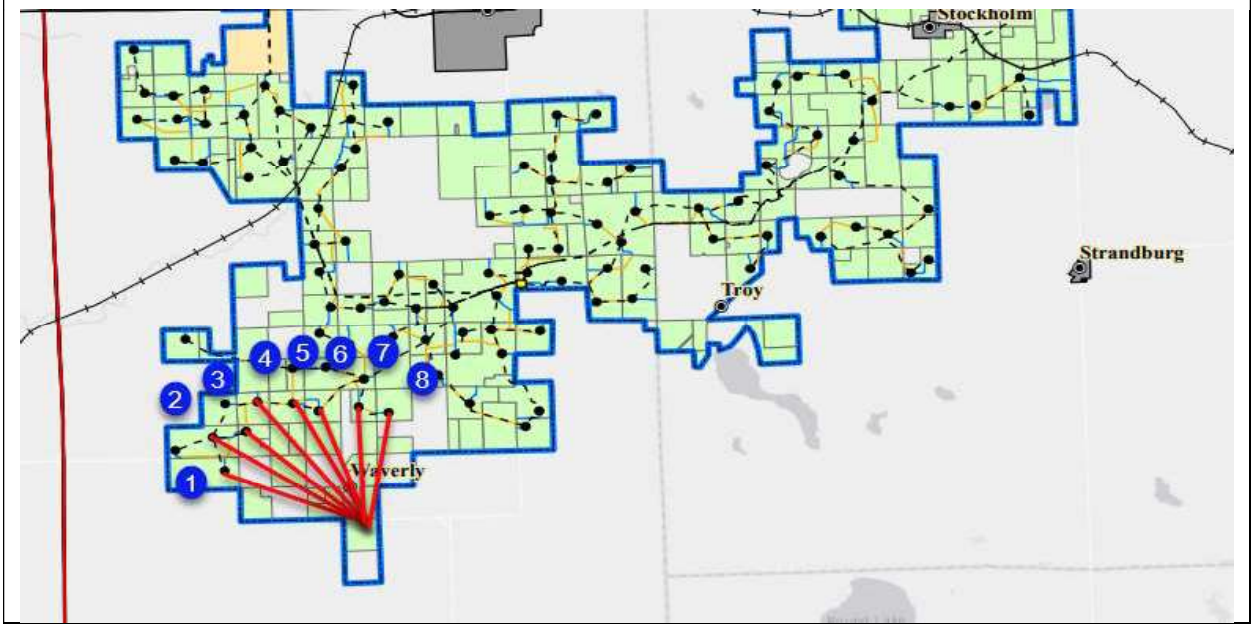
Wind Turbine Diagram:



Wind Tower Property Notes: Crowned Ridge Wind Farm is in the construction phase of the project. According to the turbine siting constraints map, twenty-two turbines will be in the proximity to the residence, with the nearest turbine CRII-134 within 2,000 feet of the property.

Wind Tower Aerial Map:





Site Analysis:

Site Visit Conducted by:	David Lawrence
Site Visit Date:	November 19, 2019
Interior/Exterior Site Visit:	The site visit is limited by an exterior only observation from the road. A detailed site inspection was not available for the analysis.
View Obstruction:	None – wind towers under construction around the Waverly market area
Noise Analysis:	NA – wind towers not operational at time of site visit
Site Photos:	



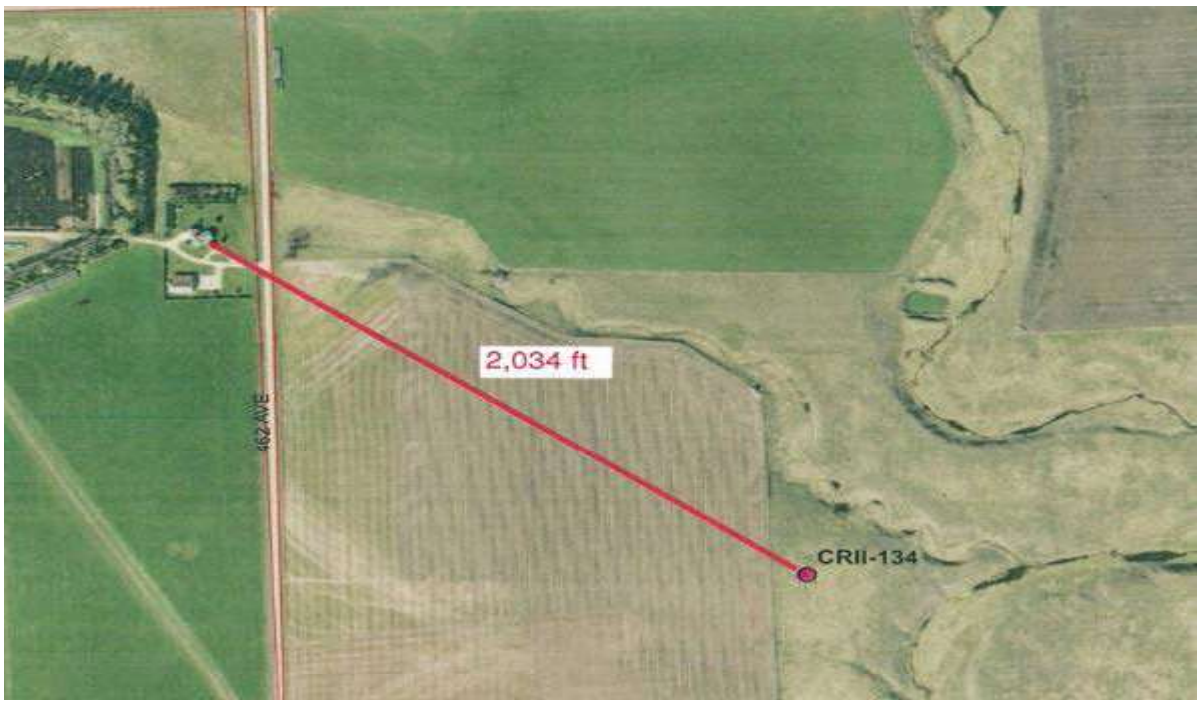




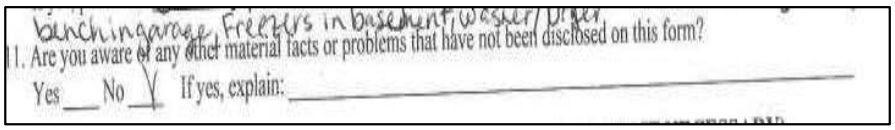
Photo: Wind tower construction west of Waverly.



Photo: Wind tower construction west of Waverly

Interview Analysis:	
Interview Conducted by:	David Lawrence
Party Interviewed:	Broker-1/Broker-2/Seller-1 50%/Seller-2 50% (Seller-1 & 2 husband & wife)/Buyer-1/Buyer-2
Interview Date(s):	November 11, 2019. December 10, 13, 14 and 15, 2019. January 09, 15, 20, 2020. (Various dates and interviews)
Interview Notes with Broker-1:	Broker-1 listed the property in June of 2018 for $424,900. After 26 days on the market, the listing price was reduced to $409,000. After 20 days the listing price was reduced to $398,500. After a total of 93 days on the market, the listing expired. Per Broker-1 the listing price was not supported by the market. The June 2, 2018 disclosure statement did not disclose the wind project or location of the tower within 2,000 feet of the residence.
Interview Notes with Broker-2:	Broker-2 was contacted by the owner in April of 2019. Prior to the listing, Broker-2 had the seller complete a disclosure statement on April 25, 2019; the wind project was not disclosed. The property was listed at $379,900, which the agent admitted was most likely on the higher end of the market range. After 60 days on the market, the price was lowered to $369,900. On July 30, 2019, Buyer-1 submitted a written offer for $350,000. The offer was accepted by the seller; however, Broker-2 updated the disclosure form on July 30, 2019, to include statements about the Crowned Ridge Wind

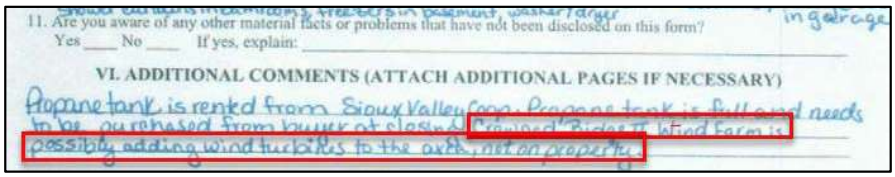
	project. After receiving the updated disclosure statement, the offer was cancelled by Buyer-1. On August 21, 2019, the listing price was reduced to $329,000. After approximately 183 days Buyer-2 submitted an offer with the knowledge of the wind project and wind towers for $275,000. The seller accepted the offer. According to Broker-2 the disclosure of the wind project and wind tower within 2,000 of the property resulted in a $75,000 or 21% difference to the seller (the difference between Buyer-1 before disclosure and Buyer-2 after disclosure). Broker-2 stated as evident with the CD2 transaction and experiences with selling real estate in S.D., residential property values are negatively affected by wind towers. Broker-2 stated wind towers will continue to be an issue for property owners as more and more towers are built. There is a segment of the market that refuses to look at properties near wind towers. Broker-2 recently built a house near Waverly prior to any knowledge of the project and will soon be living in the middle of the Crowned Ridge project. Broker-2 strongly believes their investment of a rural residence will be negatively affected by towers surrounding their home and will result in a segment of the market that will have less interest in the property when it comes time to sell.
Interview Notes with Seller-1:	The seller(s) had a signed purchase agreement for $350,000. After talking with Broker-2, the seller decided to update the disclosure statement to include new information about the wind project and location of a tower southeast of the property. Buyer-1 cancelled the offer after facts of the wind project were disclosed. Broker-2 relisted the property with full disclosure of the wind project and tower location. Buyer-2 knowledgeable of the wind project and towers offered $275,000, which the sellers accepted. Seller-1 stated the proximity of the Crown Ridge Wind Farm reduced the value of the property by $75,000 and is supported by the facts and documents of the transaction.
Additional Interview Notes with Seller-1:	When the original property disclosure form was completed, Seller-1 did not have specific knowledge of the wind tower location in proximity to the property; only a general knowledge of the wind development in the area. The timing of the updated disclosure form was presented when Seller-1 became aware of the location of the tower to the southeast in proximity to the property. They (Seller-1 & Seller-2) thought it was best to notify Buyer-1 of this material change as they believed it was their obligation to inform Buyer-1 of this new information per the South Dakota Disclosure form.
Interview Notes with Seller-2:	The home was built in 2001 and listed for sale in the local paper in 2005 because of a job relocation. The home was purchased in 2005 for approximately $155,000. The basement was not finished at the time of purchase. Starting around 2006 the sellers received two home improvement loans for $50,000 & $50,000, plus savings for the pole shed, basement finish, land purchase, and remodeling. The remodeling was completed a few years ago. The home was in excellent condition. Around 2018 the sellers were approached by a neighbor (Buyer-2) considering a $375,000 offer; however, Buyer-2 did not receive approval for financing.

	The property was listed on the MLS and received a $350,000 offer from Buyer-1. The sellers disclosed the wind development to Buyer-1 and newly discovered location of the turbine and the offer was cancelled. Broker-2 advised to counter a lower price. The sellers countered $300,000 to Buyer-1 and Buyer-1 said they would not be interested at any price because of the proximity of the turbine to the residence. The property was relisted on the MLS. According to Seller-2, Buyer-1 was not interested in the property because of the wind development surrounding the property. After three months the sellers contacted Buyer-2, who had initial interest, and asked what they would be willing to pay for the property. $275,000 was offered and accepted. Seller-2 explained the wind development and location of the tower influenced the selling price of the property by $75,000.
Interview Notes with <u>Buyer-1</u>	Buyer-1 lives in the area and wanted to find an acreage in proximity to Watertown for his family. The property was listed on the MLS for $379,000. Buyer-1 reported the improvements to be in good condition; however, some modification would have to be made to the house for their family. Buyer-1 presented a written offer for $350,000. An updated disclosure was presented to Buyer-1 disclosing the wind development after the offer was made to the sellers. After further discussions and investigation Buyer-1 confirmed a tower was going to be located just southeast of the property. Buyer-1 explained this was the final factor for withdraw of the offer to purchase the property. Buyer-1 stated they had general knowledge that wind towers were going to be built in the area but didn't want to live within 1500+/- feet of a tower. Buyer-1 cancelled the offer and purchased a home in an area that was not in proximity to a wind project.
Interview Notes with <u>Buyer-2</u>	Buyer-2 lived an avenue over, and their family has a dairy farm one mile south of the property; the property was ideally located to work and family. Buyer-2 was friends with Seller-1 and Seller-2 and they offered the property to them for $420,000. The price was beyond what Buyer-2 could afford. The house was listed on MLS and did not sell. The sellers approached Buyer-2 with disclosure of the wind tower and offered the property for $350,000. Buyer-2 presented their max offer they could afford at $275,000 and the offer was accepted. Buyer-2 explained the wind towers were not a factor at the price they paid; however, if the price would have been more, they would have likely negotiated because of the wind tower factor. According to Buyer-2, the appraisal completed for bank financing was appraised at $320,000. The condition of the property was reported to be in good condition at the time of the sale and are satisfied with the purchase.
June 2018 Disclosure Statement:	 Bench in garage, Freezers in basement, Washer/Dryer 11. Are you aware of any other material facts or problems that have not been disclosed on this form? Yes ___ No ___V___ If yes, explain: _____

March 2019 Disclosure Statement:


11. Are you aware of any other material facts or problems that have not been disclosed on this form?
Yes ___ No ✓ If yes, explain: _____

2019 Updated Disclosure Statement:


11. Are you aware of any other material facts or problems that have not been disclosed on this form?
Yes ___ No ___ If yes, explain: _____
VI. ADDITIONAL COMMENTS (ATTACH ADDITIONAL PAGES IF NECESSARY)
Propane tank is rented from Sioux Valley Coop. Propane tank is full and needs to be purchased from buyer at closing. Crowned Ridge II wind farm is possibly adding wind turbines to the area, not on property.

July 2, 2019 $350,000 Offer:


3. PURCHASE PRICE. The total purchase price is to be (S 350,000
THREE HUNDRED FIFTY THOUSAND AND 00/100 DOLLARS
After earnest money herein is credited, the remaining balance is to be paid by Purchaser at closing.

Broker-2 Statement:

To Whom this may concern, 10/7/2019 Outstanding Resul

My name is [redacted] I am a Broker at [redacted] in Watertown, South Dakota. I had the property listed of [redacted] house at [redacted] Waverly, SD 57201.

During this time of the listing we had several showings. We did get an offer together but when the buyers found out about the possibility of future wind turbines they decided not to purchase the property.

I was contacted by an appraiser who was hired by Next Era asking me about the property and what my opinion was about the list price. I told him it had previously been listed for $429,000 and did not sell at that time. The next spring I put the house on the market for $379,900. The offer that was accepted was for $350,000. The appraiser felt the house was priced strong and I said it has a nice shed and the house is in immaculate condition and sits on a little over 2 acres. I also told him that small acreages were in demand in our area which also drives up the price. I also told him the property was worth what someone was willing to pay for it. And since we did have an offer at $350,000 that is what that buyer thought the property was worth.

The sellers now have accepted an offer of $275,000 so they can move on. The sellers had to take a huge hit on this property due to the concern of the wind turbines.

Buyer-1 Statement:

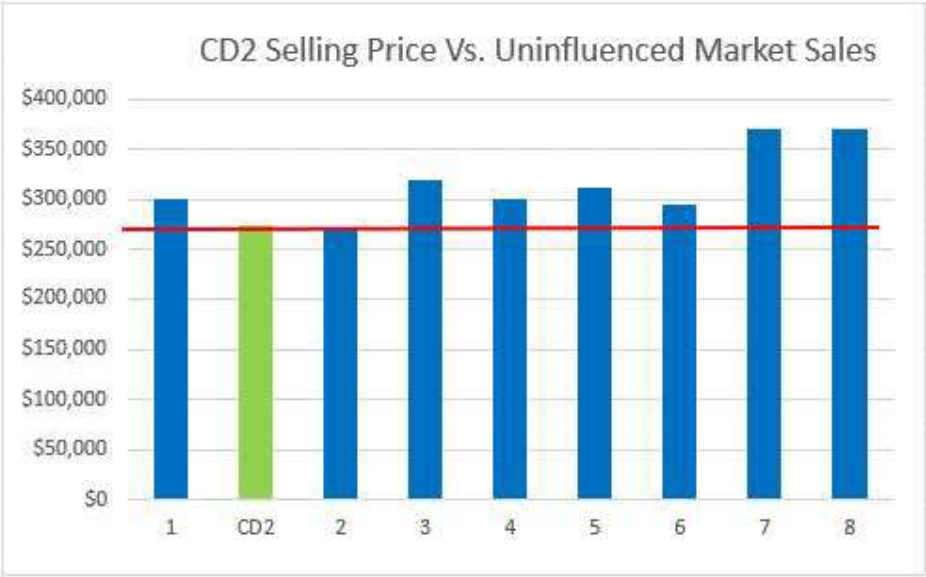
October 8, 2019

To Whom It May Concern,

RE: [redacted] **Waverly, SD Property**

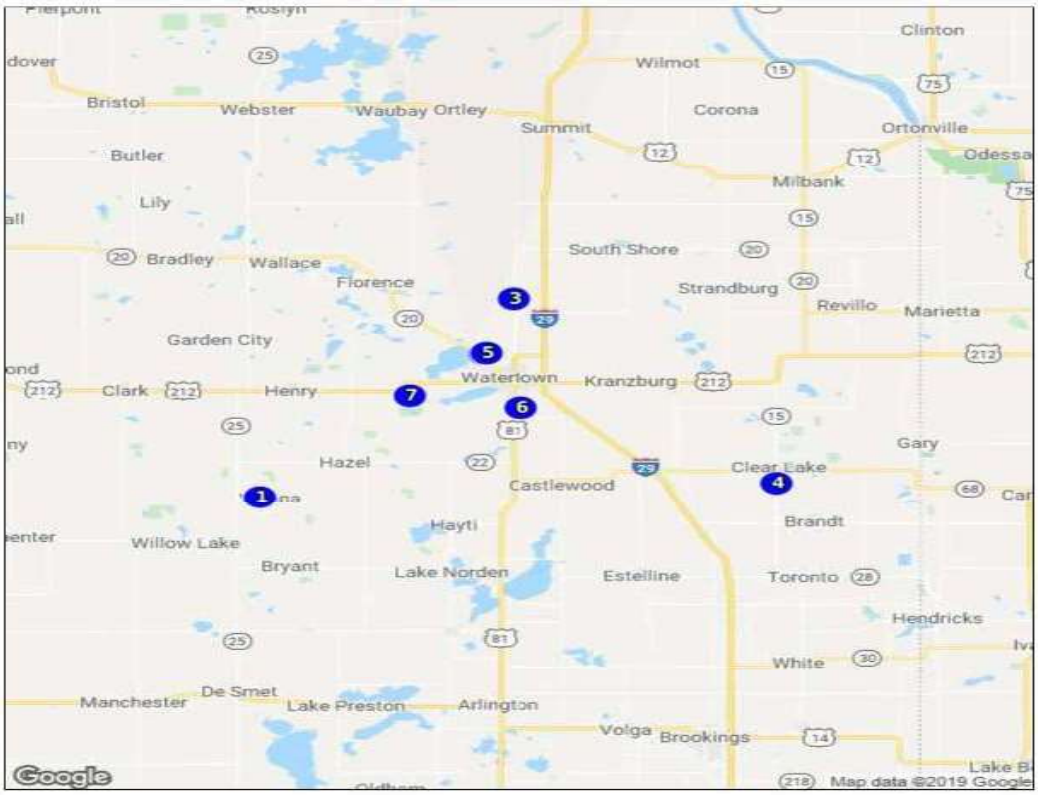
On July 2nd, 2019 my wife [redacted] and I entered an agreement to purchase the above mentioned property for $350,000. In the preceding to finalize documentation it was disclosed that the Crown Ridged II Windfarm was going to have a tower in the proximity of the [redacted] home. The decision was then made to not purchase the home in proximity to the Crown Ridge II Windfarm in the Wavery area and proximity of the [redacted] property due to the windfarm and signed purchase cancellation was sent on July 9th ending the purchase of the property by us.

Market Sales Analysis:



Sales Analysis CD2									
Sale No.	Location	Sale Date	Price	Year/E.A.	GLA	Acres	Style	Outbuildings	Overall Analysis
CD2	Waverly	2019	$275,000	2001	1,570	2.6	Split	Pole Building	
1	Watertown	2019	$300,000	1976/upd	1,106	3.21	Split	Pole Bld	Comparable
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Similar(=)*	
2	Watertown	2018	$270,000	2005	1,920	5	Ranch	None	Comparable
		Adjustments:		*Similar(=)*	*Superior(-)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
3	Vienna	2019	$275,000	1980	1,400	8.16	Ranch	None	Inferior
		Adjustments:		*Inferior(+)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
4	Watertown	2019	$319,000	1974/upd	1,476	9.46	Ranch	Pole Blds	Superior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Superior(-)*	
5	Clear Lake	2019	$301,000	1952/upd	1,556	8.9	Ranch	Pole Blds	Comparable
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	
6	Watertown	2019	$312,500	1970	1,352	5.63	Ranch	Sheds	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Superior(-)*	*Similar (=)*	*Inferior(+)*	
7	Watertown	2019	$295,000	1976	1,440	1.88	Ranch	None	Inferior
		Adjustments:		*Similar(=)*	*Inferior(+)*	*Similar(=)*	*Similar (=)*	*Inferior(+)*	
8	Watertown	2019	$370,000	2000	1,556	12.01	Ranch	Pole Blds	Superior
		Adjustments:		*Similar(=)*	*Similar(=)*	*Superior(-)*	*Similar (=)*	*Similar(=)*	

Sale Location Map:



Legend	
1. 18509 435TH AVENUE, Vienna, SD 57271(20-8178)	5. 2217 STADHEIM DRIVE, Watertown, SD 57201(42-9)
2. 2502 STADHEIM DRIVE, Watertown, SD 57201(24-6016)	6. 45581 175TH STREET, Watertown, SD 57201(98-91)
3. 16276 455TH AVENUE, Watertown, SD 57201(28-1048)	7. 17375 447TH AVENUE, Watertown, SD 57201(24-6249)
4. 18215 SD 15 HIGHWAY, Clear Lake, SD 57226(24-6243)	

Market Sales Analysis Conclusion:	Eight sales are from the market without the influence of a wind tower, project or turbine. All transactions have similar highest and best use as a rural acreage and located within the market area. Sales one, two, and five have stronger similarities to CD2. Sales two, five and six are inferior sales. Sale three has slightly superior site size and outbuildings. The market evidence suggests the bracketed market range for CD2 should fall within $270,000 to $370,000 as demonstrated by the uninfluenced market sale transactions. The selling price at $275,000 is at the low end of the market range suggesting there could be an influence on the selling price of CD2 as a result of the wind project, the proximity of the wind tower near the property and/or disclosure of the wind project. A review of the sales data suggests there is some type of negative influence or motivating factor for the sale transaction for CD2 resulting in a sale price that is on the lower end of the market range.

Overall Conclusion:	The details of the transaction suggest the purchase price was influenced by the disclosure of the location of the wind turbine within

	the proximity to the residence. Buyer-1 submitted a written offer that was accepted by the seller for $350,000 with general knowledge of wind development, but not the specific tower location southeast of the property. The offer was cancelled by Buyer-1 when Seller-1 disclosed new information about the material facts of the location of the wind turbine southeast of the property per the project location map. Buyer-2 submitted a written offer for $275,000, with knowledge and consideration given about the material facts of the wind turbine location southeast of the residence. Verification of the sale details confirmed an arm's length transaction with both the buyer and seller acting prudently, knowledgeably and for self-interest, with the transaction managed by a real estate agent. The difference between Buyer-1 uninfluenced offer and Buyer-2 influenced offer is $75,000 or 21% of the original offer/price. The transaction details show factors that suggest a negative influence on the selling price due to the disclosure of a wind project and proximity of a wind turbine. Although the evidence leads to support a change in price due to the wind tower influence, it is my overall opinion that liberally applying the results of one sale to all rural residences in proximity to a wind turbine, tower, or development in South Dakota would not have consistent or credible results. Any rural residence that shows some type of factors that might have negatively influenced the selling price, should be analyzed on a case-by-case basis with a consistent scope of work for the analysis. Nevertheless, the results of the CD2 sales analysis shows there is a segment of the market that is sensitive to living within the proximity of wind tower or turbine and there could be a situation that could influence the selling price of a rural residence located in close proximity to a wind tower or within a developing wind project.

DAL_ExhibitHB

DAL Appraisal &Land Services
4820 E. 57th Street Sioux Falls, SD 57108
david@dalappraisal.com

01/08/2020

RE: Docket EL19-027 Crowned Ridge Wind II, LLC

Mr. David Lawrence:

We have noted you have provided testimony and exhibits on behalf of the staff of the SD PUC located on Docket EL19-027 Crowned Ridge Wind II, LLC to be sited in Grant, Codington and Deuel counties. You have provided information on five homes in Deuel County as DE1, DE2, DE3, DE4 and DE5. As sellers, we have a different recollection than some of the Broker/Brokers.

Could these Comments from the Sellers additions/corrections be added as an addendum to your exhibit?

Our previous home is identified as DE1. In 2008 we built a new home with many conveniences and excesses. We planned to leave "Meadow Creek Valley" when our life ended, so we spent money others may not have chosen to spend. Deuel Harvest Wind Farm, by Invenergy submitted an application to build a wind project in Deuel County. They initially submitted three different project layouts. On these layouts, a wind turbine could be sited roughly one half to three fourths of a mile from our home. We decided we would not and could not live in a wind farm.
Later a fourth, and yet a different project layout was then submitted in the SD PUC Docket EL18-053 Deuel Harvest Wind, LLC. This fourth project layout has a wind turbine about 1.5 miles from our home. This is also too close to our home and we moved. We knew a loss would be realized when we forced our property on the market. We didn't know how much we would lose at the time, but in the final analysis, we lost roughly $250k on a 30 acre parcel.
I've been told we received a very good price for our property. We believe the buyer should be as pleased as we were at a higher price. We also experienced the socio-economic effect the community had suffered since "Big Wind" arrived. We did not want to wait and endure what some of the sellers living among the turbines near Brookings and Toronto.

Exhibit DAL_2
Transaction Reference DE1

Page 44 "Interview Notes with Broker: The agent has listed a number of properties in the immediate neighborhood and the wind project was not a reason they were selling...The agent stated the property took about 6 months to sell which is typical of property in this price range at the higher end of the market."

Our corrections to the above "Interview Notes with Broker":
The wind project was the only reason why we sold our home, DE1. At public meetings in Deuel County, as well as in other counties SD PUC wind energy dockets, we spoke against wind turbines being sited too close to wind non-participants homes.

See SD PUC Docket EL18-053 Deuel Harvest Wind, LLC for our speeches:

https://puc.sd.gov/commission/dockets/electric/2018/el18-053/holborn3.pdf

https://puc.sd.gov/commission/dockets/electric/2018/el18-053/holborn4.pdf

Fall of 2017 we placed a For Sale by Owner sign on our property and called prospective buyers who had stated they would be interested in purchasing our home. We had many people who seemed interested although many also asked about the wind turbines. We doubt that they were asking because they wanted to purchase a home in or near a wind farm. We believe we conveyed that thought to you.
03/01/2018 we listed our property for sale with a Brokerage Firm & we closed on the sale of our home 02/2019. By our count, our home was on the market in excess of 15 months.

Exhibit DAL_2
Transaction Reference DE4
Page 62 "Interview Notes with Broker: The property was listed for sale because the owner was being relocated to Minnesota. The wind project was not a concern or a motivating factor to sell the property."

Please see Docket EL18-053 Deuel Harvest Wind, LLC
Section Public Input Meeting dated 01/24/2019
Comments of Dr. Jeff Collins, DVM has submitted a letter why he & his family have moved out of Deuel County. His comments are in direct conflict with the above "Interview Notes with Broker".

https://puc.sd.gov/commission/dockets/electric/2018/el18-053/collins.pdf

Exhibit DAL_2
Transaction Reference DE5

There are no DE5 "Interview Notes with Seller". We recall visiting with these sellers then and more recently. If you were to interview them, we believe the turbines were a primary reason, if not the only reason, they sold their property.

Thank You.

Sincerely,

[redacted]

Cc. Arvid J. Swanson, PC
27452 482nd Ave. Canton, SD 57013
605-743-2070 aj@ajswanson.com

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	)	**CERTIFICATE OF SERVICE**
	)	**EL19-027**

I hereby certify that true and correct copies of the following:

- Staff's Witness and Exhibit Lists
- Exhibit S1
- Exhibit S2
- Exhibit S3
- Exhibit S4
- Exhibit S5
- Exhibit S6

and Certificate of Service were served electronically on the 29th day of January 2020, addressed to those parties listed on the service list.

Exhibit S1 (Confidential) was serviced electronically to the following on the 29th day of January 2020:

Mr. Miles Schumacher – representing Crowned Ridge Wind, LLC
Lynn, Jackson, Shultz and Lebrun, PC
101 N. Minnesota Ave., Ste. 400
Sioux Falls, SD 57104
mschumacher@lynnjackson.com

Mr. Brian J. Murphy
Managing Attorney
NextEra Energy Resources, LLC
700 Universe Blvd.
Juno Beach, FL 33408
Brian.J.Murphy@nee.com
(561) 694-3814 - voice

Kristen N. Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501
Phone (605)773-3201
Kristen.edwards@state.sd.us

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN GRANT, CODINGTON AND DEUEL COUNTIES	)))))	**EL19-027** **AMBER CHRISTENSON'S** **EXHIBIT LIST**

Amber Christenson hereby submits my Exhibit List in preparation for the evidentiary hearing in the above-captioned docket.

I intend to offer the following exhibits. I reserve the right to introduce additional exhibits necessary to rebut evidence presented by any other party in this docket or for impeachment and other legally permissible purposes. All of my exhibits are or will be available electronically in the docket.

Exhibit #	Description
AC-1	A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin
AC-2	McPherson 6 18 May
AC-3	Riina_Bray_IWT_Niagara
AC-4	Applicant's Responses to Amber Christenson's DR
AC-5	Applicant's Responses to Staff's 3rd Set
AC-6	Attachment 1 to Staff DR 3-2
AC-7	Attachment 1 to Staff DR 3-8
AC-8	Applicant's Supplemental Responses to Staff's Second Set of DR
AC-9	Applicant's Responses to Intervenors' Second Set of DR (4)
AC-10	MN-buyout-20186-143575-01
AC-11	Attachment 1 to Intervenor 2-2
AC-12	Attachment 1 to Intervenors 2-10
AC-13	Attachment 1 to Intervenors 2-16
AC-14	Attachment 1 to Intervenor 1-1 Applicant's Responses to Staff's First Set of DR
AC-15	Attachment 1 to Intervenor 1-4 Part 1

Dated this 29th day of January 2020.

/s/ Amber Christenson

Amber Christenson
16217 466th Ave
Strandburg, SD 57265
605-756-4119

EXHIBIT 2
2535-CE-100
1/17/2013 (aff)

Exhibit AC-1
PSC REF#:178263

Public Service Commission of Wisconsin
RECEIVED: 12/28/12, 1:09:50 PM

Report Number 122412-1
Issued: December 24, 2012
Revised:

A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin



Prepared Cooperatively By:

Channel Islands Acoustics, Camarillo, CA
Principal: Dr. Bruce Walker

Hessler Associates, Inc., Haymarket, VA
Principals: George F. and David M. Hessler

Rand Acoustics, Brunswick, ME
Principal: Robert Rand

Schomer and Associates, Inc., Champaign, IL
Principal: Dr. Paul Schomer

1.0_Introduction

Clean Wisconsin is a nonprofit environmental advocacy organization that works to protect Wisconsin's air and water and to promote clean energy. As such, the organization is generally supportive of wind projects. Clean Wisconsin was retained by the Wisconsin Public Service Commission (PSC) to provide an independent review of a proposed wind farm called the Highlands Project to be located in St. Croix County, WI (WI PSC Docket 2535-CE-100). Clean Wisconsin in turn retained Hessler Associates, Inc. (HAI) to provide technical assistance.

During the course of the hearings, attorneys representing groups opposed to the Highlands project, presented witnesses that lived near or within the Shirley Wind project in Brown County, WI. The Shirley wind project is made up of eight Nordex100 wind turbines that is one of the turbine models being considered for the Highlands projects. These witnesses testified that they and their children have suffered severe adverse health effects to the point that they have abandoned their homes at Shirley. They attribute their problems to arrival of the wind turbines. David Hessler, while testifying for Clean Wisconsin, suggested a sound measurement survey be made at the Shirley project to investigate low frequency noise (LFN) and infrasound (0-20 Hz) in particular.

Partial funding was authorized by the PSC to conduct a survey at Shirley and permission for home entry was granted by the three homeowners. The proposed test plan called for the wind farm owner, Duke Power, to cooperate fully in supplying operational data and by turning off the units for short intervals so the true ON/OFF impact of turbine emissions could be documented. Duke Power declined this request due to the cost burden of lost generation, and the homeowners withdrew their permission at the last moment because no invited experts on their behalf were available to attend the survey.

Clean Wisconsin, their consultants and attorneys for other groups all cooperated and persisted and the survey was rescheduled for December 4 thru 7, 2012. Four acoustical consulting firms would cooperate and jointly conduct and/or observe the survey. Channel Islands Acoustics (ChIA) has derived modest income while Hessler Associates has derived significant income from wind turbine development projects. Rand Acoustics is almost exclusively retained by opponents of wind projects. Schomer and Associates have worked about equally for both proponents and opponents of wind turbine projects. However, all of the firms are pro-wind if proper siting limits for noise are considered in the project design.

The measurement survey was conducted on schedule and this report is organized to include four Appendices A thru D where each firm submitted on their own letterhead a report summarizing their findings. Based on this body of work, a consensus is formed where possible to report or opine on the following:

- Measured LFN and infrasound documentation
- Observations of the five investigators on the perception of LFN and infrasound both outside and inside the three residences.
- Observations of the five investigators on any health effects suffered during and after the 3 to 4 day exposure.
- Recommendations with two choices to the PSC for the proposed Highlands project
- Recommendations to the PSC for the existing Shirley project

2.0_Testing Objectives

Bruce Walker employed a custom designed multi-channel data acquisition system to measure sound pressure in the time domain at a sampling rate of 24,000/second where all is collected under the same clock. The system is calibrated accurate from 0.1 Hz thru 10,000 Hz. At each residence, channels were cabled to an outside wind-speed anemometer and a microphone mounted on a ground plane covered with a 3 inch hemispherical wind screen that in turn was covered with an 18 inch diameter and 2 inch thick foam hemispherical dome (foam dome). Other channels inside each residence were in various rooms including basements, living or great rooms, office/study, kitchens and bedrooms. The objective of this set-up was to gather sufficient data for applying advanced signal processing techniques. See Appendix A for a Summary of this testing.

George and David Hessler employed four off-the-shelf type 1 precision sound level meter/frequency analyzers with a rated accuracy of +/- 1 dB from 5 Hz to 10,000 Hz. Two of the meters were used as continuous monitors to record statistical metrics for every 10 minute interval over the 3 day period. One location on property with permission was relatively close (200m) to a wind turbine but remote from the local road network to serve as an indicator of wind turbine load, ON/OFF times and a crude measure of high elevation wind speed. See cover photo. This was to compensate for lack of Duke Power's cooperation. The other logging meter was employed at residence R2, the residence with the closest turbines. The other two meters were used to simultaneously measure outside and inside each residence for a late night and early morning period to assess the spectral data. See Appendix B for a Summary of this testing.

Robert Rand observed measurements and documented neighbor reports and unusual negative health effects including nausea, dizziness and headache. He used a highly accurate seismometer to detect infrasonic pressure modulations from wind turbine to residence. See Appendix C for Rob's Summary.

Paul Schomer used a frequency spectrum analyzer as an oscilloscope wired into Bruce's system to detect in real time any interesting occurrences. Paul mainly circulated around observing results and questioning and suggesting measurement points and techniques. See Appendix D for Paul's Summary.

Measurements were made at three unoccupied residences labeled R1, R2 and R3 on Figure 2.1. The figure shows only the five closest wind turbines and other measurement locations. All in all, the investigators worked very well together and there is no question or dispute whatsoever about measurement systems or technique and competencies of personnel. Of course, conclusions from the data could differ. Mr. M. Hankard, acoustical consultant for the Highland and Shirley projects, accompanied, assisted and observed the investigators on Wednesday, 12/5.



Figure 2.1: *Aerial view showing sound survey locations*

The four firms wish to thank and acknowledge the extraordinary cooperation given to us by the residence owners and various attorneys.

3.0_Investgator Observations

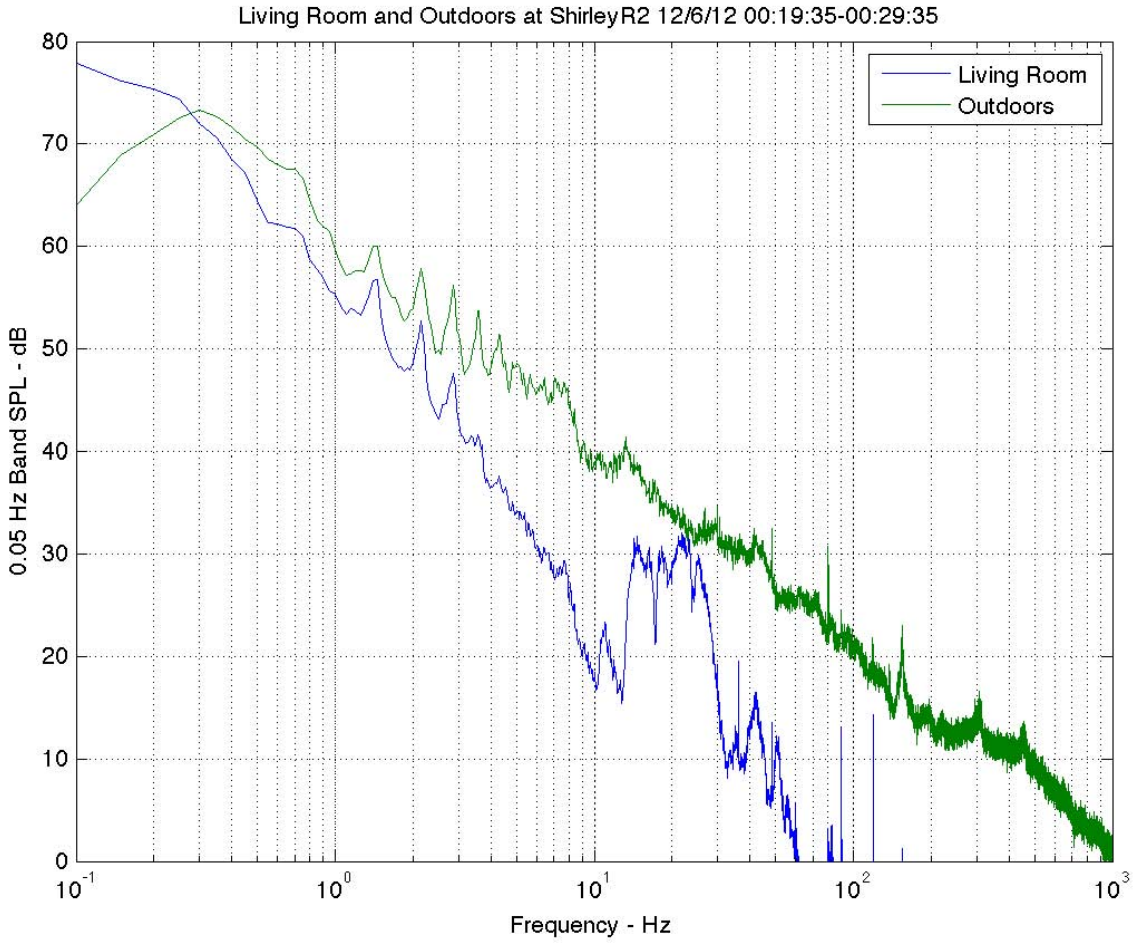
Observations from the five investigators are tabulated below: It should be noted the investigators had a relatively brief exposure compared to 24/7 occupation.

AUDIBILITY OUTSIDE RESIDENCES	
	Observations
Bruce Walker	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
George Hessler	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
David Hessler	Could detect wind turbine noise at R1, easily at R2, but not at all at R3
Robert Rand	Could detect wind turbine noise at all residences
Paul Schomer	Not sure at R1 but could detect wind turbine noise at R2, not at all at R3
AUDIBILITY INSIDE RESIDENCES	
	Observations
Bruce Walker	Could not detect wind turbine noise inside any home
George Hessler	Could not detect wind turbine noise inside any home
David Hessler	Could faintly detect wind turbine noise in residence R2
Robert Rand	Could detect wind turbine noise inside all three homes
Paul Schomer	Could not detect wind turbine noise inside any home
EXPERIENCED HEALTH EFFECTS	
	Observations
Bruce Walker	No effects during or after testing
George Hessler	No effects during or after testing
David Hessler	No effects during or after testing
Robert Rand	Reported ill effects (headache and/or nausea while testing and severe effects for 3+ days after testing
Paul Schomer	No effects during or after testing

4.0_Conclusions

This cooperative effort has made a good start in quantifying low frequency and infrasound from wind turbines.

Unequivocal measurements at the closest residence R2 are detailed herein showing that wind turbine noise is present outside and inside the residence. Any mechanical device has a unique frequency spectrum, and a wind turbine is simply a very very large fan and the blade passing frequency is easily calculated by RPM/60 x the number of blades, and for this case; 14 RPM/60 x 3 = 0.7 Hz. The next six harmonics are 1.4, 2.1, 2.8, 3.5, 4.2 & 4.9 Hz and are clearly evident on the attached graph below. Note also there is higher infrasound and LFN inside the residence in the range of 15 to 30 Hz that is attributable to the natural flexibility of typical home construction walls. This higher frequency reduces in the basement where the propagation path is through the walls plus floor construction but the tones do not reduce appreciably.



Measurements at the other residences R1 and R3 do not show this same result because the increased distance reduced periodic turbine noise closer to the background and/or turbine loads at the time of these measurements resulted in reduced acoustical emission. Future testing should be sufficiently extensive to cover overlapping turbine conditions to determine the decay rate with distance for this ultra low frequency range, or the magnitude of measurable wind turbine noise with distance.

The critical questions are what physical effects do these low frequencies have on residents and what LFN limits, if any, should be imposed on wind turbine projects. The reported response at residence R2 by the wife and their child was extremely adverse while the husband suffered no ill effects whatsoever, illustrating the complexity of the issue. The family moved far away for a solution.

A most interesting study in 1986 by the Navy reveals that physical vibration of pilots in flight simulators induced motion sickness when the vibration frequency was in the range of 0.05 to 0.9 Hz with the maximum (worst) effect being at about 0.2 Hz, not too far from the blade passing frequency of future large wind turbines. If one makes the leap from physical vibration of the body to physical vibration of the media the body is in, it suggests adverse response to wind turbines is an acceleration or vibration problem in the very low frequency region.

The four investigating firms are of the opinion that enough evidence and hypotheses have been given herein to classify LFN and infrasound as a serious issue, possibly affecting the future of the industry. It should be addressed beyond the present practice of showing that wind turbine levels are magnitudes below the threshold of hearing at low frequencies.

5.0_Recommendations

5.1_General

We recommend additional study on an urgent priority basis, specifically:

- A comprehensive literature search far beyond the search performed here under time constraints.
- A retest at Shirley to determine the decay rate of ultra low frequency wind turbine sound with distance with a more portable system for measuring nearly simultaneously at the three homes and at other locations.
- A Threshold of Perception test with participating and non-participating Shirley residents.

5.2_For the Highlands Project

ChIA and Rand do not have detail knowledge of the Highland project and refrain from specific recommendations. They agree in principle to the conclusions offered herein in Section 4.0.

Hessler Associates has summarized their experience with wind turbines to date in a peer-reviewed Journal[1] and have concluded that adverse impact is minimized if a design goal of 40 dBA (long term average) is maintained at all residences, at least at all non-participating residences. To the best of their knowledge, essentially no annoyance complaints and certainly no severe health effect complaints, as reported at Shirley, have been made known to them for *all* projects designed to this goal.

[1] Hessler G., & David, M., "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", Noise Control Engineering Journal, 59(1), Jan-Feb 2011

Schomer and Associates, using an entirely different approach have concluded that a design goal of 39 dBA is adequate to minimize impact, at least for an audible noise impact. In fact, a co-authored paper[2] is planned for an upcoming technical conference in Montreal, Canada.

Although there is no explicit limit for LFN and infrasound in these A-weighted sound levels above, the spectral shape of wind turbines is known and the C-A level difference will be well below the normally accepted difference of 15 to 20 dB. It may come to be that this metric is not adequate for wind turbine work but will be used for the time being.

Based on the above, Hessler Associates recommends approval of the application if the following Noise condition is placed on approval:

> With the Hessler recommendation, the long-term-average (2 week sample) design goal for sound emissions attributable to the array of wind turbines, exclusive of the background ambient, at all non-participating residences shall be 39.5 dBA or less.

Schomer and Associates recommends that the additional testing listed in 5.3 be done at Shirley on a very expedited basis with required support by Duke Energy prior to making a decision on the Highlands project. It is essential to know whether or not some individuals can perceive the wind turbine operation at R1 or R3. With proper resources and support, these studies could be completed by late February or early March. If a decision cannot be postponed, then Schomer and Associates recommends a criterion level of 33.5 dB. The Navy's prediction of the nauseogenic region (Schomer Figure 6 herein) indicates a 6 dB decrease in the criterion level for a doubling of power such as from 1.25 MW to 2.5 MW.

> With the Schomer recommendation, and in the presence of a forced decision, the long-term-average (2 week sample) design goal for sound emissions attributable to the array of wind turbines, exclusive of the background ambient, at all non-participating residences shall be 33.5 dBA or less.

There is one qualifier to this recommendation. The Shirley project is unique to the experience of the two firms in that the Nordex100 turbines are very high rated units (2.5 MW) essentially not included in our past experiences. HAI has completed just one project, ironically named the Highlands project in another state that uses both Nordex 90 and Nordex 100 units in two phases. There is a densely occupied Town located 1700 feet from the closest Nordex 100 turbine. The president and managers of the wind turbine company report “no noise issues at the site”.

Imposing a noise limit of less than 45 dBA will increase the buffer distances from turbines to houses or reduce the number of turbines so that the Highlands project will *not* be an exact duplication of the Shirley project. For example, the measured noise level at R2 is approximately 10 dBA higher than the recommendation resulting in a subjective response to audible outside noise as twice as loud. Measured levels at R1 and R3 would comply with the recommendation.

We understand that the recommended goal is lower than the limit of 45 dBA now legislated, and may make the project economically unviable. In this specific case, it seems justified to the two firms to be conservative (one more than the other) to avoid a duplicate project to Shirley at Highlands because there is no technical reason to believe the community response would be different.

[2] Schomer, P. & Hessler, G., “Criteria for wind-turbine noise immissions”, ICA, Montreal, Canada 2013

5.3_For the Shirley Project

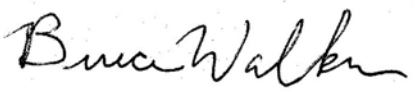
The completed testing was extremely helpful and a good start to uncover the cause of such severe adverse impact reported at this site. The issue is complex and relatively new. Such reported adverse response is sparse or non-existent in the peer-reviewed literature. At least one accepted paper at a technical conference[3] has been presented. There are also self-published reports on the internet along with much erroneous data based on outdated early wind turbine experience.

A serious literature search and review is needed and is strongly recommended. Paul Schomer, in the brief amount of time for this project analysis, has uncovered some research that *may* provide a probable cause or direction to study for the reported adverse health effects. We could be close to identifying a documented cause for the reported complaints but it involves much more serious impartial effort.

An important finding on this survey was that the cooperation of the wind farm operator is absolutely essential. Wind turbines must be measured both ON and OFF on request to obtain data under nearly identical wind and power conditions to quantify the wind turbine impact which could not be done due to Duke Power's lack of cooperation.

We strongly recommend additional testing at Shirley. The multi-channel simultaneous data acquisition system is normally deployed within a mini-van and can be used to measure immissions at the three residences under the identical or near identical wind and power conditions. In addition, seismic accelerometer and dedicated ear-simulating microphones can be easily accommodated. And, ON/OFF measurements require the cooperation of the operator.

Since the problem may be devoid of audible noise, we also recommend a test as described by Schomer in Appendix D to develop a "Threshold of Perception" for wind turbine emissions.



Bruce Walker



George F. Hessler Jr.



David M. Hessler



Robert Rand



Paul Schomer

[3] Ambrose, S. E., Rand, R. W., Krogh, C. M., "Falmouth, Massachusetts wind turbine infrasound and low frequency noise measurements", Proceedings of Inter-Noise 2012, New York, NY, August 19-22.

APPENDIX A
by
CHANNEL ISLANDS ACOUSTICS

Channel Islands Acoustics
676 West Highland Drive
Camarillo, CA 93010
805-484-8000 FAX 805-482-5075
bwalker@channelislandsacoustics.com

Low Frequency Acoustic Measurements at Shirley Wind Park

Bruce Walker, Ph.D., INCE Bd. Cert.

OVERVIEW

Bruce Walker of Channel Islands Acoustics (ChIA) was requested by Hessler Associates to assist in defining low and infrasonic frequency (approximately 0.5 – 100 Hz) sounds at abandoned residences in the environs of Shirley Wind Park near DePere, WI. ChIA has been developing a measurement system that combines extended range microphones and recording equipment with mixed time domain and frequency domain signal processing in an effort to quantify sound levels and waveform properties of very low frequency periodic signals radiated by large wind turbines[i] .

The Shirley Wind park consists of eight Nordex turbines with 85 meter hub height and 100 meter rotor diameter. These turbines are distributed over an approximately six square mile area in Brown County, WI as shown in Figure 1. The turbines are of similar in size to those investigated in Ref. 1.



Figure 1. Environs of Shirley Wind Park, Showing Eight Turbines and Three Abandoned Residences Investigated in the Program

The tests included acoustic measurement at multiple locations inside and outside three abandoned residences, at nominal distances and bearings from the three turbines as shown in Table **1**, and will be described in greater detail in a subsequent section. Test methodology and schedule were constrained to a testing period December 4-7 and inability to park the turbines to establish a reliable background noise baseline.

Table 1. Distances in feet and Bearing in degrees East of North from Turbines to Tested Residences

Receiver	R1		R2		R3	
Source	Distance	Bearing	Distance	Bearing	Distance	Bearing
WTG1	18300	74	15400	53	12250	31
WTG2	18050	78	14800	57	11300	34
WTG3	6270	82	5290	11	8140	322
WTG4	5070	63	6650	353	10330	319
WTG5	3990	93	4330	343	9020	307
WTG6	3303	72	5810	338	10470	309
WTG7	4870	141	2280	286	8360	282
WTG8	5540	127	1280	322	7110	288

ChIA measurements were conducted at residence R1 (Fairview) on the evening of December 4 and the early afternoon of December 5. Measurements were conducted at residence R2 (Glenmore) during late evening and late night December 5/early morning December 6 and mid-afternoon December 6. Measurements were conducted at residence R3 (Schmidt) during late afternoon December 6 and mid-morning December 7. Times of tests are mean wind speeds are shown in Table **3**.

TERMINOLOGY

It is assumed the reader is familiar with commonly encountered acoustical terms and units such as decibel (dB), sound level, sound pressure level, sound power level, spectrum, frequency, hertz (Hz), etc. The following is a brief glossary of terms and units that lay-persons may not be familiar with, but which will be used to describe some of the data analyses in this program.

pascals (Pa) – the standard unit of pressure. The reference sound pressure is 20 microPa. Atmospheric pressure is just over 100,000 Pa. An acoustic signal of 1 Pa rms amplitude has a sound pressure level of 94 dB.

correlation function (CC(τ)) – a time-domain description of the commonality between two signals as a function of the time delay between them. The unit is Pa-squared. The correlation function for a signal and itself is the auto-correlation, and the rms amplitude of the signal is the square-root of the auto-correlation at zero delay. The correlation function between separate signals is the cross-correlation. The peak delay of the cross-correlation time the speed of propagation shows the difference in path length between the two signals if they result from a common

source. The **correlation coefficient** is the cross-correlation function divided by the product of the square roots of the auto-correlation at zero delay.

power spectral density function (PSD) – the average of the squared-magnitude of the frequency spectrum of a time-varying signal, divided by the nominal bandwidth (BW in Hz) of the spectral analysis. The unit is Pa-squared per Hz. Narrow band sound pressure levels in this report are computed in dB as 10 log(PSD x BW) + 94.

cross-PSD – the frequency-by-frequency average of the products of the spectra from two signals.

coherence function - a frequency-domain description of the relative commonality between two signals. It is determined as the frequency-by-frequency ratio of the cross-PSD to the product of the square roots of the two PSD's. If a spectral component in two signals results from a common source, the coherence is unity (1) and if the spectral component results from two statistically independent sources, the coherence is zero.

spectrograph – a display of amplitude as color or brightness vs frequency and time.

MEASUREMENT SYSTEM and DATA ACQUISITION

A basic list of the components in the measurement system are shown in Table **2**. Serial numbers and calibration certifications are available on request.

Table 2. Basic Components of ChIA Low-Frequency Acoustic Data Acquisition System

Item	Type	Number
Portable Acoustic Analyzer	B&K 2250	2
Low Frequency Microphone	B&K 4193	6
Microphone Preamp	B&K 2639	4
Signal Conditioning Amp	B&K NEXUS 2690-OS4	1
24 Bit Simultaneous ADC	DT9826-16	1
Laptop Computer	Acer	1
Calibrator	B&K 4231	1
Anemometer	NRG Cup & Resolver	1

As deployed in this program, the 4193 microphones with low-frequency extensions, 2639 preamplifiers and NEXUS signal conditioner were placed in three or four rooms of the residences, while a fifth 4193 and a 2250 analyzer was placed in a standard 3-1/2 inch hemisphere wind ball under an 18 inch foam secondary wind screen on a ground board approximately 50 ft from the residence in the direction of wind turbines. The sixth 4193 and second 2250 were held in reserve and ultimately deployed at R3 on December 7. Full system throughput calibration was run for all channels each day and after each equipment relocation.

Measurement data was collected with simultaneous in 10-minute blocks at sampling rate 24 kHz as shown in the Test Log, Table **3**. The signal conditioning amplifiers were set for range 0.1 Hz to 10 kHz. Amplifier sensitivities were set to allow sound pressures up to 10 Pa (114 dB) to be accepted without system overload. The output of the NRG cup anemometer/resolver was recorded on a seventh channel of the

recording system. Acoustic signals, wind speed signals, set-up conditions and microphone location descriptions were stored in Matlab mat files and portions of the recorded signal were displayed for signal quality examination.

Table 3. Summary Test Log

Channel	1	2	3	4	5	6	7	Date	Start Time
Location R1	Study Desk	MBR Bedhead	Kitchen Counter	Outside Wall	Outside Ground Board	No Signal	Wind		
04T182504							2.3	12/4/12	20:25:04
04T184332							2.2	12/4/12	20:43:32
04T191533							3.2	12/4/12	21:15:33
04T192808							2.8	12/4/12	21:28:08
05T102032							1.2	12/5/12	12:20:32
05T110121							1.4	12/5/12	13:10:21
05T112110							1.5	12/5/12	13:21:10
Location R2	Living Room	Upstairs BR	Behind Kitchen	Basement	Outside Ground Board	No Signal	Wind		
05T204657								12/5/12	22:46:57
05T212420								12/5/12	23:24:20
05T213611							2.3	12/5/12	23:36:11
05T221935							3.0	12/6/12	0:19:35
05T231754							3.2	12/6/12	1:17:54
06T001413							3.3	12/6/12	2:14:13
06T120621							2.1	12/6/12	14:06:21
06T122547							1.7	12/6/12	14:25:47
Location R3	Family Room	Upstairs BR	Living Room	Basement	Outside Ground Board	No Signal	Wind		
06T135713							2.8	12/6/12	15:57:13
06T142857							2.4	12/6/12	16:28:57
Location R3	Family Room	Upstairs BR	Living Room	No Signal	Outside Ground Board	Isotron 86 on K Island	Wind		
07T092024							1.1	12/7/12	11:20:24
Location R3	Family Room	Upstairs BR	No Signal	Basement	Outside Ground Board	Living Room 2250	Wind		
07T094616							0.9	12/7/12	11:46:16
07T100232							1.1	12/7/12	12:02:32
	Note Blue = Chevy SUV Front Seat								
	Note Red = Problem Data								
	Note Gray = Channel Not Used								

DATA ANALYSIS

For each ten-minute data block, the following computed values were obtained and stored:

1. For each data channel, the time history of the signal, phaseless band pass filtered from 0.5 to 100 Hz, the time histories of Leq100ms for A, C, Z, G and 0.5-100 Hz bandpass filtering.
2. For each data channel, the 0.1 Hz narrow band and one-third octave frequency spectra covering the range 0.5 to 1,000 Hz, and the coherence function between the outdoor microphone and each indoor microphone.
3. For each data channel, the auto-correlation function and the cross correlation function from the outdoor microphone to each indoor microphone for the delay range -10 to +10 seconds.

It was observed in the time history plots that “high intensity” regions in the indoor and outdoor microphone channels were not necessarily aligned in time, possibly indicating that indoor noise sometimes resulted from sources other than those affecting the outdoor microphone. To study this in additional detail, each 10-minute data block was analyzed in 20-second sub-blocks for narrow-band frequency spectrum, cross-spectrum with the outdoor microphone and coherence with the outdoor microphone.

Following this, the spectrum with the most distinct representation of turbine blade passage pulsation was identified. From the Blade Passage harmonic series noted for this spectrum, waveforms were synthesized assuming two sets of phase relationships. In the first, the harmonics were arranged as sine waves with zero phase. In the second, they were arranged as cosine waves with zero phase. The former produces a composite wave with maximum wavefront slope while the latter produces a composite wave with maximum peak-to-rms ratio (crest factor).

RESULTS EXAMPLES

The test produced a large compendium of testing results, which, it is hoped, can be correlated with turbine operating conditions from data yet to be received. Mean local wind speeds for all blocks are shown (meters per second) in Table **3**. Illustrative examples showing disparities among the three residences are shown in the following graphs. The full set of data is available for review.

Figure **2** shows a sample of raw data collected during windy conditions at Residence R2. Note that apparently wind-driven very low frequency pressure fluctuations are well synchronized and nearly equal in amplitude at four disparate locations within the home.

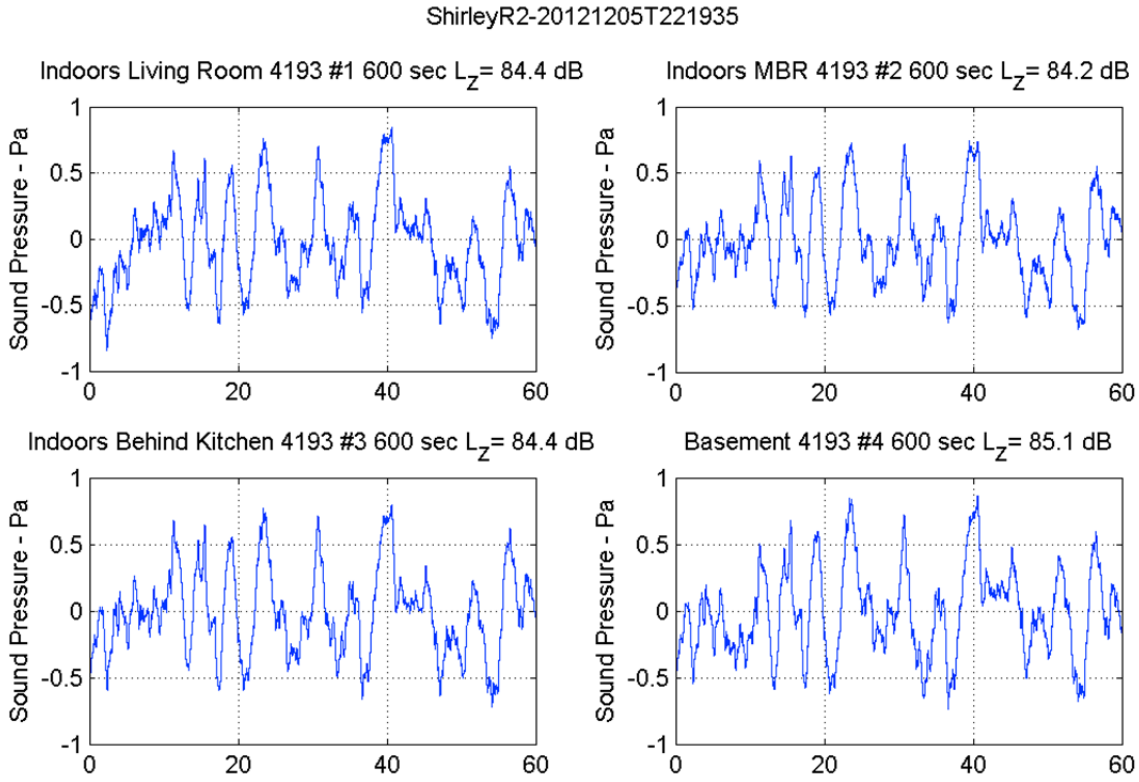


Figure 2. First Minute of Raw Data Collected at R2 On Dec 6 Starting 00:19:35. Note very low frequency fluctuations are nearly equal at four locations.

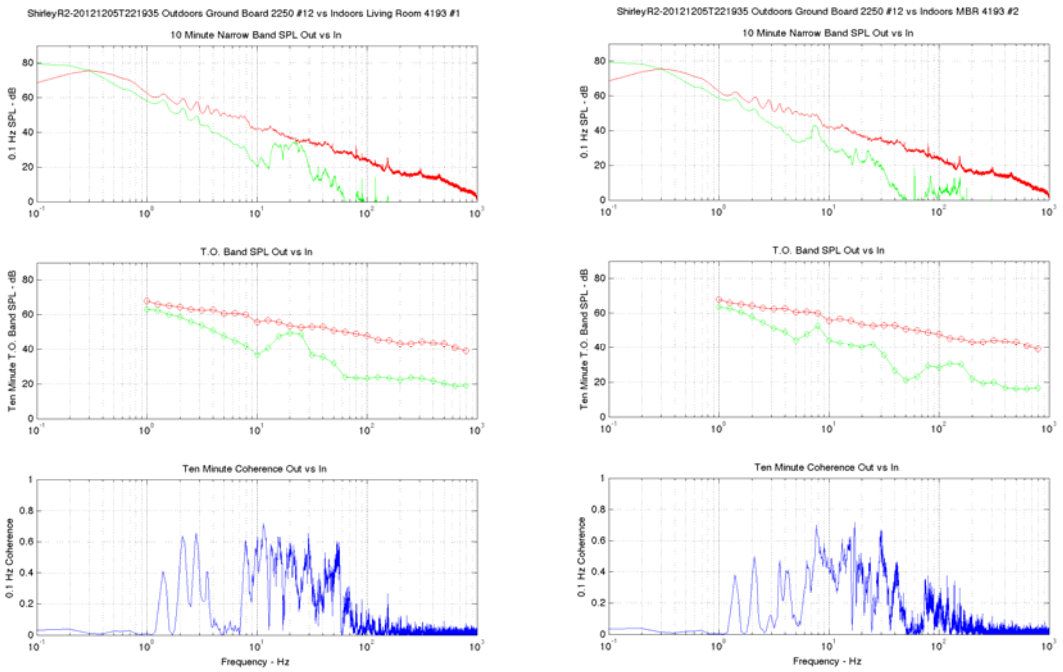


Figure 3. Low Frequency (0.1-1,000 Hz) Spectra and Coherence from Two Rooms in R2 measured 12/6/12 starting 00:19:35 showing differences in detail and well correlated low-order blade-pass harmonics. Red curve is measured outdoors between turbines and home.

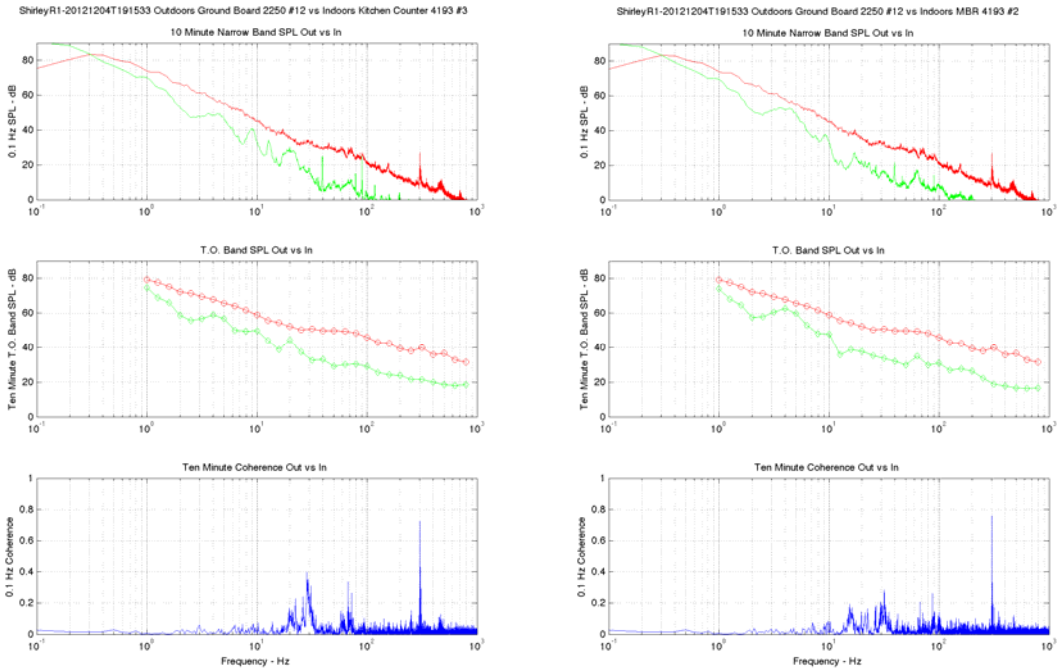


Figure 4. Low Frequency (0.1-1,000 Hz) Spectra and Coherence from Two Rooms in R1 measured 12/4/12 starting 21:15:33 showing differences in detail and poorly correlated low-order blade-pass harmonics. Red curve is measured outdoors between turbines and home.

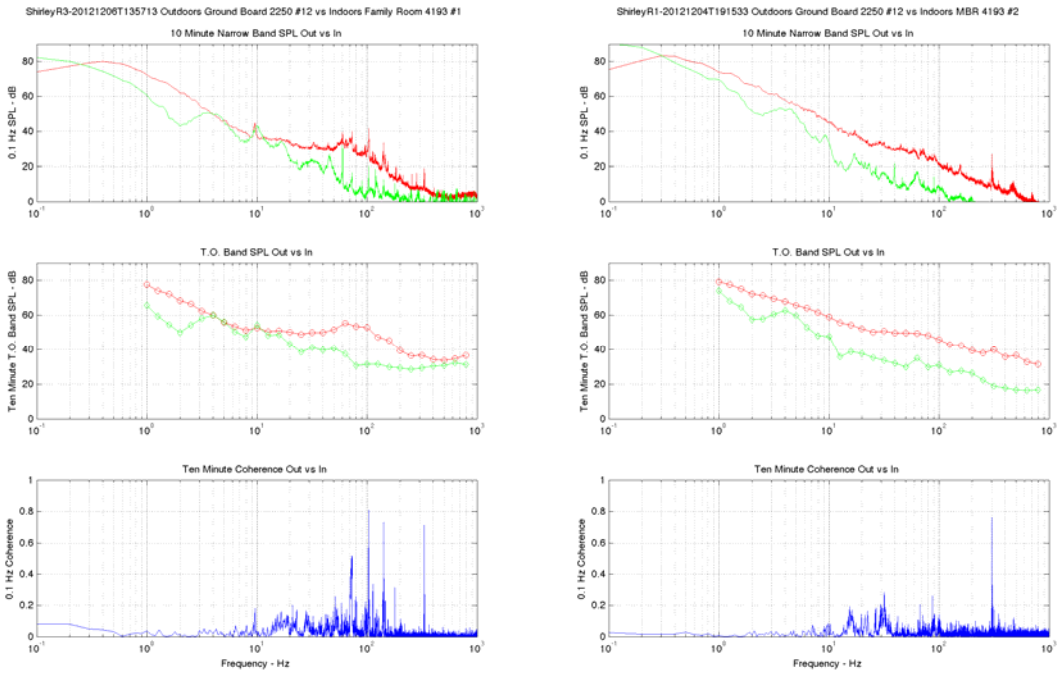


Figure 5. Low Frequency (0.1-1,000 Hz) Spectra and Coherence from Two Rooms in R3 measured 12/6/12 starting 15:57:13 showing differences in detail, poorly correlated low-order blade-pass harmonics and well correlated tones from passing vehicle exhausts. Red curve is measured outdoors between turbines and home.

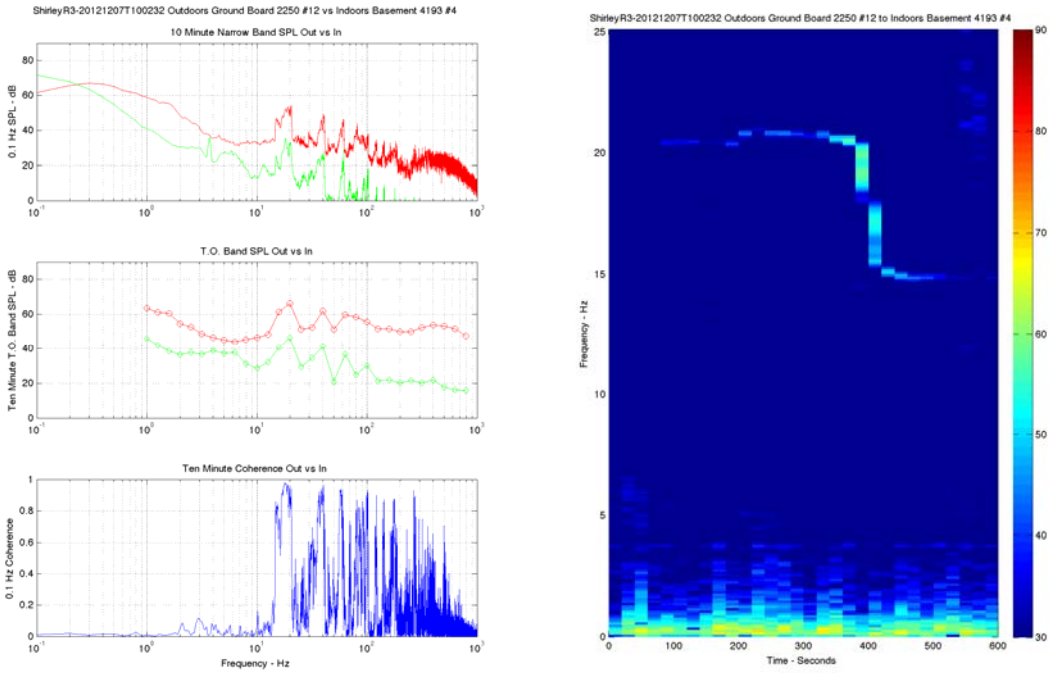


Figure 6. Low Frequency Spectra and Outdoor-Indoor Cross Spectrograph in Basement of R3 with Helicopter flyover. Note Doppler shift of rotor tone from 20.5 Hz on approach to 15 Hz receding. Also note high coherence of the helicopter rotor blade harmonics. Note very low coherence of turbine blade frequencies below 10 Hz, suggesting most of the infrasound is general atmospheric pressure fluctuation and wind force on the residence.

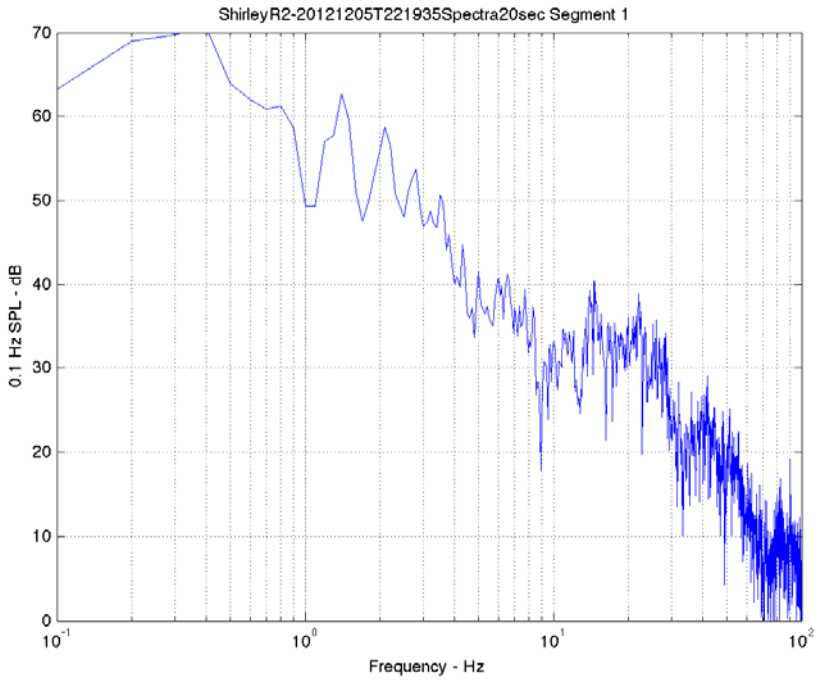


Figure 7. Short (20 sec) duration spectrum with best defined turbine blade harmonics, multiples of 0.7 Hz. Overall SPL of the Blade Pass Signal is 70 dB.

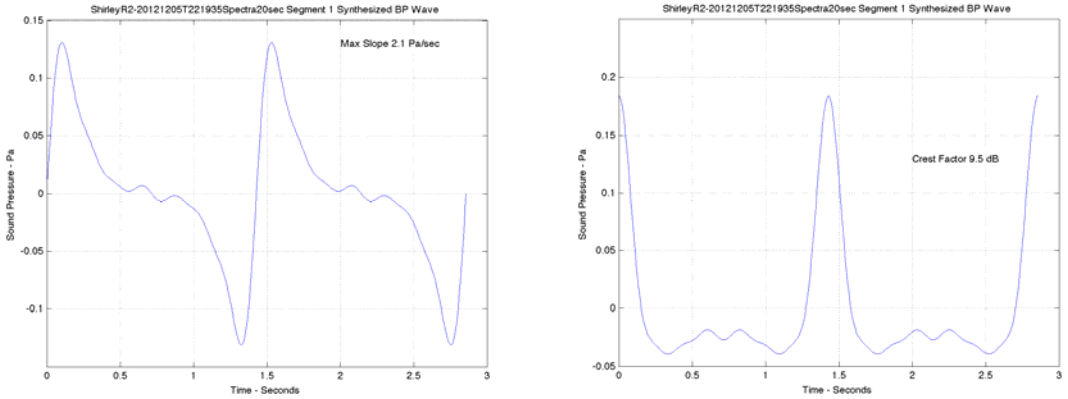


Figure 8. Turbine blade-pass waveforms synthesized from the harmonic series shown in Figure 7. Peak-to-peak SPL of the left-hand, more probable signal is about 82 dB.

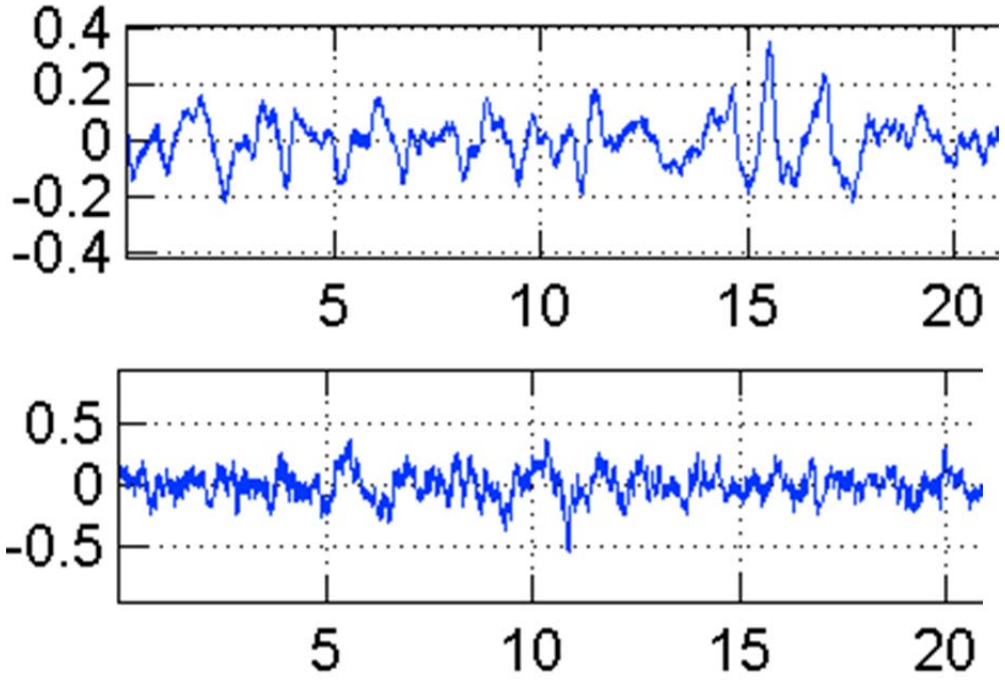


Figure 9. 0.5 Hz Phaseless High-Pass Filtered Waves Indoors (upper) and Outdoors at R2, Corresponding to Spectrum of Figure 7. Note repetitive waves indoors, similar to left-hand synthesized example. Note transient event indoors at 15.5 seconds unrelated to outside noise.

A summary of statistical sound levels for each test is shown in Table **4**. Note that the high frequency noise floor of the low-frequency microphones used indoors limits the A-weighted results to 29-30 dB minimum. The cells marked in red were affected by system overload or other problems and should be discounted. The cells marked in gold are for a seismic accelerometer mounted on the Kitchen island of R3 and are not calibrated except that 94 dB is approximately 1 m/sec^2. The cells marked in teal are taken on the front seat of the Mini-SUV parked outside R2. All others are normal measurements as shown in the Log, Table **3**.

Table 4. Statistical Sound Levels for All 10-minute Tests

Shirley	Weight	LA						LC						LZ						LG						L_0.5-100					
ChIA	Channel	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
R1	L1	36.9	32.3	42.4	54.0	43.6		52.5	49.2	53.0	72.0	62.5		93.7	93.5	93.8	111.9	93.4		67.5	67.1	68.3	87.5	72.4		80.7	79.8	80.1	94.9	90.2	
12/4/12	L10	33.7	30.5	34.6	37.7	42.4		50.7	42.9	46.2	60.0	56.2		89.5	89.1	89.4	94.4	86.1		63.9	63.0	64.1	73.0	66.5		74.7	73.7	73.8	82.4	82.1	
20:43:32	L50	33.2	30.1	30.3	32.3	41.5		48.9	39.8	42.7	48.5	53.9		80.6	80.0	80.5	84.7	75.7		58.6	55.7	58.3	62.0	61.6		66.1	65.2	65.2	71.0	70.9	
20:53:32	L90	32.6	29.8	29.6	31.0	41.0		47.2	37.5	40.0	45.5	52.1		67.7	67.0	67.2	71.3	64.5		53.9	49.7	53.2	55.3	57.3		58.5	56.3	56.5	59.7	62.0	
2.2 mps	Leq	33.9	30.2	32.9	76.2	41.7		49.2	41.2	44.4	94.9	55.1		85.0	84.6	85.0	102.6	82.8		60.4	58.9	60.6	89.4	64.2		70.8	69.8	69.9	98.0	79.2	
R1	L1	36.1	32.6	34.8	66.9	49.6		53.2	51.1	50.8	85.3	68.4		104.1	104.0	104.3	112.9	102.6		77.3	77.2	77.5	92.7	79.2		90.7	89.7	90.0	104.1	97.4	
12/4/12	L10	34.0	31.2	30.7	54.8	45.3		51.2	47.2	47.1	76.3	59.8		98.6	98.5	98.8	107.3	94.0		71.9	71.7	72.1	85.7	71.6		84.1	83.3	83.6	96.7	89.6	
21:15:33	L50	33.5	30.3	29.8	44.7	42.2		49.5	42.7	43.5	64.1	55.8		89.8	89.7	90.0	99.0	84.0		64.1	63.3	64.0	77.6	64.7		75.0	74.3	74.4	87.3	78.7	
21:25:33	L90	33.2	29.9	29.4	41.8	41.4		47.9	39.5	40.6	57.6	53.5		76.4	76.2	76.6	86.2	71.5		57.3	54.1	56.2	69.7	59.6		64.8	63.8	63.9	76.7	67.6	
3.2 mps	Leq	35.9	33.7	34.1	54.0	43.5		50.7	46.4	47.0	73.1	58.6		94.6	94.4	94.7	103.2	90.8		68.2	67.9	68.4	82.3	69.2		80.2	79.4	79.6	93.1	86.0	
R1	L1	34.9	32.4	34.4	64.2	51.9		50.4	48.0	48.2	83.5	66.2		100.6	100.4	100.7	111.5	98.4		73.7	73.6	74.0	91.1	75.6		86.4	85.4	85.7	102.0	94.1	
12/4/12	L10	32.5	30.6	30.4	52.6	43.8		48.7	44.5	44.8	75.1	58.8		95.9	95.7	96.0	106.0	91.3		69.1	69.0	69.3	84.4	68.6		80.7	80.0	80.1	94.8	86.4	
21:28:08	L50	32.2	30.1	29.7	43.2	41.7		47.4	41.0	41.5	62.4	54.7		87.7	87.6	87.8	96.7	80.9		61.6	61.2	61.9	75.8	63.0		72.1	71.5	71.5	85.0	75.5	
21:38:08	L90	32.0	29.8	29.0	40.8	41.0		46.2	38.2	38.4	56.4	52.6		74.1	74.1	74.2	83.6	68.6		53.8	52.3	54.5	67.8	58.3		61.5	61.1	60.8	73.8	64.5	
2.8 mps	Leq	32.7	30.3	30.0	51.9	43.2		47.6	42.0	42.4	71.6	57.1		91.6	91.4	91.7	101.7	87.6		65.0	64.8	65.3	80.8	66.2		76.7	75.9	76.0	91.1	82.8	
R1	L1	36.5	36.8	47.5	56.9	44.4		56.9	57.5	63.4	72.7	59.9		96.6	96.2	96.4	92.9	87.4		71.3	71.4	76.8	73.9	68.8		83.9	83.0	83.4	76.0	82.5	
12/5/12	L10	31.9	31.2	39.1	38.7	41.0		48.4	45.8	50.2	60.9	57.8		90.5	90.1	90.5	85.0	78.9		65.2	64.8	67.0	70.2	66.2		76.8	76.0	76.3	67.5	71.7	
12:30:22	L50	31.3	30.1	30.8	37.4	40.4		46.0	41.5	44.7	58.6	55.8		79.8	79.3	80.1	75.5	68.2		57.8	56.4	60.2	66.5	62.2		65.5	64.7	64.8	64.1	63.0	
12:40:22	L90	31.0	29.7	29.3	36.7	40.0		44.2	38.9	40.9	56.3	53.7		67.2	65.8	66.2	65.8	60.9		52.8	50.6	55.2	62.3	57.8		55.6	54.8	55.6	61.1	59.0	
1.2 mps	Leq	32.1	31.0	37.0	53.4	40.8		47.6	45.8	51.0	70.0	56.1		86.1	85.8	86.2	81.8	75.9		61.7	61.5	65.8	69.4	63.2		73.2	72.3	72.6	71.5	70.4	
R1	L1	46.2	30.8	35.0	41.3	42.1		56.0	45.3	49.1	63.0	60.2		83.5	82.6	83.6	89.6	89.9		66.6	58.2	63.0	73.1	69.6		72.6	69.2	69.4	72.1	84.4	
12/5/12	L10	37.3	30.2	30.7	39.7	41.0		53.5	43.1	46.6	61.3	58.4		79.4	78.2	78.7	81.9	82.9		60.6	55.5	60.3	70.6	67.0		64.7	63.0	62.8	67.9	76.5	
13:01:21	L50	36.3	29.9	29.6	38.7	40.6		52.3	40.9	43.4	59.1	56.5		71.2	69.8	69.9	73.8	72.4		56.6	51.8	56.3	66.8	63.0		59.2	56.4	56.3	64.9	66.4	
13:11:21	L90	35.9	29.7	29.2	38.0	40.2		51.3	38.7	40.5	56.9	54.4		59.8	57.4	57.9	65.3	62.7		52.1	47.7	51.7	62.5	58.5		55.1	49.9	51.1	62.0	60.7	
1.4 mps	Leq	40.3	30.0	30.4	39.0	40.7		53.4	41.3	44.2	59.5	56.7		75.0	73.9	74.4	78.8	79.1		59.4	52.7	57.3	67.7	64.0		62.8	59.7	59.8	65.9	73.2	
R1	L1	42.0	44.9	55.5	47.3	58.3		59.4	58.9	64.6	63.9	65.6		100.7	99.0	99.2	88.8	88.2		76.2	73.0	76.0	72.7	68.8		89.8	87.0	87.4	74.4	82.0	
12/5/12	L10	39.9	33.0	41.0	41.0	42.5		56.4	49.1	52.0	61.5	59.2		91.2	90.1	91.5	83.7	79.3		65.8	64.7	67.5	70.3	66.6		78.7	77.3	77.3	69.0	72.6	
13:21:10	L50	33.1	30.0	29.6	38.4	40.3		49.5	44.6	45.9	59.1	56.3		80.1	79.8	81.4	75.0	65.7		57.5	56.7	59.7	67.0	62.5		66.6	65.7	65.8	65.2	62.7	
13:31:10	L90	32.0	29.7	29.1	37.4	31.3		46.4	40.1	41.9	56.8	30.5		65.7	65.9	66.7	66.0	52.6		52.0	51.3	54.5	63.1	25.9		56.6	54.9	55.4	62.2	14.9	
1.5 mps	Leq	54.5	34.3	43.4	39.7	67.1		66.7	48.6	53.1	59.6	79.8		89.0	87.0	87.8	79.6	84.3		74.4	62.3	66.5	67.8	86.8		78.9	75.1	75.4	66.7	83.3	
R2	L1	32.3	31.1	28.9	31.0	49.7		52.1	47.0	46.3	45.1	62.1		92.0	91.1	91.2	91.8	91.5		66.8	64.7	64.7	65.0	72.2							
12/5/12	L10	30.1	30.6	28.7	30.4	48.5		49.5	44.6	43.6	42.6	60.3		87.7	87.0	87.1	87.7	83.2		64.1	61.2	61.5	61.3	69.4							
22:46:57	L50	29.7	30.3	28.5	30.1	47.2		45.7	41.9	39.8	39.6	58.4		79.2	78.8	78.8	79.6	74.5		60.0	56.2	56.8	55.0	65.7							
22:56:57	L90	29.5	30.0	28.3	29.8	45.9		41.5	39.4	36.0	37.4	56.6		65.6	64.6	64.9	65.4	66.7		55.2	51.6	51.7	49.0	61.6							
[redacted]	Leq	34.0	30.3	28.5	30.2	47.3		48.5	42.5	40.8	40.4	58.7		83.2	82.6	82.6	83.3	80.2		61.4	57.9	58.2	57.4	66.6							
R2	L1	45.3	31.7	35.6	38.3	54.9		63.2	53.9	51.5	61.0	64.7		102.2	101.6	101.0	100.7	92.4		77.8	75.3	74.7	77.0	73.9		90.8	91.2	90.2	89.7	86.9	
12/5/12	L10	37.0	30.9	30.3	32.2	50.4		53.1	46.7	46.2	48.5	62.3		91.4	91.0	91.1	92.0	85.2		67.7	64.9	65.2	66.4	71.2		77.1	76.9	77.3	78.0	79.6	
23:24:20	L50	30.3	30.5	28.6	30.4	48.8		48.3	43.7	42.1	42.4	60.2		82.4	82.1	82.4	83.3	76.5		62.6	58.9	59.5	59.1	67.5		68.5	68.0	68.8	69.5	72.8	
23:34:20	L90	29.7	30.1	28.3	30.1	47.5		44.2	41.2	38.0	39.3	58.3		69.0	68.6	68.9	70.2	68.7		57.7	53.8	54.0	52.3	63.4		59.7	58.4	59.6	60.0	66.8	
[redacted]	Leq	34.9	30.5	29.4	31.6	58.0		54.3	45.3	44.9	51.5	62.5		89.5	89.2	88.8	89.2	81.8		68.0	63.3	63.5	66.0	68.4		78.6	78.7	77.8	77.5	76.7	
R2	L1	38.8	31.3	31.0	36.8	52.1		55.6	49.4	51.8	53.7	63.0		93.0	93.0	93.1	93.9	90.1		69.1	66.7	68.1	68.0	72.7		80.5	80.6	81.1	81.5	85.0	
12/5/12	L10	32.5	30.7	28.9	31.2	49.2		51.1	45.4	44.8	46.0	61.0		89.0	88.9	89.1	89.7	83.7		65.5	62.9	63.5	63.7	69.9		75.7	75.7	76.2	76.5	78.5	
23:36:11	L50	30.0	30.3	28.5	30.2	47.8		47.0	42.6	40.7	41.5	59.0		81.2	80.9	81.3	81.9	74.7		61.3	57.6	58.1	57.5	66.4		67.7	67.7	68.1	68.5	71.6	
23:46:11	L90	29.6	30.0	28.3	29.9	46.6		42.9	40.1	36.8	38.6	57.2		67.7	67.7	68.1	68.4	67.3		56.6	52.8	52.9	51.3	62.1		59.1	58.3	58.7	59.0	65.5	
2.3 mps	Leq	31.4	30.5	28.8	31.1	48.5		48.6	43.5	43.6	44.5	59.4		84.7	84.5	84.7	85.4	80.0		62.7	59.6	60.6	60.2	67.2		71.6	71.6	72.0	72.5	75.1	
R2	L1	37.5	31.2	30.7	35.4	50.6		53.8	48.6	47.7	49.7	63.3		93.1	92.8	93.1	93.9	93.2		67.9	66.4	66.7	67.3	73.4		79.7	79.7	80.1	80.4	87.0	
12/6/12	L10	32.7	30.7	29.0	31.0	49.3		50.9	46.0	45.0	44.9	61.7		88.9	88.7	88.9	89.6	86.2		65.1	62.9	63.1	63.1	70.8		75.3	75.4	75.7	76.0	80.1	
0:19:35	L50	30.1	30.3	28.6	30.0	47.8		47.1	43.2	41.3	41.5	59.8		80.3	80.1	80.2	81.0	76.7		61.3	57.8	58.3	56.9	67.2		67.9	67.9	68.3	68.6	72.7	
0:29:35	L90	29.7	30.0	28.3	29.8	46.5		43.3	40.5	37.4	38.7	57.9		66.6	66.3	66.6	66.9	68.6		56.7	53.1	53.2	51.2	63.2		59.2	58.8	58.9	59.1	66.6	
3.0 mps	Leq	31.6	30.4	29.0	30.8	48.0		48.4	43.8	42.4	43.0	60.0		84.4	84.2	84.4	85.1	82.4		62.3	59.5	59.9	59.5	68.0		71.2	71.3	71.6	71.9	76.8	
R2	L1	31.8	31.7	41.6	37.9	52.1		57.3	49.9	49.7	52.6	64.1		103.8	98.2	98.5	99.2	95.6		77.4	71.6	71.8	72.7	74.2		91.7	86.2	86.0	86.4	90.0	
12/6/12	L10	30.3	31.0	35.7	31.3	50.1		52.9	46.8	46.7	45.5	62.3		98.4	93.7	93.7	94.6	88.7		72.1	67.2	67.2	68.0	71.4		84.0	79.4	79.4	79.9	82.6	
1:17:54	L50	29.9	30.5	28.9	30.3	48.5		49.1	43.9	43.0	41.8	60.1		89.6	84.7	84.6	85.4	79.0		65.4	60.3	60.6	59.7	67.6		75.6	70.6	70.6	71.2	74.3	
1:27:54	L90	29.6	30.1	28.4	30.0	47.1		45.4	41.2	38.8	39.0	58.2		76.6	71.1	71.0	71.1	69.9		58.9	54.7	54.5	52.2	63.4		67.1	60.6	60.6	60.6	67.6	
3.2 mps	Leq	32.7	33.3	34.4	33.4	48.7		50.9	46.4	45.8	45.7	60.5		94.3	89.2	89.2	90.0	84.9		68.6	63.3	63.5	63.7	68.5		80.8	75.8	75.8	76.2	79.2	
R2	L1	39.7	31.4	32.3	40.3	51.8		56.4	49.2	48.8	57.7	64.2		96.1	95.7	96.1	96.6	97.3		70.4	69.1	69.2	71.2	74.7		83.5	83.7	84.1	84.5	91.9	
12/6/12	L10	32.8	31.0	28.9	31.3	50.7		51.7	47.0	45.5	47.2	62.6		91.2	91.2	91.4	92.1	89.6		67.0	65.0	65.1	66.2	71.6		78.6	78.6	79.0	79.5	83.6	
2:14:13	L50	30.1	30.6	28.5	30.1	49.3		47.8	44.3	41.5	42.0	60.7		83.7	83.6	83.8	84.6	79.7		62.6	59.7	59.8	59.7	67.7		70.9	71.1	71.2	71.7	74.9	
2:24:13	L90	29.8	30.2	28.3	29.8	48.0		43.8	41.6	37.6	38.9	59.0		70.5	70.7	70.4	70.8	70.4		57.7	54.7	54.0	52.7	63.6		61.4	61.0	61.2	61.7	68.0	
3.3 mps	Leq	32.0	30.7	28.9	34.8	49.4		49.3	44.9	42.7	46.9	61.0		87.2	87.1	87.2	88.0	86.2		63.9	61.8	61.9	62.8	68.8		74.7	74.9	75.1	75.5	80.6	
R2	L1	54.9	32.0	44.5	45.6	51.0		76.5	58.2	60.4	78.7	63.2		92.6	91.2	92.4	92.3	89.2		87.9	71.4	74.6	90.5	67.8		87.0	84.1	84.6	87.3	85.7	
12/6/12	L10	44.5	30.4	35.8	35.5	45.8		60.7	45.9	50.2	60.3	57.9		86.0	84.4	84.8	85.3	82.3		71.4	61.2	64.1	72.5	64.3		75.4	72.2	72.9	75.0	77.8	
14:06:21	L50	33.9	29.9	28.9	30.3	42.9		47.0	39.6	40.4	43.8	54.6		77.4	74.8	75.5	76.3	72.1		59.6	53.5	55.5	57.3	60.5		65.7	64.0	64.3	65.6	68.2	
14:16:21	L90	29.4	29.7	28.3	29.9	41.3		40.7	36.7	35.2	37.1	52.7		64.6	61.3	62.5	63.9	62.5		53.8	48.1	49.5	49.3	56.4		56.3	54.1	54.9	55.9	60.4	
2.1 mps	Leq	45.0	30.2	35.3	42.2	47.4		63.1	46.4	50.1	64.5	57.0		83.1	81.8	82.2	82.5	78.7		74.7	60.4	63.7	76.7	62.0		76.2	73.0	74.1	75.0	74.7	
R2	L1	43.5	35.0	35.6	42.8	66.1		66.4	51.7	51.3	69.3	72.2		95.8	95.6	95.2	95.8	95.6		78.6	69.0	69.4	81.9	71.4		81.5	81.0	80.5	81.2	91.0	
12/6/12	L10	36.7	30.8	29.9	35.1	49.5		55.2	44.2	44.7	56.2	59.6		90.0	89.7	89.5	90.1	87.5		68.5	63.6	63.9	69.9	66.5		75.2	73.7	73.9	75.3	81.7	
14:25:47	L50	31.8	30.2	28.7	30.4	46.1		47.5	40.7	40.3	46.2	56.7		81.8	81.5	81.3	82.2	76.9		62.1	56.9	57.9	61.4	62.7		67.9	65.6	66.0	68.0	71.0	
14:35:47	L90	30.1	29.9	28.3	29.9	44.2		42.6	38.1	36.9	40.6	54.9		68.7	67.3	67.3	69.1	66.2		56.7	50.8	51.8	54.7	58.5		59.2	56.1	56.7	59.0	62.7	
1.7 mps	Leq	34.8	30.6	29.5	33.4	53.0		55.0	42.6	42.7	56.5	60.4		86.2	85.9	85.7	86.4	84.2		67.4	60.1	60.6	69.5	64.1		71.7	70.3	70.3	71.7	79.0	
R3	L1	46.6	37.9	41.7		51.8		58.1	58.3	59.0		69.7		98.3	94.9	95.6		98.5		72.3	68.3	73.2		72.5		80.2	81.8	80.9		94.5	
12/6/12	L10	37.4	33.9	34.9		48.6		51.4	52.7	50.9		64.4		90.3	89.7	90.5		91.9		65.9	63.6	65.8		68.1		73.8	74.1	74.0		86.9	
15:57:13	L50	31.2	31.9	30.5		43.9		46.0	48.0	45.5		57.3		81.1	80.6	82.1		82.7		59.7	57.6	59.6		63.7		65.7	65.6	65.9		77.4	
16:07:13	L90	30.1	31.0	29.3		40.1		42.3	45.4	42.0		53.9		67.2	66.7	67.9		71.0		53.8	52.4	53.7		59.3		56.6	56.7	56.3		67.2	
2.8 mps	Leq	40.7	32.6	35.6		45.6		49.3	50.0	49.2		60.7		86.8	86.0	86.8		88.1		63.0	60.5	63.3		65.2		73.2	74.2	73.5		83.5	
R3	L1	47.6	37.0	54.3		50.4		60.5	55.6	64.3		69.4		104.4	104.5	104.4		102.6		80.2	78.2	80.9		80.5		93.6	94.0	92.9		98.7	
12/6/12	L10	39.7	33.1	37.5		47.8		51.1	51.3	50.9		62.5		91.3	91.1	91.4		95.1		66.8	64.9	67.3		70.4		73.2	72.7	73.4		90.9	
16:28:57	L50	32.3	31.5	29.7		44.0		44.2	47.0	43.4		56.7		81.8	81.6	81.9		85.1		58.5	57.5	58.4		63.2		64.1	63.9	64.3		80.8	
16:38:57	L90	30.3	30.8	28.8		40.0		40.5	44.3	40.3		53.0		67.8	67.3	68.2		72.8		52.3	51.4	52.3		58.3		54.5	54.6	54.2		69.0	
2.4 mps	Leq	37.0	32.2	42.1		44.9		54.7	49.8	55.6		59.9		92.1	92.1	92.2		91.7		70.1	66.0	70.5		68.8		80.4	81.1	80.3		87.8	
R3	L1	48.8	34.9	44.4		45.0	51.9	62.7	57.6	60.6		68.1	67.6	98.3	95.3	95.3		85.3	69.9	76.0	69.4	73.1		70.1	72.7	86.8	86.4	85.9		81.1	68.3
12/7/12	L10	38.3	31.8	33.6		40.6	36.6	53.5	50.1	49.8		59.8	52.1	91.8	79.6	80.2		79.0	55.0	68.1	58.7	62.4		65.2	57.2	69.1	65.2	67.9		73.9	53.1
11:20:24	L50	30.9	30.2	29.1		38.0	18.8	43.8	44.7	43.9		53.6	37.3	81.9	70.7	71.3		70.3	41.4	60.3	54.1	56.3		60.9	45.1	58.2	56.4	57.6		64.5	40.5
11:30:24	L90	29.7	29.8	28.6		37.2	15.3	39.6	41.9	40.3		51.2	29.8	66.5	58.2	59.6		60.6	34.1	53.1	49.4	51.1		56.2	37.3	50.7	49.8	50.5		58.1	33.4
1.1 mps	Leq	37.6	30.8	33.6		39.0	41.5	51.7	47.4	49.4		57.4	62.0	87.9	82.1	81.9		75.2	63.7	66.1	57.7	62.3		62.5	62.2	75.6	76.3	75.3		70.4	63.1
R3	L1	36.4	33.9			44.9	37.3	53.7	53.8			65.0	50.4	92.3	80.3			84.7	72.7	67.0	59.4			70.2	64.5	65.0	64.8			80.3	64.6
12/7/12	L10	30.8	31.2			40.1	36.2	45.8	46.6			57.2	47.3	85.9	75.8			77.6	67.5	62.3	56.5			65.1	61.0	60.0	59.5			71.9	59.8
11:46:16	L50	30.0	30.1			37.5	36.0	40.9	43.0			52.5	43.9	73.5	67.8			67.9	59.4	54.2	52.3			60.7	56.3	53.3	52.4			62.4	54.0
11:56:16	L90	29.7	29.8			36.9	35.7	37.8	40.4			49.9	40.9	59.9	55.2			59.2	51.8	49.0	47.6			55.9	50.7	47.7	47.5			56.9	49.0
0.9 mps	Leq	31.4	30.5			38.6	36.0	44.0	44.8			55.0	44.8	81.5	71.6			74.0	63.8	58.1	53.4			62.3	57.8	56.3	55.7			69.0	56.4
R3	L1	36.7	46.8		35.7	71.0	44.1	63.8	74.0	38.7	57.7	81.1	72.7	87.5	83.3		83.9	85.8	79.4	76.8	76.1		69.4	90.4	87.6	69.2	75.8		65.7	84.3	79.1
12/7/12	L10	33.0	37.4		30.6	50.8	37.8	55.0	62.1	38.3	45.9	68.8	59.0	81.0	78.7		79.6	80.1	71.6	62.9	67.3		56.8	77.0	69.5	62.6	66.4		60.4	76.1	65.1
12:02:32	L50	30.1	30.5		29.4	38.2	36.1	43.5	48.2	37.9	35.5	55.5	47.4	73.1	70.9		71.6	70.4	61.9	55.5	56.9		48.7	64.6	59.8	54.9	55.9		52.2	66.1	56.3
12:12:32	L90	29.8	29.9		29.1	36.9	35.8	39.1	41.8	37.4	33.1	50.3	42.2	59.5	59.0		57.4	60.7	54.0	50.0	50.5		41.8	58.0	52.9	48.7	49.6		43.9	58.7	50.7
1.1 mps	Leq	31.2	35.3		30.1	56.5	37.2	52.3	60.2	37.9	44.6	67.4	60.0	77.4	74.4		75.2	76.0	68.0	63.5	65.1		56.4	75.9	73.4	59.2	63.2		56.3	72.7	65.8

CONCLUDING REMARKS

In an effort to determine acoustical conditions that could be linked to apparent intense reaction by some Shirley environs homeowners, simultaneous indoor and outdoor acoustic and local wind speed measurements were conducted sequentially at three disparate locations over a three-day period starting the evening of December 4, 2012. A very large compendium of raw and processed data was obtained, a small fraction of which is presented in this summary.

The apparent and tentative result indicates that at the second residence, located approximately 1,280 ft from the nearest turbine, blade-passage induced infrasound was correlated between outdoor and indoor locations and peak amplitudes of periodic waves composed of blade harmonics 0.7 to 5.6 Hz on the order 76 dB were detected both indoors and outdoors. Well correlated broadband low frequency noise at this nearest residence was also detected, with one-third octave band sound pressure levels approximately 50 dB in the frequency range 16-25 Hz. Both of these sounds are below normal hearing threshold; residents report being intensely affected without audibility.

At the other two residences, located approximately 3,300 and 7,100 ft from the nearest turbine, respectively, high levels of infrasound were detected indoors but the correlation with outdoor acoustic signals was not clear except at the 3,300 ft residence, where the broadband noise in the 20 Hz range was moderately correlated and produce one-third octave band level approximately 40 dB, which is well below normal hearing threshold. At the 7,100 ft residence, outdoor-to-indoor correlation was low except during motor vehicle passages or in particular a helicopter overflight. Again, residents report being intensely affected despite inaudibility and to be aware of turbine operation when the turbines are not visible.

The author is not qualified to make judgments regarding human response to normally subliminal sources of acoustic excitation. A detection test has been proposed by the consortium of investigators and put forth by Dr. Schomer. The author concurs that this is an important step in resolving a difficult issue.

An additional missing element in the program is ability to correlate acoustic test results with turbine operating conditions. Near-turbine acoustic monitors placed by HAI showed significant variability in near-field sound levels for turbines WTG6 and WTG8 over the course of the program, with an indication that turbine noise emissions may have decreased shortly before the team started and increased shortly after the team stopped measuring on some days. Review of turbine SCADA records will show turbine-height wind speeds and directions and turbine power output as well as times when turbine were parked for flicker suppression or other purposes. This will help determine the program for additional measurements and/or if scaling of measured levels would be appropriate.

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[i] B. Walker, Time Domain Analysis of Low Frequency Wind Turbine Noise, Low Frequency Noise 2012, Stratford Upon Avon, UK

APPENDIX B
by
HESSLER ASSOCIATES, INC.

Hessler Associates, Inc.
Consultants in Engineering Acoustics
3862 Clifton Manor Place, Suite B
Haymarket, Virginia 20169 USA
Phone: 703-753-1602
Fax: 703-753-1522
Website: www.hesslernoise.com

Appendix B to Report Number 122412-1

1. Introduction

Hessler Associates concentrated on acquiring data to define the low frequency issue at the Shirley site using four Norsonics Model N-140 ANSI Type 1 precision instruments (NOR140). These systems with the standard microphone and preamp are rated at an accuracy of +/- 1 dB from 5 Hz to 20,000 Hz. Two of the systems were used as continuous data loggers and the other two for relevant attended measurements. The systems were also calibrated against the extended frequency range system brought by Channel Islands Acoustics (ChIA).

2. Calibration

Two NOR140 units were set-up in the living room of residence R2 adjacent to the high performance ChIA microphone, which is rated accurate from 0.1 Hz to 20,000 Hz. The results of a 10-minute run between the three systems, along with a photograph of the set-up, are shown below. It is clear from the test that the NOR140 off-the-shelf unit can be used with confidence down to about 2 Hz; significantly better than its 5 Hz rating.

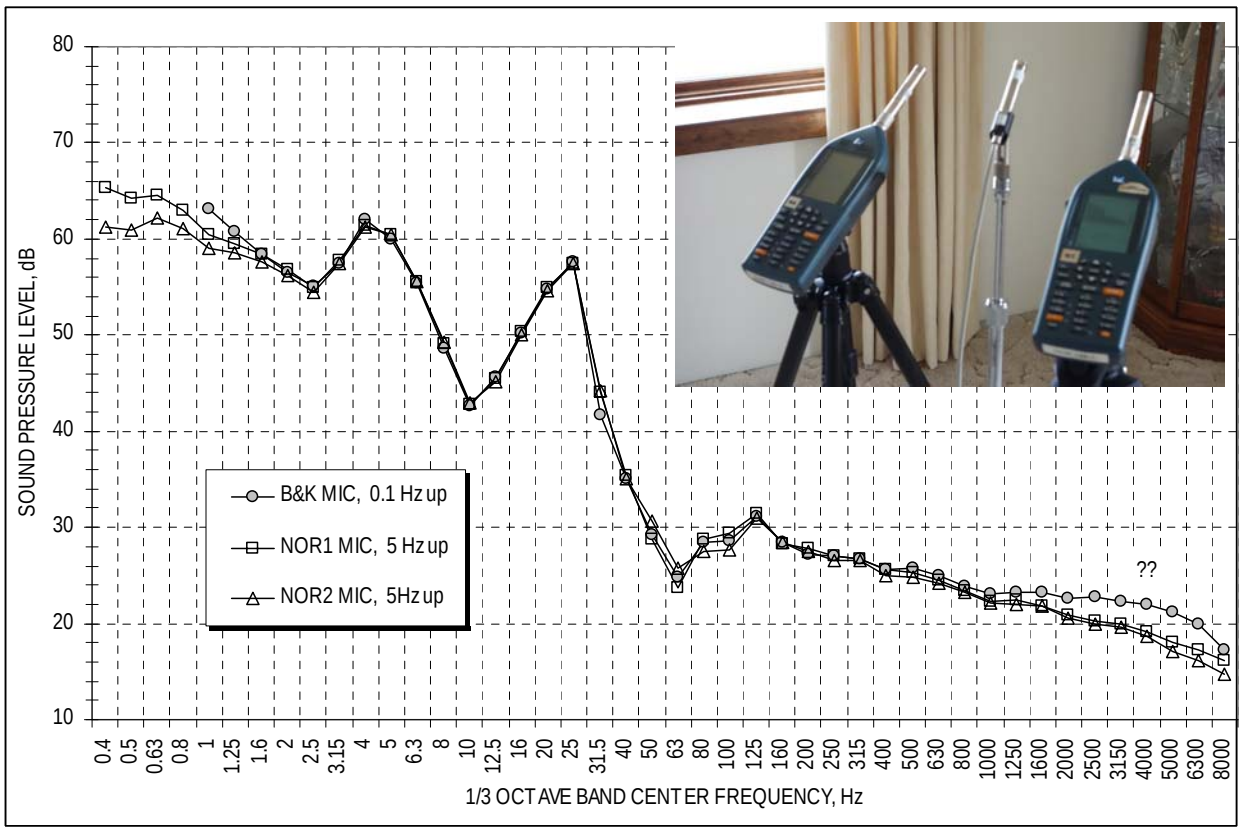


Figure 2.1 *Instrument Calibration Check Relative to High Performance ChIA System*

3. Data Logger

Because Duke Power would not participate in the test, it became necessary to install an automated sound level recorder near Turbine 6 to get a sense of what load that turbine, and presumably the remainder of the project, was operating at - and, indeed, whether the turbines were operating at all. The test position, designated as Monitor 1, is shown in Figure 2.1 in the cover report. A plot for each 10-minute interval in terms of the L50, L90 and Leq statistical metrics is given below.

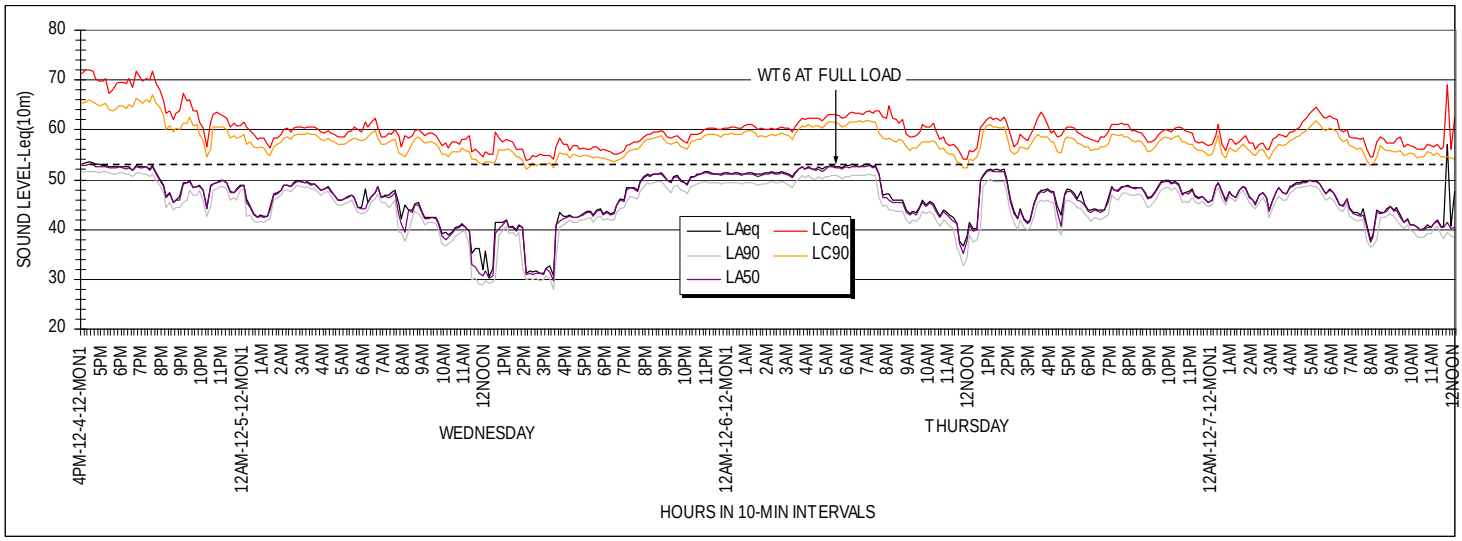


Figure 3.1 *Monitor 1 Results*

Calculations indicate that the turbine is at full power when the sound pressure at the monitor is approximately 53 dBA. In general, the plot shows when the unit was near or at full power and when it was off (e.g. around midday on Wednesday when the sound level dropped to about 31 dBA).

The second long-term logger, Monitor 2, which was located in front of the residence at R2, was not as useful because it was strongly influenced by extraneous, contaminating noise from traffic on Glenmore Road. Nevertheless, the results are given below in Figure 3.2.

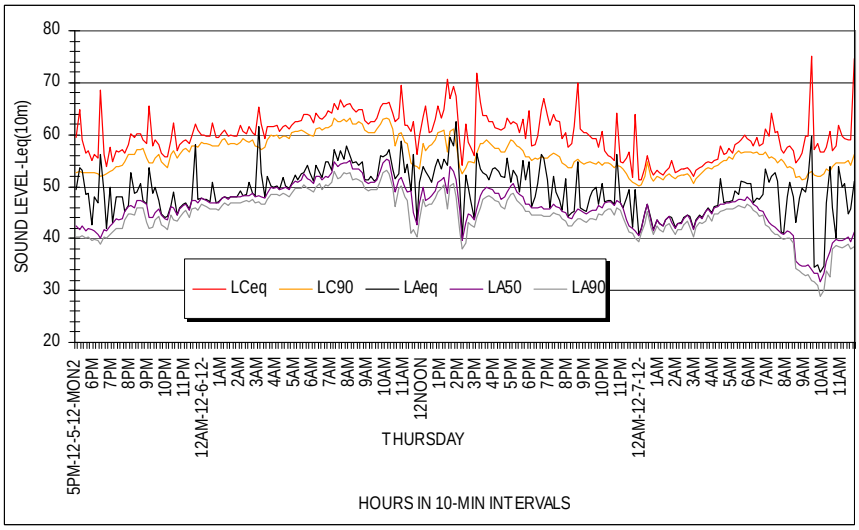
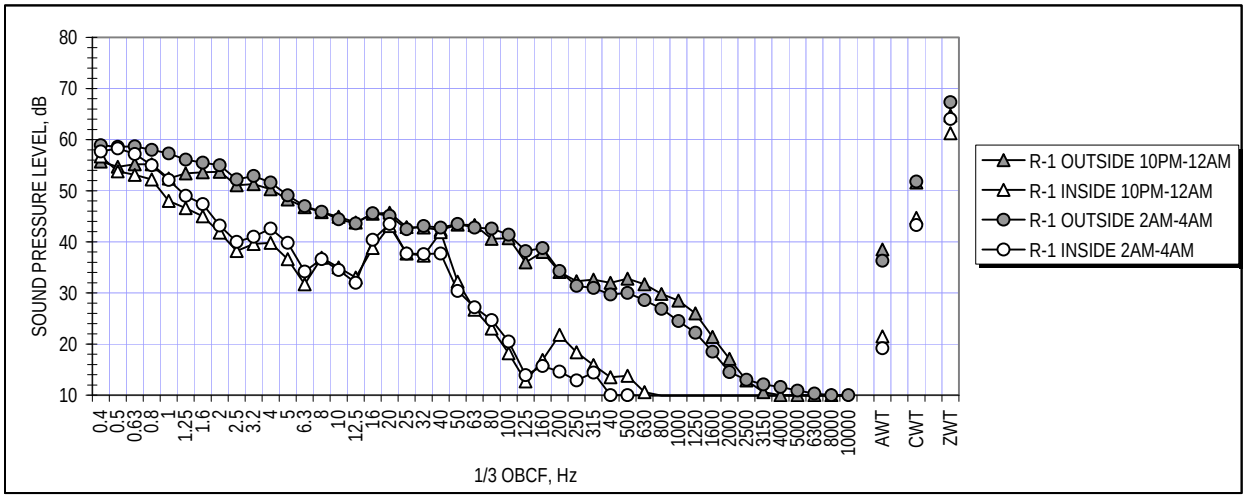
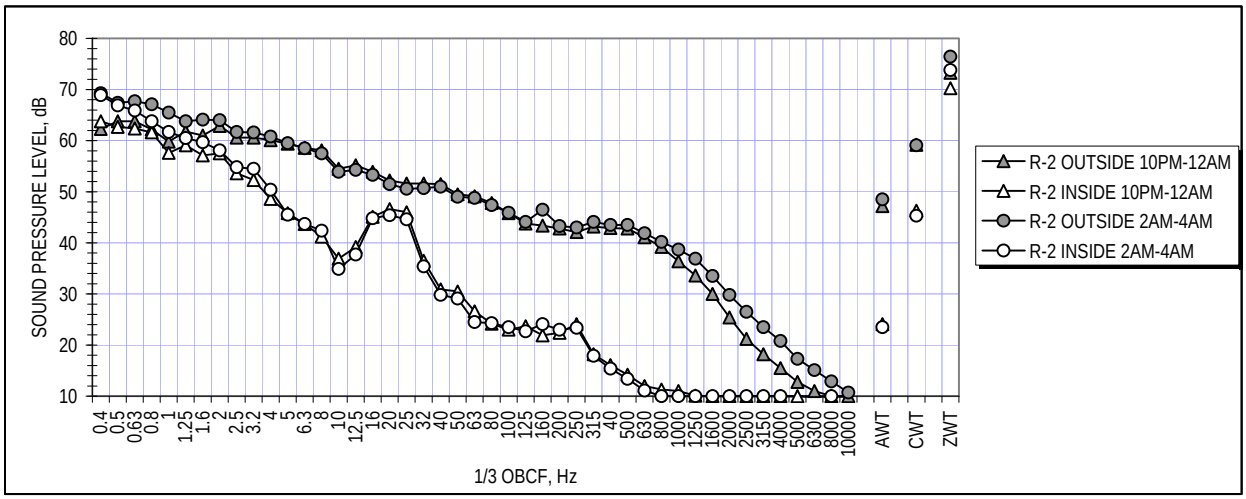


Figure 3.2 *Monitor 2 Results*

4. OUTDOOR/INDOOR Measurements

Measurements of the frequency spectra inside and outside of each of three residences on Wednesday night and early Thursday morning while the turbines were operating near full power are plotted below.





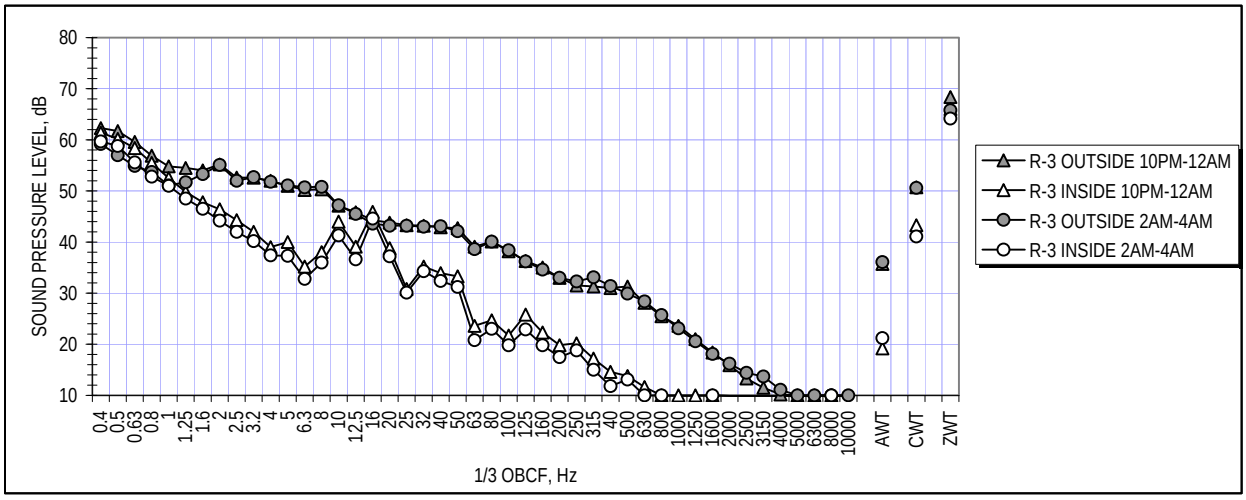


Figure 4.1 *Inside/Outside Sound Levels during Project Operation*

These figures are 10-minute L50 samples made simultaneously outside and inside of the three residences between 10 p.m. and midnight and between 2 and 4 a.m. The measured levels below 1 or 2 Hz may be pseudo noise, or false signal noise from the wind blowing over the microphone, even though the microphone was placed on a reflective ground board under a 7" hemispherical windscreen to minimize this effect. The plotted outdoor levels are the raw measurement results obtained on the reflective ground plane and should be reduced by 3 dB to reflect a standard measurement 1.5 meters above grade. Maximum levels occur at R-2 as one would expect, since it is closest to the turbines and the location where wind turbine noise was most readily audible.

What is significant about these plots is that there is a low frequency region from about 10 to 40 Hz where the noise reduction of each house structure appears to be weakest. This behavior is attributed to the frequency response of each structure, which is known to be in this frequency range. The small differences in the magnitude and frequency of the interior sound levels in this region of the spectrum are largely associated with differences in construction, design, openings, etc. The question is: what is the driving or excitation force in this range? It could be acoustic noise immissions from the wind turbines, normal environmental sources (mostly traffic), the natural response of each structure to varying wind pressure or some combination of these causes. The only sure way to discover the driving force is to turn off the wind turbines for a short period to see if the spectrum changes without the turbines in operation. This type of on/off testing was requested in the first test protocol and these rather inconclusive results make it clear that such an approach is essential to the task of identifying and quantifying the sound emissions specifically from the turbines inside of these homes.

5. ON/OFF Measurements

In the course of taking some supplemental outdoor measurements of the turbine closest to R-2 at least one on/off sample, although outdoors, was obtained through happenstance. After several measurements at a position 269 m WNW of WTG8, with the turbine in operation at some intermediate load in light winds from the north, the unit was unexpectedly shutdown by O&M personnel. Additional measurements were immediately obtained with all variables constant except for turbine operation. Prior to shutdown the rotor was turning at 11 rpm, which equates to a blade passing frequency of 0.55 Hz. The resulting on/off spectra are plotted below in Figure 5.1.

One could conclude that the wind turbine was not producing any low frequency noise since the spectra are essentially equal from 0 to 12.5 Hz; however, despite measuring on a hard surface using a hemispherical windscreen, the low end of both spectra appear to be pseudo, or false-signal noise based on some recent empirical tests of windscreen performance carried out in the Mohave Desert (in support of a new ANSI standard that is being developed for measuring in windy conditions). The objective of this testing was to evaluate measured low frequency sound levels in a moderately windy environment without any actual source of low frequency noise. The on/off measurements of WTG8 show that the levels below about 20 Hz coincide with the sound levels measured in the desert in the presence of a light 1 to 2 m/s wind. Consequently, all that can be concluded is that the low frequency emissions from the turbine were substantially lower in magnitude than the distortion effect produced from a nearly negligible amount of airflow through a 7" windscreen and across the ground-mounted microphone.

The overall reduction in audible sound of 8 dBA is attributable to eliminating the "whoosh" sound, which is clearly seen to occur in the higher frequencies; generally from about 200 to 2000 Hz.

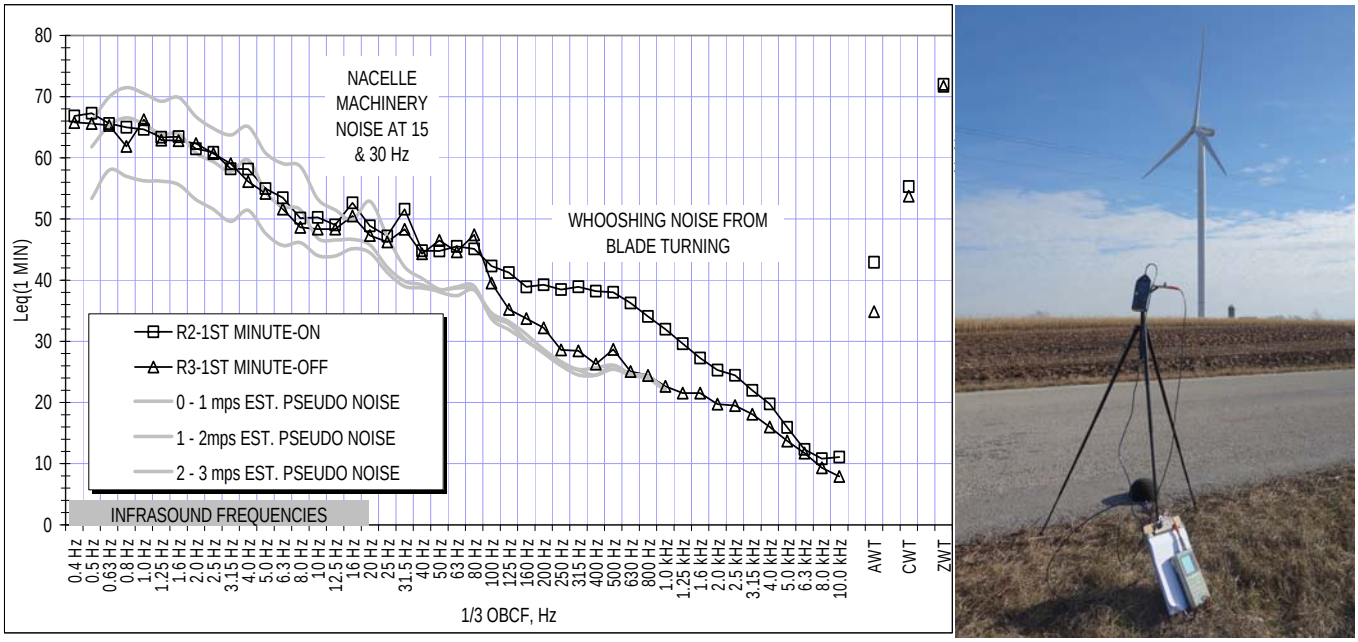


Figure 5.1 *On/Off Sound Levels Outdoors during Project Operation*

6. Proposed Method for Measuring Outdoor LFN in Wind

The experience above with on/off measurements outdoors can be combined with a finding made by Walker and Schomer that LFN inside a dwelling was quite uniform throughout all the rooms in the house, and not, as one might intuitively imagine, in the rooms facing the nearest turbine. This prompted them to measure the sound level inside of a vehicle, an SUV, and compare it to the levels measured inside the residence. It was found that the low frequency levels inside the car were similar to those inside the adjacent dwelling. Since an SUV is a closed, wind-free volume, it follows that the problem of obscuring pseudo could be eliminated with such measurements and accurate narrow band measurement of extreme low frequency sound could be measured inside of a car. The spectrum for a wind turbine shows up as a distinct pattern of peaks beginning at the blade passing frequency (about .5 to 1 Hz for modern wind turbines) with several following harmonic peaks that positively identify wind turbine low-frequency infrasound immissions. The beauty of the system sketched below in Figure 6.1 is that it is mobile and can be used at any public assess near or far from a wind farm.

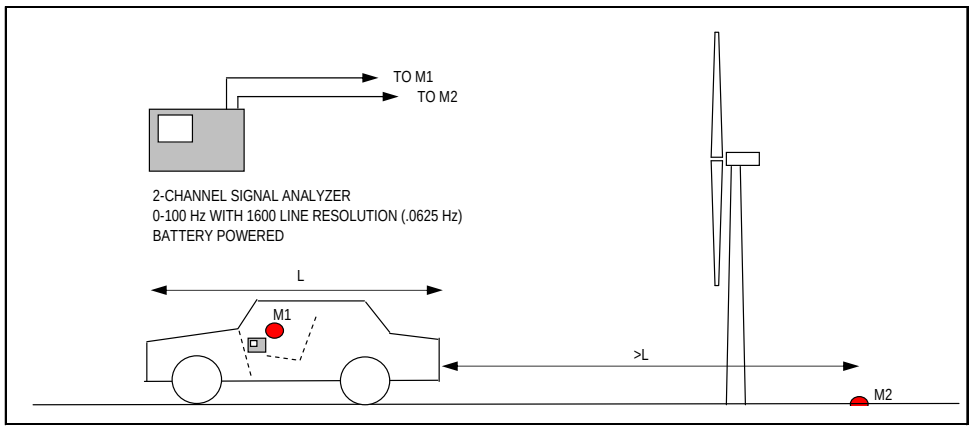


Figure 6.1
Schematic of Alternative, Mobile Measurement Technique for Low Frequency Sound Emissions from Wind Turbines

7. Conclusions

Walker showed unequivocally that low level infrasonic sound emissions from the wind turbines were detectable during near full load operation with specialized instrumentation inside of residence R2 as a series of peaks associated with harmonics of the blade passing frequency. The long-term response of the inhabitants at R2 has been severely adverse for the wife and child while the husband has experienced no ill effects, which illustrates the complexity of the issue. The family moved out of the area to solve the problem.

The industry response to claims of excessive low frequency noise from wind turbines has always been that the levels are so far below the threshold of hearing that they are insignificant. The figure below plots the exterior sound level measured around 2 a.m. on a night at R2 during full load operation compared to the threshold of hearing. In the region of spectrum where the blade passing frequency and its harmonics occur, from about 0.5 to 4 Hz, the levels are so extremely low, even neglecting the very real possibility that these levels are elevated due to self-generated pseudo noise, that one may deduce that these tones will never be audible. What apparently is needed is a new Threshold of Perception.

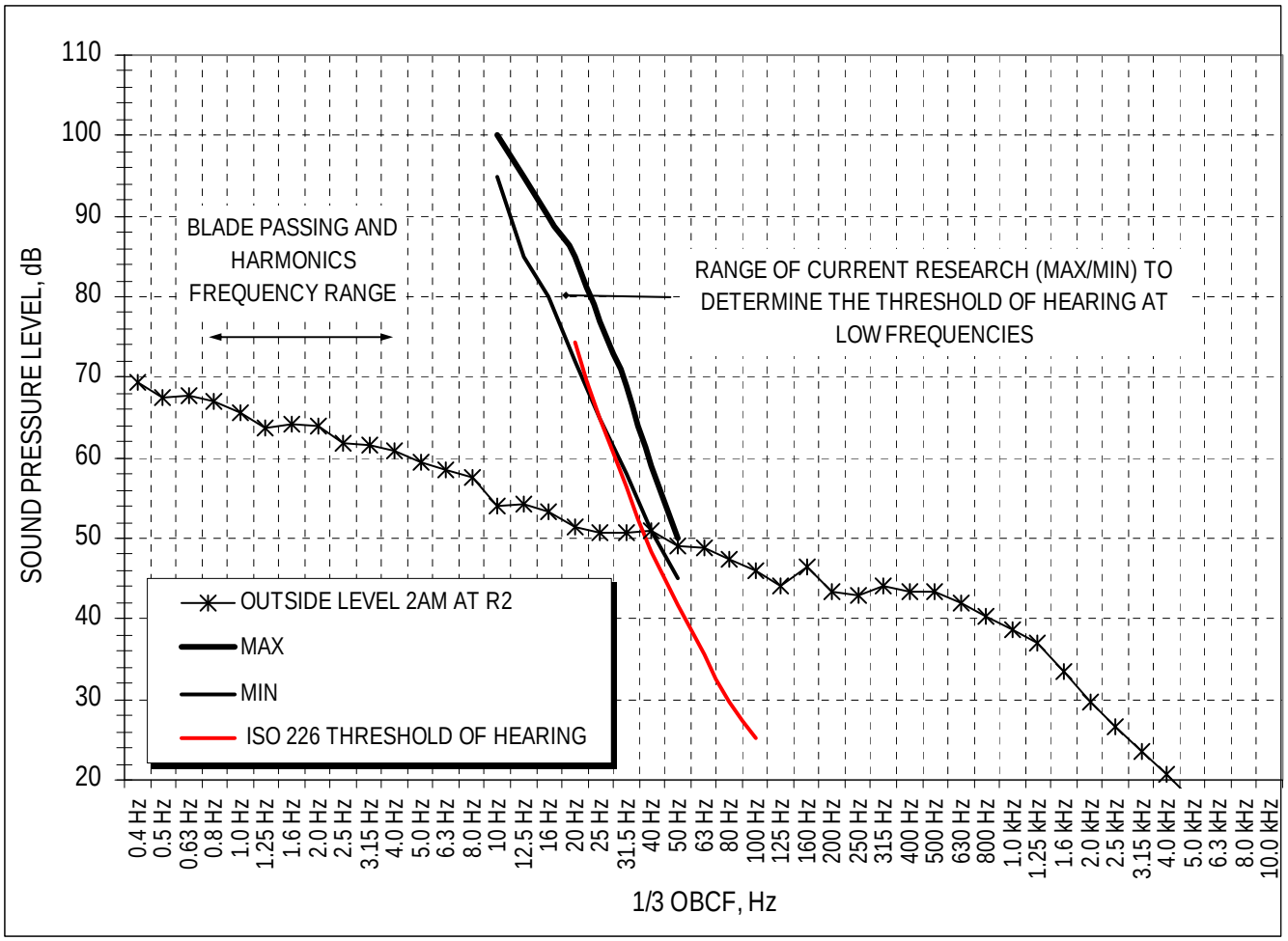


Figure 7.1 *Measured Project Sound Level Compared to Threshold of Hearing*

The study also showed that a wind turbine is indeed a unique source with ultra low frequency energy. The next figure plots the same R2 data above compared to a more commonly recognized low frequency noise source, an open cycle industrial gas turbine complex sited too close to homes. These two sources of electrical energy production, assuming the low end of the wind turbine measurement is actually due to the turbine rather than pseudo noise, have about the same A-weighted and Z-weighted overall sound levels.

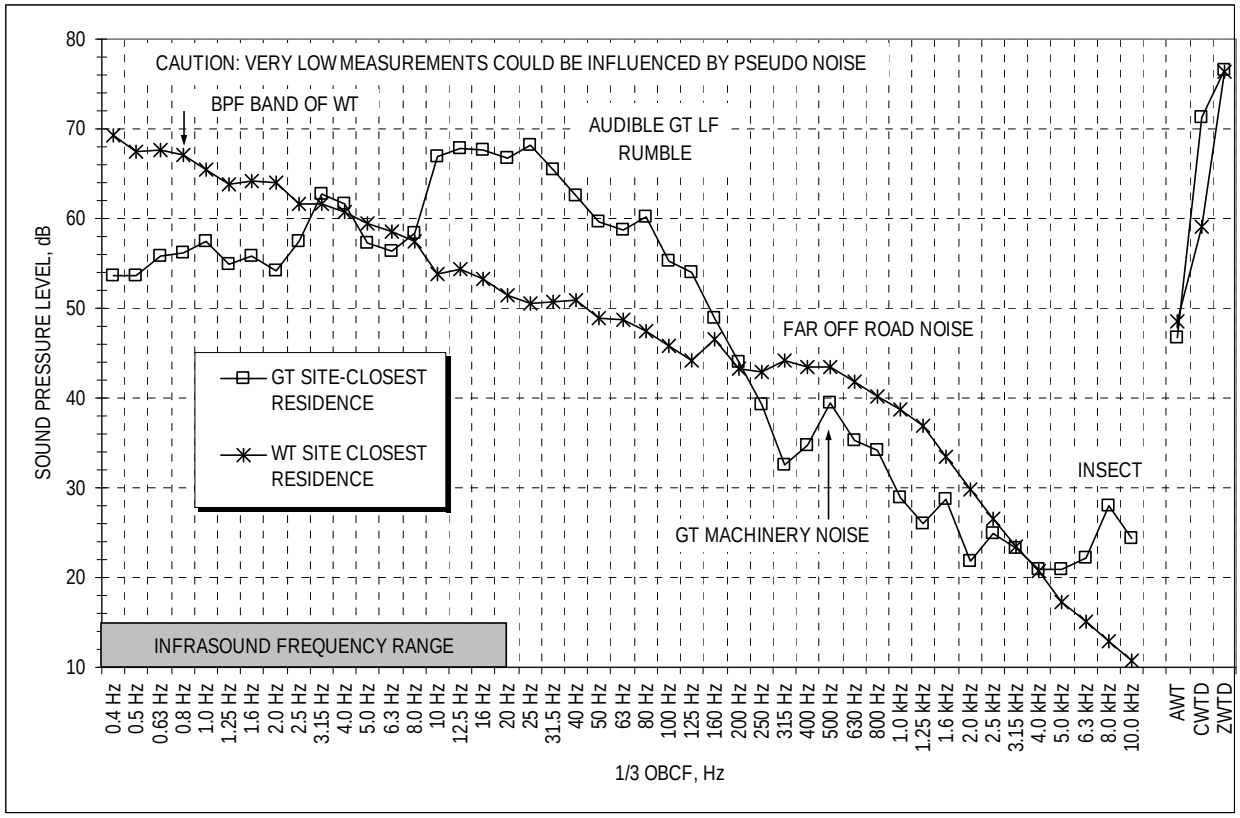


Figure 7.2 *As-Measured Wind Turbine Spectrum Compared to Gas Turbine Sound Level*

The C-weighted sound level is often used as a measure of low frequency noise; most commonly in gas turbine applications. If the C minus A level difference of a source is 15 to 20 dB, further investigation of the source is recommended by some test standards, since that apparent imbalance may be an indicator of excessive low frequency content in the sound. In this instance, the C-A level difference for the wind turbine is only 11 dB compared to 25 dB for the gas turbine, so this metric does not appear to work for wind turbines.

Schomer and Rand contend that the illness that is being reported may be a form of motion sickness associated with the body experiencing motion in approximately the same frequency range as wind turbine blade passing infrasound. However, this conjecture is based on a Navy study in which subjects were physically vibrated in flight simulators at amplitudes that may or may not be comparable to the situation at hand, whereas any such force from a distant wind turbine would need to be conducted through the air. One must make the leap that motion of the body in still air is the same as being still in air containing some level of infrasound. While potentially plausible this hypothesis needs to be verified.

Hessler and Walker have measured overall A-weighted sound levels and levels of infrasound at numerous wind farms that substantially exceed those measured here and to the best of their knowledge there are no reported adverse effects for noise or adverse health issues. It would be informative, in any further study, to survey the reactions of project participants and possibly other neighbors close to turbines, particularly with regard to health effects.

In general, enough was learned by these investigators, all with quite different past experiences, that it can be mutually agreed that infrasound from wind turbines is an important issue that needs to be resolved in a more conclusive manner by appropriate study, as recommended in the cover report.

End of Text

APPENDIX C
by
RAND ACOUSTICS

Robert W. Rand, INCE
RAND ACOUSTICS
65 Mere Point Road
Brunswick, Maine 04011

rrand@randacoustics.com
TEL 207.632.1215
FAX 206.339.3441

December 21, 2012

Investigations of infrasonic and low-frequency noise
Shirley Wind Facility, Wisconsin, December 4-7, 2012

1.0 Introduction

This report presents information on an investigation of infrasonic and low frequency noise performed at the Shirley Wind facility in Wisconsin December 4-7, 2012. The investigation was conducted by acousticians Dr. Bruce Walker, George Hessler, Dr. Paul Schomer, and Robert Rand under a Memorandum of Agreement developed for the investigation by Clean Wisconsin and Forest Voice. Mr. Hessler was accompanied by his son David Hessler. During the investigation, unexpectedly another consultant, Mr. Michael Hankard, visited the team and entered the homes under investigation during testing.

The investigation was conducted using instrumentation provided and employed by the acousticians. Three homes were investigated that had been abandoned by the owners due to negative health effects experienced since the Shirley Wind facility had started up. The health effects were reported to make life unbearable at the homes and had affected work and school performance. It was understood that once relocated far away from the facility, the owners and families recovered their health; yet revisiting the homes and roads near the facility provoked a resurfacing of the adverse health effects. The owners had documented their experiences in affidavits prior to the investigation.

This team functioned very well together with a common goal, and found collectively a new understanding of significant very low frequency wind turbine acoustic components that correlated with operating conditions associated with an intolerable condition for neighbors.

2.0 Methodology

It was generally understood that Dr. Walker would acquire simultaneous multi-channel, wide-bandwidth, high-precision recordings for later analysis. If successful and clear of contamination, those recordings would form the primary database for the investigation. George Hessler would acquire precision sound level meter measurements to correlate with wind turbine operations and for his project requirements. Paul Schomer and Rob Rand would serve as observers and, would also analyze and acquire measurements according to their investigative needs during the test. Measurements by acousticians would be catalogued and made available for later research and analysis. These general understandings were not detailed in the MOU due primarily to time constraints for the unusual, unprecedented collaboration brought together for this investigation.

Having investigated other wind turbine facilities and directly experienced the negative health

effects reported by others living near wind turbines [1,2], Mr. Rand focused on acquiring neighbor reports on health impacts during and prior to testing and correlated those to data being acquired. The working assumption borne out by experience is that the human being is the best reporting instrument.

Correlation: When investigating community noise complaints, value can be derived from measurements and analysis primarily when they are highly correlated to neighbor reports. In simple terms: if a recording or analysis is made when the turbines are turning, and the neighbors are present and report feeling intolerable, tolerable, or not a problem, and report such details as headache, nausea, vomiting, dizziness, vertigo, or cloudy thinking, or the absence of health effects, the correlation to the neighbor reports provides very useful information for assessing the utility of those data. Without the neighbor reports, it is difficult to determine the significance of acoustic data. From details given in neighbor reports, the investigators can look for unusual or distinctive acoustic characteristics or differences to clarify what acoustical conditions correspond to the degree of health effects being reported.

Self-reports taken as valid: The team agreed prior to testing that neighbor reports would be useful. They also agreed that neighbor reports are sincere and truthful, not "claims" as often alleged by the wind industry. Neighbors considered and agreed to requests to be available during testing. Mr. Rand also agreed to note his condition during the testing, since unlike the other acousticians he is prone to seasickness and has also proved vulnerable to negative health effects when near large wind turbines.

Due to schedule constraints, Mr. Rand was unable to attend a preliminary meeting with the owners of the three homes during the midday on Tuesday, December 4. However he met with the owners during the evening of December 4 shortly after arriving, and observed and acquired owner health reports and noted his own health over the next three days.

2.1 Equipment

Equipment used by Mr. Rand included:

- Gras 40AN microphone
- Larson Davis Type 902 Preamplifier
- Larson Davis Type 824 Sound Level Meter
- M-Audio MicroTrackII 24-bit line-level audio recorder
- Bruel & Kjaer Type 4230 Acoustic Calibrator
- SoundDevices USBPre audio interface
- Infiltec Model INFRA-20 seismometer (acoustic pressure, 0.1 to 20 Hz)
- SpectraPlus 5.0 acoustic analysis software
- Amaseis helicorder datalogger software

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1 Robert W. Rand, Stephen E. Ambrose, Carmen M. E. Krogh, "Occupational Health and Industrial Wind Turbines: A Case Study", Bulletin of Science Technology Society October 2011 vol. 31 no. 5 359-362.
2 Ambrose, S. E., Rand, R. W., Krogh, C. M., “Falmouth, Massachusetts wind turbine infrasound and low frequency noise measurements”, Proceedings of Inter-Noise 2012, New York, NY, August 19-22.

2.2 Protocol

Measurements would be obtained during higher-wind conditions as possible to derive a contrast from low- or no-wind conditions at the three homes under investigation. A "control" home in a quiet location far away from the Shirley Wind facility would be measured to provide background acoustic levels and signatures with no wind turbines nearby. Walker measurements would be observed and discussed and independent analysis performed by the observers as possible during the testing. The first primary goal was to obtain clean precision audio recordings for later analysis. The second primary goal was to obtain neighbor reports and discern acoustic contrast during the field investigations for immediate reporting of significant noise components to concerned parties. Mr. Rand would remain attentive to and report his health state during the testing.

At times during the testing Mr. Rand moved to other locations independently of the Walker system because of easier instrumentation mobility and to reduce noise contamination from activity by the other investigators.

3.0 Data collected

Mr. Rand took notes on health reports during the investigations, conveyed his state to the team during the testing, and compiled notes for later analysis, provided in Table 1. Neighbors were interviewed and they assembled reports for the team's use, listed in Table 2.

Mr. Rand referred primarily to Dr. Walker's acoustic recordings and analysis during testing and analysis. He acquired recordings and infrasonic acoustic pressure data separately for backup and reference.

Weather data were obtained from Wunderground as shown in Table 3.

Note: Although requested prior to the survey and again while at the site, Mr. Hessler made a decision not to acquire acoustic data with the Walker system at a control home far away from the Shirley Wind facility, citing "too many variables."

4.0 Analysis

Analysis focused on health state and, the levels and time-varying waveforms during higher-wind conditions when neighbors reported conditions as intolerable or difficult, versus quieter conditions which neighbors reported as tolerable.

5.0 Results

Results are preliminary. Nausea was experienced and **nauseogenicity** is indicated.

5.1 ***Neighbors report either tolerable or intolerable conditions, with little rating scale in***

between. They said if the turbines are operating, it's intolerable. Mr. Rand observed neighbors unable to stay at the homes at times even under moderate wind conditions during the testing.

5.2 ***Neighbors do not always hear the turbines. The neighbors indicated there is no real difference in wind compass direction on the negative health effects.*** The house could be upwind, downwind or crosswind to the turbine; no difference.

5.3 ***Neighbors retreated to the basement and gained partial relief from symptoms. Tested sound levels are the same everywhere in the home except less in the basement.*** Lower sound levels in the basement matches the neighbor reports to Mr. Rand to the effect that, when the turbines are operating, it's about the same level of difficulty everywhere in the house, except the basement, where they would retreat to gain partial relief, until they either left or abandoned the home to get substantial relief. The neighbors reported that they felt a need to get outside when conditions were intolerable. Their reports are supported by and correlate to the ubiquitous presence of the acoustic energy inside in all locations, except in the basement where it is slightly less. The neighbors take to the basement or if that is not sufficient to gain relief, they leave the home.

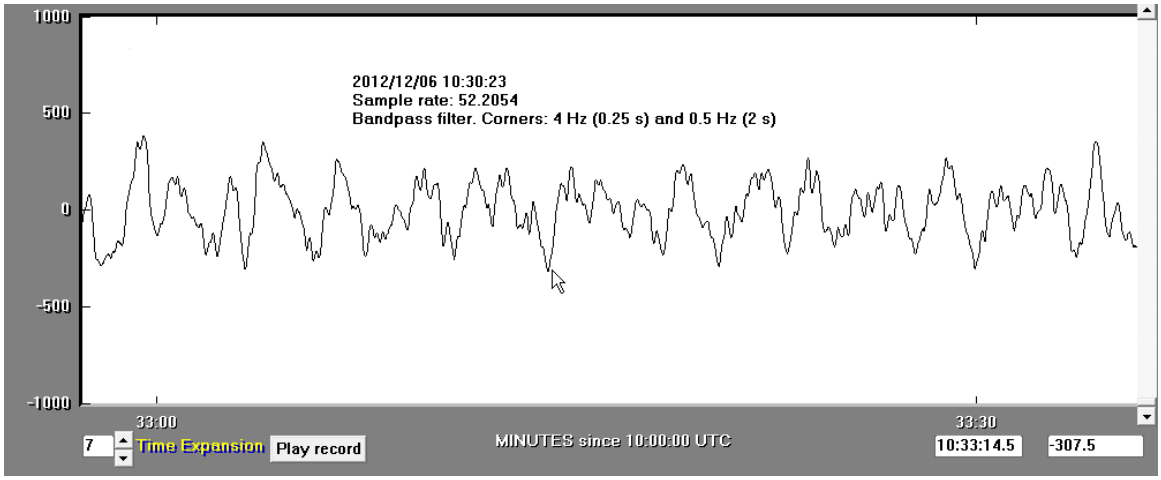
5.5 ***Acoustic energy outside was strongly coupled into the home at infrasonic frequencies when turbines operating in design range.*** Neighbors reported feeling worst when turbines are turning compared to light-wind conditions with some or all turbines off when they report using words such as "tolerable". Coherence between outdoor and indoors time-series was high at infrasonic frequencies below 8 Hz when wind turbines operating compared to when wind turbines off or turning slowly in light winds.

5.6 ***Neighbors reported being highly annoyed by the interior sound. Elevated acoustic energy was observed inside all three homes in the range of 10 to 40 Hz.*** Room, house, wall and floor acoustic modes (resonant frequencies) are found in the 10 to 40 Hz range. The Nordex N100 has in-flow turbulence noise at a peak frequency of 9 to 14 Hz depending on rotational speed, which might be involved in exciting resonant frequencies in walls and floors. More analysis and/or survey work appears needed to determine the extent of the problem. Mr. Rand was able to discern panel excitation in R3 where the owner reported feeling pressure on his ears as he moved toward the southerly wall of the sitting area in the open-area. Two wind turbines operating at a distance were faintly audible in R3 and detectable with ear to wall. Dr. Walker and Mr. Rand discussed the sensation, examined the walls, and made measurements of the home room dimensions for a future check of room modes against acoustic recordings.

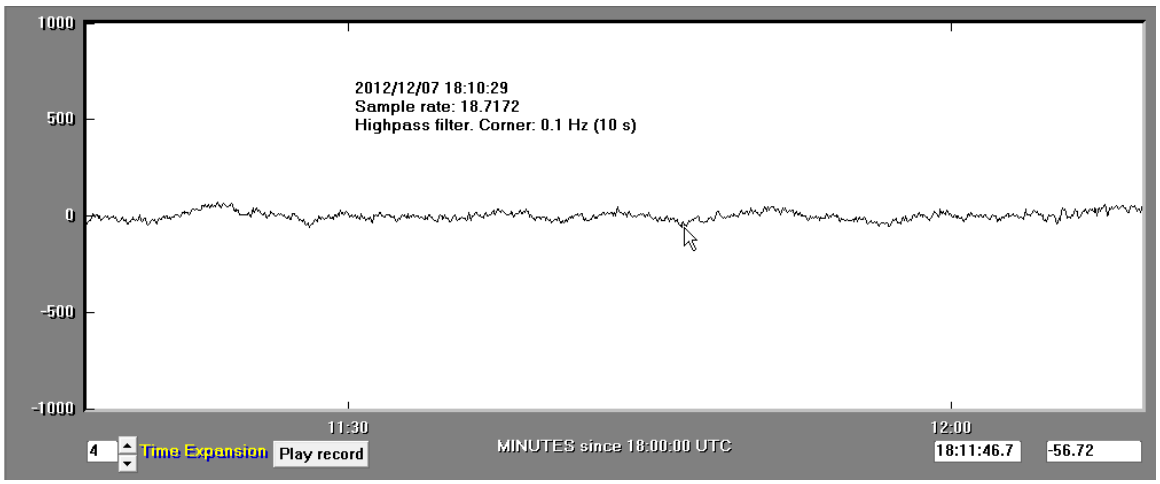
5.7 ***Neighbors reported that at a distance of 3-1/2 miles, they could find relief when turbines were operating.*** Outdoor average sound levels at the nearest home R2, a distance of 1100 feet, were measured at approximately 48 dBA. Assuming 6 dB per doubling of distance for the A-weighted sound level, a probable A-weighted sound level at 3-1/2 miles is 48-20log(1100/18480) or, 48-23 or, **25 dBA**. Measured infrasonic unweighted average levels outdoors were approximately 73 dB at 0.3 Hz at 1100 feet. Assuming 3 dB per doubling of

distance (cylindrical spreading) [2][3] for infrasonic propagation, a probable average infrasonic level at 3-1/2 miles is 73-10log(1100/18480) or, 73-12 or, **61 dB**. More work is needed to establish what infrasonic levels are consistent with relief for the neighbors.

The sample seismometer graph below shows the time varying waveform inside R2, the closest home at 121206 3:33 am with several turbines turning. Signal is filtered to pass the blade pass frequency and first four harmonics. Peak levels were 0.2 to 0.3 Pa (living room; scale shown approximately in milliPa), about 80 to 83 dB peak.



At R3 on 121207 110pm winds were light and the neighbors described the conditions as "tolerable" with no real problems. The sample seismometer graph below shows the time varying waveform for that period inside R3, the farthest home away in the testing. Peak levels were roughly 0.05 Pa (living room; scale shown approximately in milliPa), or about 50 dB peak. These results are preliminary and roughly similar to Dr. Walker's infrasonic data.



3 H. Møller and C. S. Pedersen: Low-frequency wind-turbine noise from large wind turbines. J. Acoust. Soc. Am. 129 (6), June 2011.

5.7 ***Negative health effects were experienced.*** During testing Mr. Rand experienced again [4] some of the adverse health effects reported by the neighbors. In effect, Mr. Rand "peer-reviewed" the neighbors by staying in two of the homes for extended periods of time overnight to experience what they are reporting. Mr. Rand slept in R1 the night of December 4th to assess the effects on sleep, and worked at R2 much of the second night (to 5:30 am) to assess audibility and effects while awake. Wind turbine sound levels were faintly detectable with interior sound levels in the range of 18-20 dBA. Note: Although he had arrived the previous night feeling good, on awakening on December 5 Mr. Rand felt nauseous (very unusual). To summarize, Mr. Rand encountered unusual negative health effects during the testing period when near the operating wind turbines, including, at various times:

- **Nausea**
- Headache
- Dizziness

Symptoms persisted after the testing for about a week, relieved by rest away from the site. The other investigators do not get seasick and did not report the same negative health effects.

Implications

A nauseogenic factor is present. Naval, aviation and other research has established human sensitivity to motion producing nausea. While mechanism for motion sickness is not well understood, "theories all describe the cause of motion sickness via the same proposition: that the vestibular apparatus within the inner ear provides the brain with information about self motion that does not match the sensations of motion generated by visual or kinesthetic (proprioceptive) systems, or what is expected from previous experience". The range of motion nauseogenicity has been measured at 0.1 to 0.7 Hz and with a maximum nauseogenic potential at 0.2 Hz [5][6] (see Figure 1). The Nordex N100 has a rotational rate of 0.16 to 0.25 Hz and a nominal blade passage rate of 0.5 to 0.7 Hz (three times the rotational rate). A hypothesis is suggested based on the limited, preliminary research correlating acceleration and nauseogenicity: ***Nauseogenicity is present at Shirley due to acceleration on inner ear from modulated, impulsive acoustic pressure at rotation and/or blade passage rates.***

Note: Wind turbines produce periodic acoustic pressure modulations at the rotation rate (per blade) and blade passage rate (per turbine), due to changes in wind speed and turbulence as blades are rotated top to bottom, and as they pass the tower where a pressure blow zone changes local wind speed. Pressure modulations at BPF with strong rates of change were documented by Dr. Walker (see Dr. Walkers report and the main report, conclusions).

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4 Nausea/dizziness/headache (very unusual) experienced at three other wind turbine sites including Falmouth, MA, April 2011 (Vestas V82); Hardscrabble, NY, August, 2012 (Gamesa G90-2MW); Vader Piet, Aruba, October, 2012 (Vestas V90-3MW).
5 Samson C. Stevens and Michael G. Parsons, Effects of Motion at Sea on Crew Performance: A Survey. Marine Technology, Vol. 39, No. 1, January 2002, pp. 29–47.
6 Golding JF, Mueller AG, Gresty MA., A motion sickness maximum around the 0.2 Hz frequency range of horizontal translational oscillation. Aviat Space Environ Med. 2001 Mar;72(3):188-92.

Note: Wind turbines encounter stronger winds at the top of rotation compared to the bottom. As each blade rotates through a full turn (one revolution) the blade is forced, bent, or flexed back by stronger wind load at the top of rotation and then returns to a lesser amount of bending at the bottom of rotation (the bending moment). Flexing occurs at the rotation rate. It's hypothesized that the blade displaces or disturbs a volume of air proportional to bending moment, translating motion into sound pressure at the flexing frequency, just as a loudspeaker moves air by displacement. Blade flexing may also impart a forcing function into the tower then transmitted into the ground, traveling to the house which responds, yielding two paths for acceleration on the inner ear.

Figure 2 shows rotational rates in Hz for various wind turbine models, for the total frequency span of 0.1 to 1 Hz associated with nauseogenicity. As wind turbine MW ratings have increased, the blades have become longer and less stiff with larger bending moments, and the rotational rate has decreased. The operating rpm for the Nordex N100 is 0.16 to 0.25 Hz with blade pass rates at 0.5 to 0.7 Hz.

Under the hypothesis of nausea produced by a periodic forcing acceleration on the inner ear either at rotation or blade pass rates, the Nordex N100 operates in or near the documented range of highest potential for nauseogenicity. Earlier turbine models studied for annoyance (primarily the stall- regulated models shown) have shorter, stiffer blades with smaller bending moments and do not have rotation rates near the peak potential nauseogenic frequencies. Consistent with the hypothesis, a limited review of a previous wind turbine noise study on community effects near smaller wind turbines [3] did not find nausea.

The only range of frequencies capable of creating an identical level throughout an enclosed structure are frequencies with wavelengths significantly larger than the size of the enclosed volume (the house). This points to the lower infrasonic frequency range below 10 Hz. This is consistent with the nauseogenic hypothesis for a driving force near 0.2 Hz and, the highest sound levels which were measured in the range of 0.2-0.4 Hz (see main report) with the wind turbines turning at 9 to 14 rpm (0.16 to 0.25 Hz) with blade pass rates of 0.5 to 0.7 Hz. While the highest sound levels indoors were down near 0.2 Hz, the most strongly coupled acoustic frequencies were the first several multiples of 0.7 Hz.

Shirley neighbors reported sleep interference in affidavits. Sleep deprivation magnifies the occurrence of motion sickness because it interferes with the vestibular system habituation process [4]. Further, many people suffer the misery of motion sickness without vomiting [4].

Conclusions

Nauseogenicity is a factor at Shirley. Acceleration of the inner ear is suggested due to extremely low-frequency pulsations at the rotation and blade pass rates that occur in or near the frequencies of highest potential for nauseogenicity and, are coupled strongly into the homes now abandoned. More research at Shirley is recommended to understand nauseogenicity from wind turbine operations, to properly design and site large industrial wind turbines (over 1 MW) near residential areas to prevent the severe health effects. More work is needed to establish what infrasonic levels are consistent with relief for the neighbors.

Medical research and measurement is urgently needed to be field coordinated along with infrasonic acoustic and vibration testing. The correlations to nauseogenicity at the 2.5MW power rating and size suggest worsening effects as larger, slower-rotating wind turbines are sited near people.

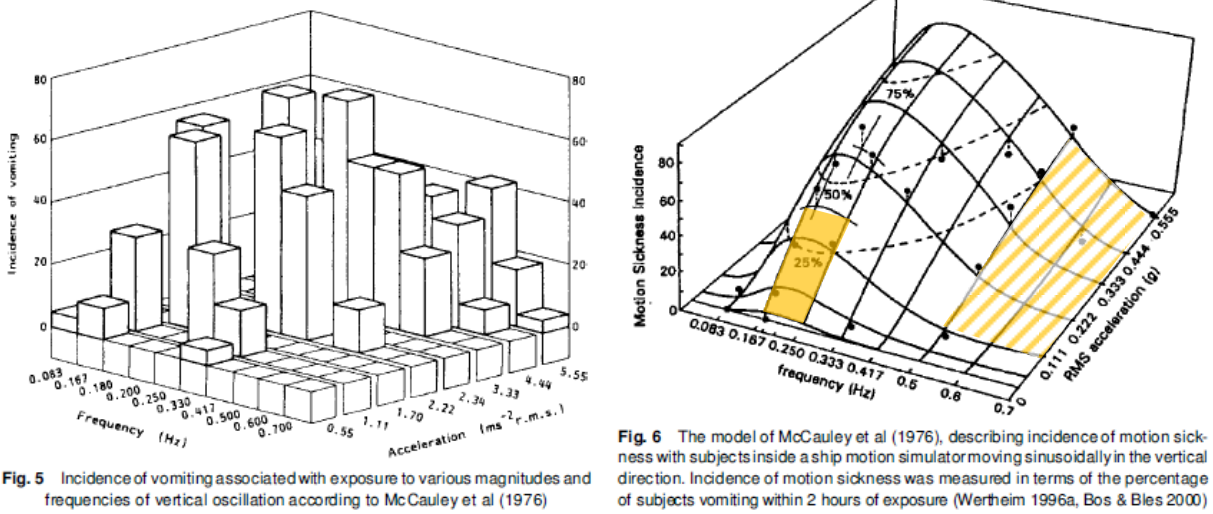


Fig. 5 Incidence of vomiting associated with exposure to various magnitudes and frequencies of vertical oscillation according to McCauley et al (1976)

Fig. 6 The model of McCauley et al (1976), describing incidence of motion sickness with subjects inside a ship motion simulator moving sinusoidally in the vertical direction. Incidence of motion sickness was measured in terms of the percentage of subjects vomiting within 2 hours of exposure (Wertheim 1996a, Bos & Bles 2000)

Figure 1. From Stevens et al (2002) Figure 5 showing incidence of vomiting associated with vertical oscillation according to McCauley et al (1976) and modeled. Colored patches postulate association between rotational rate (solid), BPF(striped) and response at Shirley (nausea, did not vomit); acceleration level was not measured.

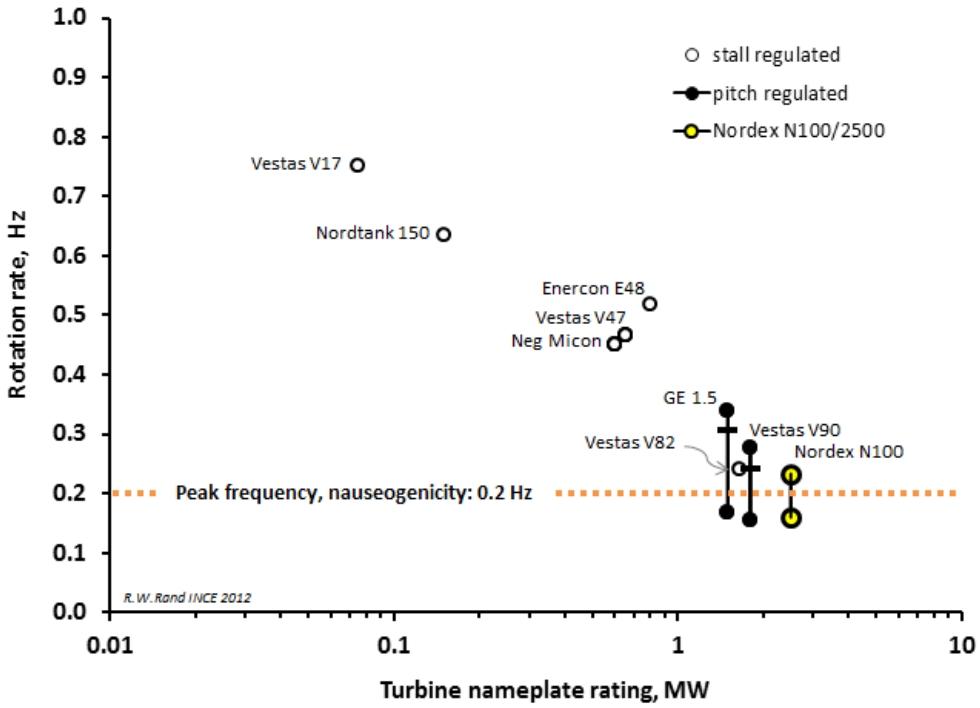
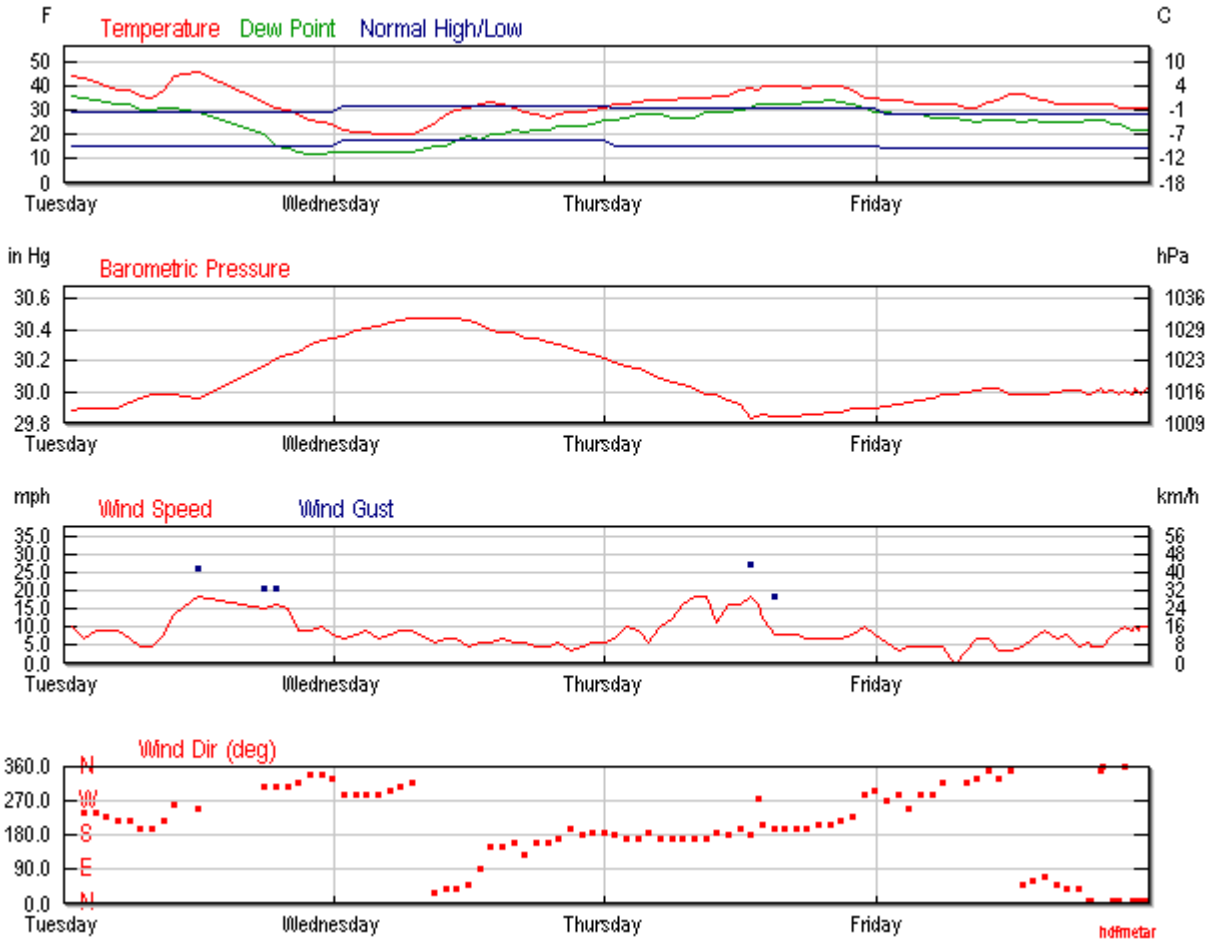


Figure 2. Chart of wind turbine rotation rates (Hz) for various wind turbine models including the Nordex N100. Note nauseogenicity range is 0.1 to 1 Hz with peak potential noted at 0.2 Hz. Note bars on GE 1.5 and Vestas V90 models indicate nominal rotation rate.

Figure 3. Weather conditions during investigations, December 4-7, 2012.



Weather source: KGRB Green Bay, WI. December 4-7, 2012
http://www.wunderground.com/history/airport/KGRB/2012/12/4/CustomHistory.html?dayend=7&monthend=12&yearend=2012&req_city=NA&req_state=NA&req_statename=NA&MR=1

Investigations of infrasonic and low-frequency noise
Shirley Wind Facility, Wisconsin, December 4-7, 2012

Table 1. Symptom reports logged during investigations.

Date	Time	Location	Condition	Report By
12/4/2012	before 8:15 pm	R1 - Enz	Intolerable (left the home).	Mrs. Enz
12/4/2012	after 8:15 pm	R1 - Enz	Lessened. (sound levels dropped)	Rand Schomer, Rand
12/4/2012	9:30 pm	R2 – Cappelle	Dizzy, tight chest. (No sensation)	Mrs. Cappelle (Mr. Cappelle)
12/5/2012	7 am	R1 – Enz	Slept at R1. Nauseous on awakening (very unusual).	Rand
12/5/2012	11:45 am	R1 – Enz	Feel okay. WTs stopped.	Rand
12/5/2012	12::45 pm	R3 – Ashley	Feel all right. Light winds, only 2 of 8 WTs turning	Rand
12/5/2012	8:38 pm	R2 - Cappelle	Headache, left ear full.	Rand
12/5/2012	9 pm	R1 – Enz Kitchen area	Chest pain (both parties) Left ear pain "Pain of wall echoing off head."	D. Enz, D.Ashley D. Enz D. Ashley
12/5/2012	9:10 pm	R1- Enz Kitchen area	Both ears feel blocked.	Rand
12/5/2012	9:23 pm	R1 – Enz Blue bedroom	Feeling okay. Not comfortable.	Rand D. Enz, D. Ashley
12/5/2012	10:45–11:15 pm	R2 – Cappelle	Felt ill 10:45 pm, felt better around 11:15 pm. Symptoms explained-not WTs.	P. Schomer, Bruce Walker
12/5/2012	11:45 pm	R2 – Cappelle	Feeling okay except pressure in left back of head (very unusual). Stayed listening, judging condition, and observing seismometer until 12/6/12 5:30 am.	Rand
12/6/2012	1:08 pm	R2 – Cappelle	Headache onset, intensified all day (very unusual).	Rand
12/6/2012	2:06 pm	R2 – Cappelle	Pressure in back of head (very unusual, felt only at other wind turbine sites).	Rand
12/6/2012	2:55 pm	R2 – Cappelle	Very dizzy on stairs, almost fell, had to steady with hand, pressure in back of head, strong headache (very unusual).	Rand
12/7/2012	12:02 pm	R3 – Ashley	"very tolerable"; right ear popping and cracking.	D. Ashley
12/9-15/12	after testing	Maine	Dizziness, nausea persist. Eye fatigue. PC work reduced.	Rand

Investigations of infrasonic and low-frequency noise
Shirley Wind Facility, Wisconsin, December 4-7, 2012

Table 2. Neighbor field notes.

				Enz and Ashley
Name:		Darren Ashley	Location:	Homes
Date	Time	What you were feeling	Wind direction	# turbines on
4-Dec	12-1 pm	Tight chest, slight starting ear pain/pressure	west	4-6
4-Dec	2:30-3:30	Ears burning, more burning as on more turbine starts up	west	4-6
4-Dec	8:45 PM	Ears burning, especially strong sensation as I approached west window in Enz house	west/northwest	6 I think
5-Dec	am	Traveled from Denmark home to Schmidt home, mild ear pain in and outside of home, and while traveling	southeast	on and off
5-Dec	3-4:30 pm	At Schmidt home, in basement, fixing furnace, mild ear pain, very anxious all day into evening.	southeast	6 of 8
5-Dec	9-9:45 pm	pain in middle of my chest at Enz house, could not sit in kitchen against north wall because of head pain/pressure, no strong sensation as I would approach window west windows	south/southeast	6 of 8
6-Dec	12-12:45 am	felt strong presence in cozy room at Schmidt house, better outside not nearly as anxious all day	south/southeast	8
6-Dec	12-12:45 am	I had a tight neck while sitting on couch at Schmidt house, waiting for test	south/southeast	8
6-Dec	11:30 AM	drove thru wind farm, no issues, no pain, no headache	south	ZERO
6-Dec	12:40-12:50 pm	Driving home from Schmidt home thru wind farm I had a splitting headache, which lessoned as got further away.	south	7
6-Dec	4:15 PM	Stood on Glenmore road, close to Shirley road, felt sicker and sicker through my body the longer I stayed	south/southwest	6?
6-Dec	4:25 PM	could feel pressure in cozy room at Schmidt house, not as strong as night before, but still detectable	Southwest	5
6-Dec	4:35 PM	While testing I stepped outside, two turbines at School rd were off, I could immediately feel pressure in my right ear as the two turbines started up, reported this to Rand. At Schmidt home	Southwest	2at School rd and 3 others

Investigations of infrasonic and low-frequency noise
Shirley Wind Facility, Wisconsin, December 4-7, 2012

Table 2 (continued). Neighbor field notes.

				Enz and Ashley
Name:		Dave Enz	Location:	Homes
4-Dec	8:30 AM	Headache, tight chest, unstable at Enz home	west	4
4-Dec	3:00 PM	blurred vision, tight chest, head pressure at Enz Home	West	4-5
5-Dec	am	head and ear pressure, felt upstairs in Schmidt house from turbines dir	S-SE	1-3
5-Dec	9-10 pm	At Enz home, felt chest pain mostly on left side-it moved toward the center. It felt like my forehead was being pushed into my head, ear pressure, pain queasy stomach.	SE I think	8?
5-Dec	Midnight	At Schmidt house, head pain and ear pressure, both downstairs along east side of house where it was the worst, eyes blurry, upset stomach and unstable	SE	
6-Dec	1:00 AM	we stopped on Highview RD and videoed turbines, loud whooshing and thumping sounds varied a lot as the turbines meshed with each other.	SE	
6-Dec	1:45 AM	while laying in bed, my chest started to quiver, I checked my pulse, it seemed OK. It lasted a few minutes. Eyes are blurry and I am very unstable, I don't feel well yet.	In Denmark away from turbines	
6-Dec	8:00 AM	At Denmark House, away from turbines. Working on computer difficult due to blurry vision/eye strain. Still unstable and nauseated. I don't feel well, hope it will pass soon. Ears are still burning and sore. I don't think I will go among turbines today. I am not sure being a lab rat. Left eye seems out of touch with right eye.	In Denmark away from turbines	

Name:		Rose Enz	Location:	Enz Home
Date	Time	What you were feeling	Wind direction	# turbines on
4-Dec	8:30 AM	My ears started hurting as we retrieved some items out of the house before testing	tails to the house	
4-Dec	8:45 PM	My ears started hurting and then I started side stepping as not walking in a straight line. I had a hard time not tripping over all the wires. I sat down in my rocker chair, kitchen corner for a short time, felt sick to my head and stomach.	tails to the house	

APPENDIX D
by
SCHOMER AND ASSOCIATES, INC.

SCHOMER AND ASSOCIATES, INC.
Consultants in Acoustics and Noise Control

Paul D. Schomer, Ph.D., P.E.
Member; Board Certified
Institute of Noise Control Engineering

2117 ROBERT DRIVE
CHAMPAIGN, ILLINOIS 61821
PHONE: (217) 359-6602
FAX: (217) 359-3303

December 21, 2012

I) Observations from discussions with residents:

Four of the five researchers; George Hessler, David Hessler, Bruce Walker, and Paul Schomer met with affected residents of Shirley and discussed the problems they had that were precipitated by the wind turbines. This discussion produced several notable points not previously known by this researcher.

1. At most locations where these health problems occurred, the wind turbines were generally not audible. That is, these health problems are devoid of noise problems and concomitant noise annoyance issues. The wind turbines could only be heard distinctly a one of the 3 residences examined, and they could not even be heard indoors at this one residence during high wind conditions.

2. The residents could sense when the turbines turned on and off; this was independent of hearing the turbines.

3. The residents reported "bad spots" in their homes but pointed out that these locations were as likely to be "bad" because of the time they spent at those locations, as because of the "acoustic" (inaudible) environment. The residents certainly did not report large changes from one part of their residences to another.

4. The residents reported little or no change to the effects based on any directional factors. Effects were unchanged by the orientation of the rotor with respect to the house; the house could be upwind, downwind, or crosswind of the source.

5. Residents of the nearest house reported that their baby son, now 2 years old, would wake up 4 times a night screaming. This totally stopped upon their leaving the vicinity of the wind turbines, and he now sleeps 8 hours and awakens happy.

I) Implications of these observations:

1. The fact that these residents largely report wind turbines as inaudible, and the reported effects on a baby seem to rule out the illness being caused by extreme annoyance as some have suggested.

2. The lack of change with orientation of the turbine with respect to the house and the lack of change with position in the house suggest that we are dealing with very low frequencies; frequencies where the wind turbine size is a fraction of the wavelength--about 3 Hz or lower.

II) Observations from results of measurements:

1. These observations are based upon the coherence plots and coherence graphs produced by Bruce Walker. He produced both amplitude, frequency and coherence plots and 10 minute coherence charts showing only amplitude and frequency. While both show the same thing, this analysis concentrates on the latter because the former have only a 30 dB dynamic range. Figures 1 and 2 show the coherence between the outdoor ground plane microphone and 4 indoor spaces at Residence 2: the living room, the master bedroom, behind the kitchen, and in the basement. Figure 3 shows the single valid example of basement measurements at Residence 3. The data from Residence 2 are for optimum wind conditions in terms of the turbine operation. Whereas the data at Residence 3 are for low wind conditions and not necessarily indicative of what would be found were the wind turbines operating at normal power.

2. In Implications (I), it is inferred from the resident observations that the important effects result from very low frequency infrasound, about 3 Hz or lower. We can test the assertion with the data collected at the three residences at Shirley. Only Residence 2 was tested during optimum wind conditions, so that is the primary source of data used herein. Figures 1 and 2 show the coherence

between the outdoor ground plane microphone and the four indoor spaces listed above. First, we examine Figure 1. All of the four spaces exhibit coherence at 0.7 Hz, 1.4 Hz, 2.1 Hz, 2.8 Hz and 3.5 Hz, and in this range there is no coherence indicated except for these five frequencies. The basement continues, with coherence exhibited at 4.2 Hz, 4.9 Hz. 5.6 Hz, 6.3 Hz and 7 Hz. The coherence in the basement drops low from 10-18 Hz and is more or less random and low after 18 Hz. Figure 1b shows the coherence just for the frequency range from 10 Hz to 35 Hz, and essentially this figure exhibits random patterns with no correlation from one room to the next. For example, coherence with the microphone behind the kitchen is high from 10-14 Hz and the master bedroom is high from 12-14 Hz while the other two spaces exhibit low coherence, and again the master bedroom is high 28-35 Hz with the others being low, and the living room is high from 50-58 Hz with the other spaces low; no pattern. In contrast all four spaces are lock step together in their coherence with the outdoor microphone below about 4 Hz. Figure 2, another sample from Residence 2 shows much the same pattern. In this case, 0 .7 Hz, 1.4 Hz, 2.1 Hz clearly are evident for all four spaces. For some reason 2.8 Hz is much reduced for the living room but 3.5 Hz is evident for all four spaces. In terms of the basement a number of other peaks are evident up to about 8 Hz where the basement then falls low until about 18 Hz and is random thereafter. As with Figure 1, there is no pattern to the coherence function above about 8 Hz.

3. Residence 2, and indeed all three residences, exhibit classic wall resonances in about the 10-35 Hz range which are different for each room and exposure, so it is reasonable to suppose that the randomness in the 10-35 Hz region in the above ground rooms is the result of wall resonances. The basement, which has no common wall with the outside, exhibits generally the lowest coherence in the 10-35Hz region. Thus, I conclude that the only wind turbine related data evident in the measurements at Residence 2 are the very low frequencies ranging from the blade passage frequency of 0.7 Hz to up to about 7 Hz. This conclusion is consonant with the residents' reports that the effects were similar from one space to another but a little to somewhat improved in the basement, the effects were independent of the direction of the rotor and generally not related to audible sound.

4. Figure 4 shows the coherence as functions of both time and frequency, and it is clear that the basement shows the greatest coherence below 8Hz of the four spaces and the least coherence above 8Hz. This result further supports the conclusion that it is the very low frequencies that are important.

5. Figure 3 is for Residence 3 which was 7000 feet from the nearest turbine, in contrast to Residence 2 which was only 1100 feet from the nearest turbine. Even here with much reduced amplitude there seems to be several frequencies where the four spaces have peaks together beginning at 0.8 Hz. However, unlike Residence 2, the coherence functions for all four of the space move together from about 15 Hz to 70 Hz. The sound pressure level at the outdoor microphone and at each of the four indoor spaces shows every harmonic from what appears to be the first harmonic at 20 Hz through 200 Hz. To my thinking this was clearly a loud outdoor source with a fundamental frequency of just under 20 Hz. And indeed it was. I called Bruce and he told me it was a helicopter. (I was not present the last day)

6. Figure 5 shows the sound pressure level for first minute of the 10 minutes represented by Figure 1, above. This figure, which is sensitive to the lowest frequencies shows that at these very low frequencies the sound pressure level in all four spaces is quite similar. The small changes from different positions in the house also suggests that the house is small compared to the wavelength so that the insides of the house are acting like a closed cavity with uniform pressure throughout being driven by very low-frequency infrasound.

II) Implications of the measurements:

1. The measurements support the hypothesis developed in (I)that the primary frequencies are very low, in the range of several tenths of a Hertz up to several Hertz. The coherence analysis shows that only the very low frequencies appear throughout the house and are clearly related to the blade

passage frequency of the turbine. As Figure 5 shows, the house is acting like a cavity and indeed at 5 Hz and below, where the wavelength is 200 Ft or greater, the house is small compared to the wavelength.

III) Observations from related literature:

1. We consider a 1987 paper entitled: Motion Sickness Symptoms and Postural Changes Following Flights in Motion-Based Flight Trainers .

This paper was motivated by Navy pilots becoming ill from using flight simulators. The problems encountered by the Navy pilots appear to be somewhat similar to those reported by the Shirley residents. This 1987 paper focused on whether the accelerations in a simulator might cause symptoms similar to those caused by motion sickness or seasickness. Figure 6 (Figure 1 from the reference) shows the advent of motion sickness in relation to frequency, acceleration level and duration of exposure. To develop these data, subjects were exposed to various frequencies, acceleration levels and exposure durations, and the Motion Sickness Incidence (MSI) was developed as the percentage of subjects who vomited. Figure 6 show two delineated regions. The lower region is for an MSI of 10%. The top end of this region is for an exposure duration of 30 minutes and the bottom end is for eight hours of exposure. The upper delineated region has the same duration limits but is for an MSI of 50%. The acceleration levels indicated for the SH3 Sea King Simulator show that the accelerations in the y and z direction went well into the nauseogenic region as defined by the Navy, whereas the P3-C Orion simulator had comparable accelerations in the x direction and lower accelerations in the y and z direction. Not surprisingly pilots' reports of sickness increased dramatically after exposure to the SH3 simulator while exposure to the P3 -C simulator had virtually no effect on reports of sickness.

2. What is important here is the range encompassed by the delineated regions of Figure 6. Essentially, this nauseogenic condition occurs below 1 Hz; above 1Hz it appears that accelerations of 1G would be required for the nauseogenic condition to manifest itself. While the Navy criteria are for acceleration, in Shirley we are dealing with pressures in a closed cavity, the house. Acceleration of the fluid filled semi-circular canal in the ear will manifest itself as force on the canal. The similarity between force on the canal from acceleration and pressure on the canal from being in a closed cavity suggest that the mechanisms and frequencies governing the nauseogenic region are very similar for both pressure and acceleration.

3. As the generated electric power of a wind turbine doubles the sound power doubles and the blade passage frequency decreases by about 1/3 of an octave. The wind turbines at Shirley have a blade passage frequency of about 0.7 Hz. This suggests that a wind turbine producing 1 MW would have a blade passage frequency of about 0.9 Hz, and on Figure 6, a change from 0.7 Hz to 0.9 Hz requires a doubling of the acceleration for the same level of response. Thus, it is very possible that this nauseogenic condition has not appeared frequently heretofore because older wind farms were built with smaller wind turbines. However, the 2 MW, 0.7Hz wind turbines clearly have moved well into the nauseogenic frequency range.

III) Implications from the Navy's Nauseogenic Criteria:

1. This analysis suggests that similar problems to the problems in Shirley can be expected for other wind turbines that have the same or lower fundamental frequency. The Navy criteria suggests that to maintain the same level of health-related effects as have occurred heretofore, the levels of a 2 MW,0.7 Hz wind turbine as experienced in the community must be 6 dB lower than those for 1 MW, 0.9 Hz wind turbine. Moreover, Figure 6 does not bode well for future larger wind turbines if they go even lower in frequency.

IV) Descriptors for Wind Turbine Emissions

1. Currently the wind turbine industry presents only A-weighted octave band data down to 31 Hz. They have stated that the wind turbines do not produce low frequency sound energies. The

measurements at Shirley have clearly shown that low frequency infrasound is clearly present and relevant. A-weighting is totally inadequate and inappropriate for description of this infrasound. In point of fact, the A-weighting, and also the C and Z-weightings for a Type 1 sound level meter have a lower tolerance limit of -4.5 dB in the 16 Hz one-third-octave band, a tolerance of minus infinity in the 12.5 Hz and 10 Hz one-third- octave bands, and are totally undefined below the 10 Hz one-third-octave band. Thus, the International Electro-technical Commission (IEC) standard needs to include both infrasonic measurements and a standard for the instrument by which they are measured.

V) The Tests We Should Perform

1. That the wind turbines make people sick is difficult to prove or disprove. However, the sensing of the turbines turning on or off is testable. Consider the two houses where there is no audible sound. Residents would arrive at the house with the wind turbines running for something like a 2-hour test. Sometime during the first hour, the wind turbines might or might not be turned off. If turned off, it would be the residents task to sense this "turn off" within some reasonable time--say 1 hour. Correct responses (hits) would be sensing a "turn off" when the turbines were turned off, or sensing no change if they were not turned off. Incorrect responses (misses) would be failure to sense a turn off when the turbines were turned off, or "sensing" a turn off when the turbines were not turned off. Similar tests could be done starting with the turbines initially off.

2. It would be necessary to prevent the subjects from seeing the turbines or being influenced by one another. If everyone marked a silent response on their board or into their laptop at the same time; say every 5 minutes, then no one would be able to know another person's responses. Pure chance is 50/50, so a hit rate statistically significantly greater than 50/50, and/or a miss rate statistically significantly less than 50/50 would indicate that the residents were able to sense the wind turbines without the use of sight or sound.

3. Testing would take about 3 to 5 good days; days when the wind was such that the wind turbines were operating at a substantial fraction of full power. Up to 3 tests per day could be done, with 3-4 subjects in each of the two, or possibly 3, houses. Physical measurements would be made of the before and after conditions at each house simultaneously to correlate with the sensing tests. Each subject would be tested up to 5 times. Note: Testing multiple times per day presupposing that the subjects could tolerate such a rigorous testing schedule.

4. The testing would require at least 1 researcher at each house to take the physical measurements and one researcher to supervise the sensing test with one test "proctor" per test room. It would be necessary for the proctor to help the researcher performing the physical measurements during non-test hours with activities like calibration.

5. Conduct of this test clearly requires the assistance and cooperation of Duke Energy. This test can only be done if Duke Energy turns on and off the turbines from full power, as requested and for the length of time requested.

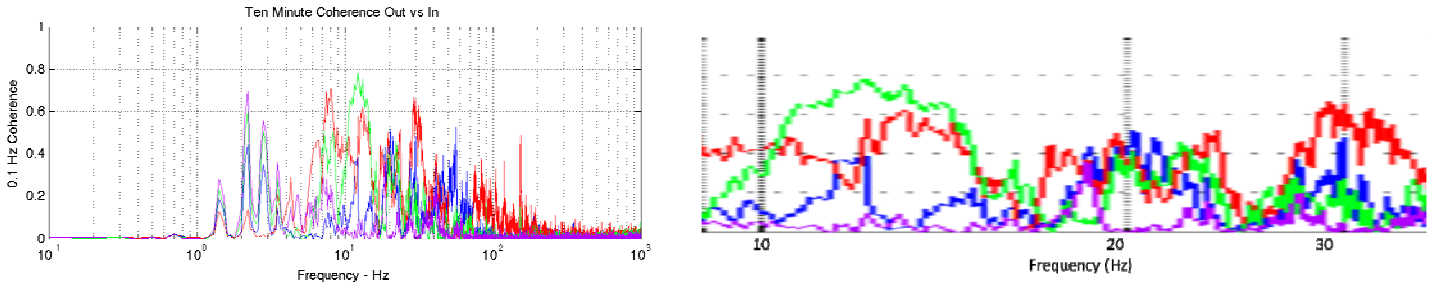


Figure 1a, b: R2-5T212420--coherence with outdoor-ground plane microphone; Living Room-Blue, Master Bed Room- Red, Behind Kitchen- Green, Basement-Purple, b is an expanded view from 9` Hz to 35 Hz

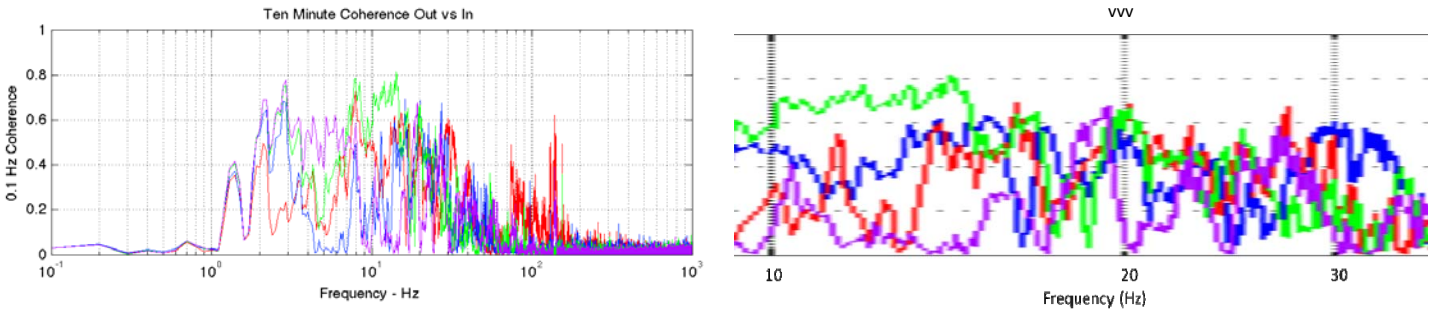


Figure 2a, b: R2-5T204657--coherence with outdoor, ground-plane microphone; Living Room-Blue, Master Bed Room-Red, Behind Kitchen- Green, Basement-Purple, b is an expanded view from 9 Hz to 35 Hz

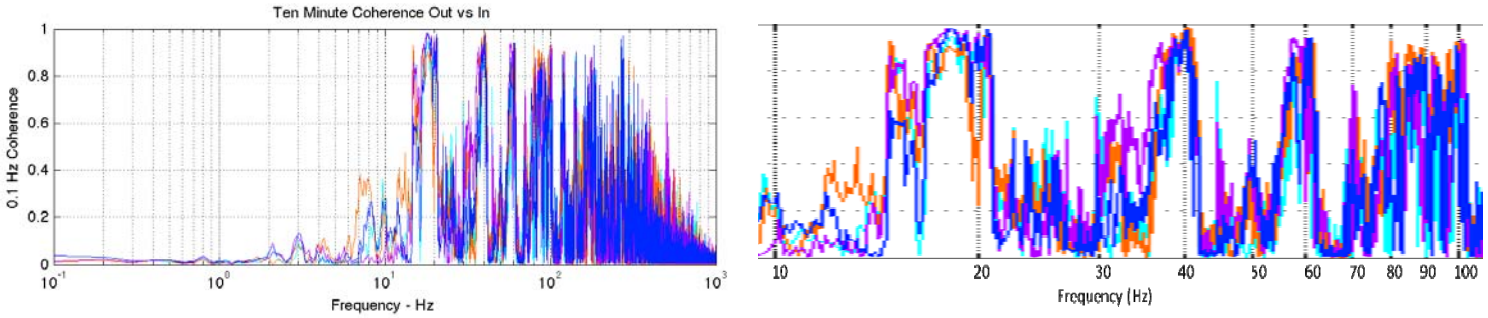
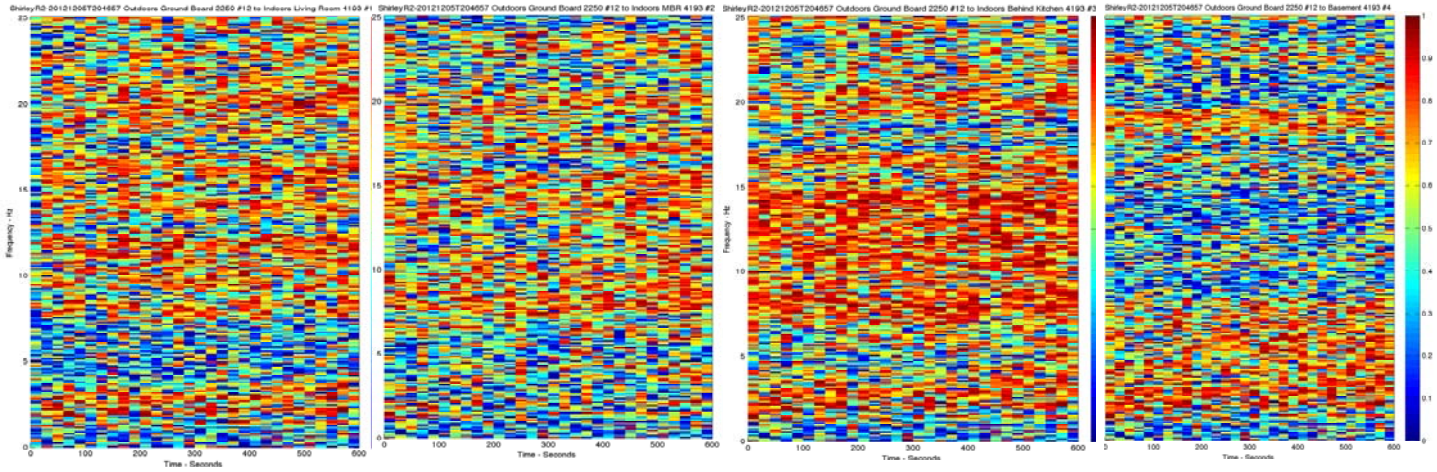


Figure 3a, b: R2-5T204657; Living Room-Blue, Upstairs Bed Room- Orange, Family Room- Turquoise, Basement-Purple, b is an expanded view from 10 Hz to 100 Hz. Note the strong coherence from 20 through at least 80 Hz that resulted from a nearby Helicopter.



4a- Living Room 4b- Master Bed Room 4c- Behind Kitchen 4d- Basement

Figure 4a,b,c,d- Coherence with the outside ground microphone and the four inside microphones in the locations indicated. Note the Basement (4d) which does not have walls coincident with outside shows high coherence at the wind turbine blade passage frequency for several harmonics and almost no coherence above about 8 Hz where the at or above ground walls are resonant.

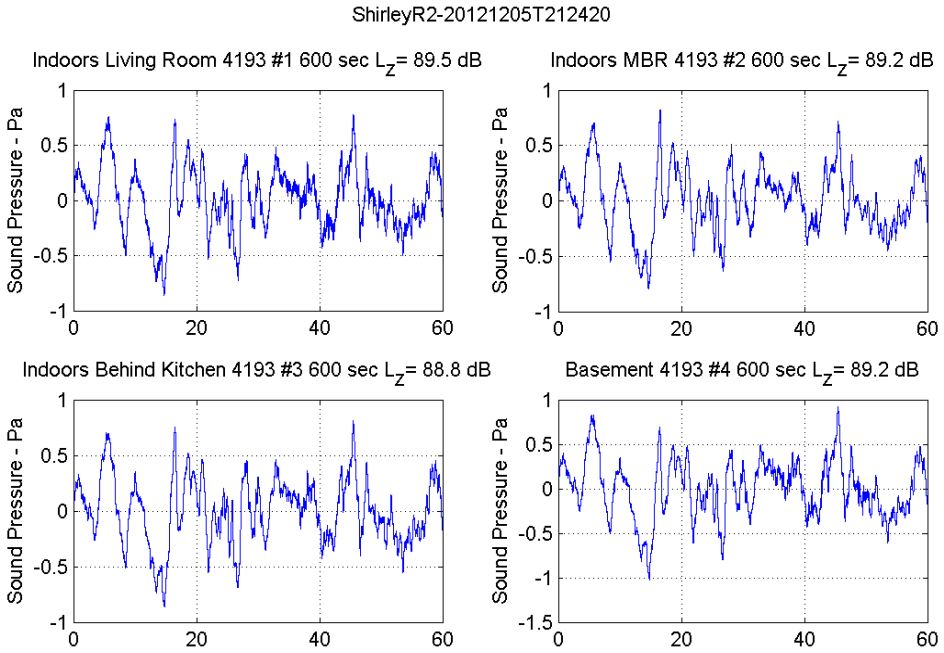


Figure 5- First of the ten minute period of 5T212420. Note that the SPL is very similar for all indoor locations.

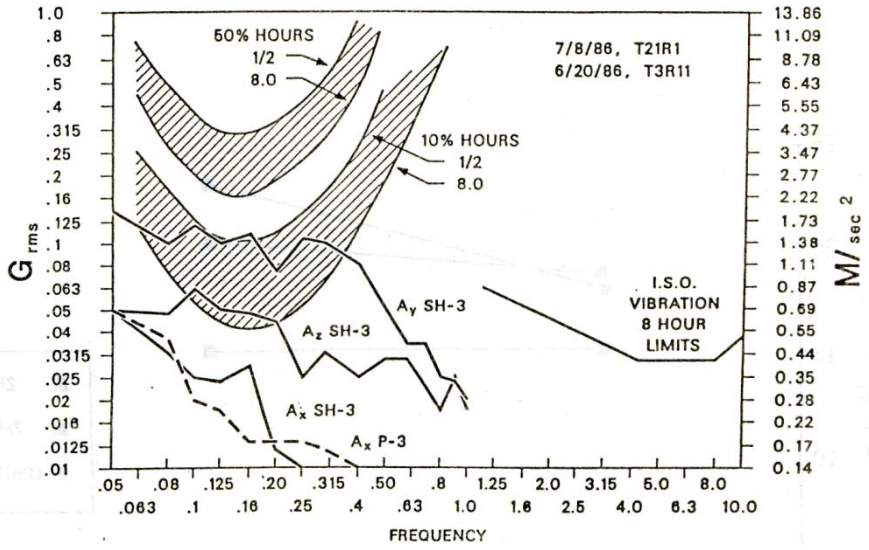


Figure 6. SH3 Sea King Nominal Run vs P-S Orion Nominal A_x

Figure 1 from "Motion Sickness Symptoms and Postural Changes Following Flights in Motion-Based Flight Trainers"

R.S. Kennedy, G.O. Allgood, B.W. Van Hoy, M.G. Lilienthal, **(1987).** " Motion Sickness Symptoms and Postural Changes Following Flights in Motion-Based Flight Trainers," Journal of Low Frequency Noise and Vibration, **6** (4), 147-154.

A theory to explain some physiological effects of the infrasonic emissions at some wind farm sites

Paul D. Schomer[a)]
Schomer and Associates, Inc., 2117 Robert Drive, Champaign, Illinois 61821

John Erdreich
Erdreich Forensic Acoustics, 1 Westover Way, Edison, New Jersey 08820

Pranav K. Pamidighantam and James H. Boyle
Schomer and Associates, Inc., 2117 Robert Drive, Champaign, Illinois 61821

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For at least four decades, there have been reports in scientific literature of people experiencing motion sickness-like symptoms attributed to low-frequency sound and infrasound. In the last several years, there have been an increasing number of such reports with respect to wind turbines; this corresponds to wind turbines becoming more prevalent. A study in Shirley, WI, has led to interesting findings that include: (1) To induce major effects, it appears that the source must be at a very low frequency, about 0.8 Hz and below with maximum effects at about 0.2 Hz; (2) the largest, newest wind turbines are moving down in frequency into this range; (3) the symptoms of motion sickness and wind turbine acoustic emissions "sickness" are very similar; (4) and it appears that the same organs in the inner ear, the otoliths may be central to both conditions. Given that the same organs may produce the same symptoms, one explanation is that the wind turbine acoustic emissions may, in fact, induce motion sickness in those prone to this affliction.
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[BSF] Pages: 1356–1365

I. INTRODUCTION

For at least four decades there have been reports in the scientific literature of people experiencing motion sickness-like symptoms attributed to low-frequency sound and infrasound. For example, Dawson (1982) makes the following points:

"Apart from the matter of acoustic fatigue in buildings and other structures, the main problem arising from excessive low frequency noise concerns people who can be disturbed, annoyed, made wretched or ill by acoustic insult to a degree which can be disruptive on a local scale and which nationally produces significant economic and social penalties."

He adds that: "[With] low frequency noise some people can be distressed to an extreme degree while others remain quite unaffected."

"Once a person has displayed some sensitivity to low frequency noise, further exposure lowers the sensitivity threshold."

"Any sensitivity is exacerbated by the presence of other stresses. The low frequency sensitivity syndrome includes: Feelings of irritation, unease, stress, undue fatigue, headache, nausea, vomiting, heart palpitations, disorientation, swooning, prostration."

Fifteen years later, Tesarz *et al.* (1997) reports much the same scenario: "In case studies of persons sensitive to low frequency noise, symptoms such as pressure on the eardrum or a pulsating feeling on the eardrum have been the most consistent result. Other symptoms that have been reported in both field and experimental studies are tiredness, irritation and uneasiness, difficulties to concentrate, headache, nausea and dizziness…."

Adopting the conclusions of Tesarz, Annex C, Clause C.1 of ISO 1996-1 (2003) states "…that the perception and the effects of sounds differ considerably at low frequencies as compared to mid or high frequencies." The text goes on to list six reasons for these differences. Two of these reasons are: (1) "perception of sounds as pulsations and fluctuations," and (2) "complaints about feelings of ear pressure." These are the same two effects as those listed in the preceding text by Tesarz as "most consistent."

Now these same problems are appearing in the vicinity of wind farms, and as in 1982 and earlier, nobody understands how these problems arise; nor is it understood why only a fraction of the population is affected.

The purpose of this paper is to provide a foundation upon which the reported effects of infrasound from wind turbines may be investigated. This paper presents a theory upon which needed investigations can go forward. The Appendix outlines some elements of a research statement.

II. DATA FROM A PROBLEM SITE

A. Observations from people affected by the installation of wind turbines

One wind farm that is experiencing these problems is in Shirley, WI. Here three families have abandoned their homes

a)Author to whom correspondence should be addressed. Electronic mail: schomer@SchomerAndAssociates.com

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because family members who became ill after installation of the turbines could not acclimate to the situation.[1] Because of these conditions in Shirley, a study was conducted with the proposed test plan calling for the wind farm owner to cooperate fully in supplying operational data and by turning off the units for short intervals so the true ON/OFF impact of turbine emissions could be documented. The owner declined this request citing the cost burden of lost generation from the eight turbines at the Shirley site.

Four acoustical consulting firms cooperated to jointly conduct this study: (1) Channel Islands Acoustics (ChIA), (2) Hessler Associates, Inc., (3) Rand Acoustics, and (4) Schomer and Associates, Inc.

This study was conducted during a 3-day period in December, 2012. The first task accomplished was to meet with residents having problems with the wind turbine acoustic emissions including members of the three families who had abandoned their homes. These discussions with the residents yielded the following observations:

(1) At most locations where these various symptoms occurred, the wind turbines were generally not audible. That is, these problematic symptoms are devoid of noise problems and concomitant noise annoyance issues. The wind turbines could only be heard distinctly at one of the three residences examined, and they could not even be heard indoors at this one residence during high wind conditions.
(2) Some residents reported that they could sense when the turbines turned on and off; this was independent of hearing or seeing the turbines. This assertion by the residents is readily testable, and a plan to test this assertion is briefly summarized in the Appendix.
(3) The residents reported "bad spots" in their homes but pointed out that these locations were as likely to be "bad" because of the time they spent at those locations as because of the "acoustic" (inaudible) environment. The residents did not report large changes from one part of their residences to another.
(4) The residents reported little or no change to the effects based on any directional factors. Effects were unchanged by the orientation of the rotor with respect to the house; the house could be upwind, downwind, or crosswind of the source.
(5) Many of the residents reported motion sickness like symptoms as adverse effects associated with the wind turbines.

Two of the major implications of these five findings are: (1) Because these residents largely report wind turbines as inaudible, it seems that suggestions some have made that these conditions are being caused by extreme annoyance can be ruled out and (2) the lack of change with orientation of the turbine with respect to the house and the lack of change with position in the house suggest that we are dealing with very low frequencies; frequencies such that the wavelength is a large fraction of the wind-turbine diameter (i.e., about 3 Hz or lower).

It should be mentioned that there are about 120 residences within about 5000 ft of the closest turbine; this suggests that there are about 275 residents. Of these 275 residents, 50 have described adverse effects that they have experienced after the introduction of the wind turbines. It is not known how many of the 120 residences are "participating," but most agreements for participating residences include some form of confidentiality and non-complaint clauses.[2]

The most common complaints are feelings of pressure and pulsations in the ears. And this is very much in accordance with ISO 1996-1 (2003) where, as discussed in the preceding text, these two factors are listed as the most common effects of low-frequency noise. However, in this paper, we are concentrating on sea-sickness like symptoms.

B. Physical measurements

Figure 1 is an aerial photo of the Shirley wind farm. This figure shows the positions of five of the eight wind turbines that make up this site, Nordex N-100 s, and the position of the three abandoned residences. Primary measurements were made at residences 1–3 on consecutive days.

Bruce Walker of Channel Island Acoustics employed a custom designed multi-channel data acquisition system to measure sound pressure in the time domain at a sampling rate of 4000/s where all signals are collected under the same clock. The system is calibrated to be accurate from 0.1 Hz thru 10 000 Hz. Measurements were made both inside and outside the house to gather sufficient data for applying advanced signal processing techniques.

George and David Hessler of Hessler Associates, Inc., employed four off-the-shelf type 1 precision sound level meter/frequency analyzers with a rated accuracy of ± 1 dB from 5 to 10 000 Hz. Two of the meters were used as continuous monitors to record statistical metrics for every 10-min interval over the 3-day period.

Robert Rand of Rand Acoustics observed measurements and documented neighbor reports and physiological effects including nausea, dizziness, and headache. He used a highly accurate microbarograph to detect infrasonic pressure modulations from wind turbine to residences.

Paul Schomer of Schomer and Associates, Inc., observed all measurements. Among other things the following observations are made based on the results of the physical measurements. In particular, these observations are based upon the coherence calculations by Bruce Walker. Figure 2 shows the coherence between the outdoor ground plane microphone and four indoor spaces at residence 2: The living room, the master bedroom, behind the kitchen, and in the basement. The data collected at residence 2 were measured with only 58% of turbine power, although the wind conditions were optimal for turbine operation, and the power was much less than 58% during the measurement periods at R1 and R3.

It is inferred from the residents' observations that the important effects result from very low frequency infrasound of about 3 Hz or lower. We can test this assertion with the data collected at the three residences at Shirley. Only residence 2 was tested during a time when significant power was being generated, so it is the only source of data used herein. Figure 2 shows the coherence between the outdoor ground plane microphone and the four indoor spaces listed above

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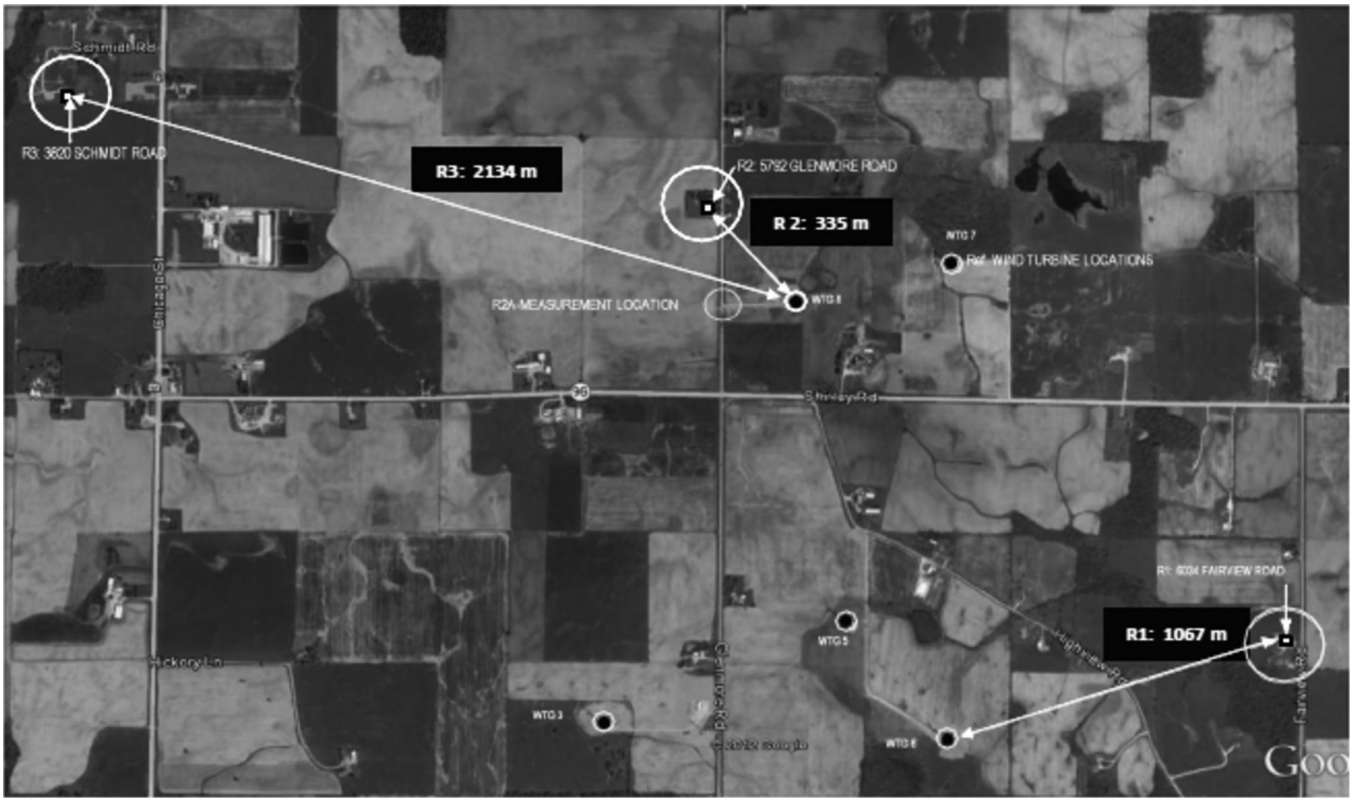


FIG. 1. Aerial photograph of the site showing the three residences and the five closest wind turbines.

for the frequency range from 0.5 to 7 Hz. All of the four spaces exhibit coherence at 0.7, 1.4, 2.1, 2.8, and 3.5 Hz, and in this range, there is no coherence indicated except for these five frequencies. The basement continues, with coherence exhibited at these higher harmonically related frequencies of 4.2, 4.9, 5.6, 6.3, and 7 Hz. The three indoor microphones situated on the first floor exhibit only random zones of high and low coherence as a function of frequency but not so as to correspond to other microphones in the house. That is, above 5 Hz the three indoor microphones exhibit only random periods of coherence, and above 7 Hz the basement microphone exhibits only random periods of coherence. But all four microphones are lock step together in their coherence with the outdoor microphone below about 4 Hz.

As an analysis that is complementary to the coherence plots of Fig. 2, Fig. 3 shows spectral plots of data collected at residence 2. As in the coherence plots, one can see the first several harmonics of the wind-turbine blade-passage frequency, 0.7 Hz, and nothing notable above about 7 Hz. Two channels of measurement are shown on Fig. 3, the outside, ground plane microphone (upper curve), and the indoor microphone in the living room (lower curve). Note that the pressures that result from the acoustic emissions of the wind turbines, when measured indoors, keep growing as the frequency goes lower because the entire house is behaving like a closed cavity.

Based on this analysis of the spectral and coherence data, we conclude that the only wind turbine-related data

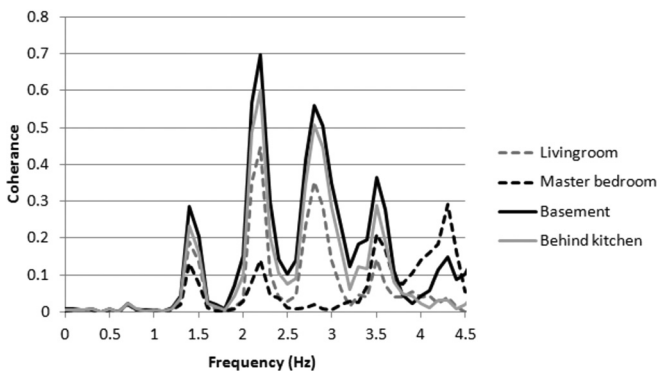


FIG. 2. Coherence between the each of the four indicated rooms with the outdoor-ground plane microphone.

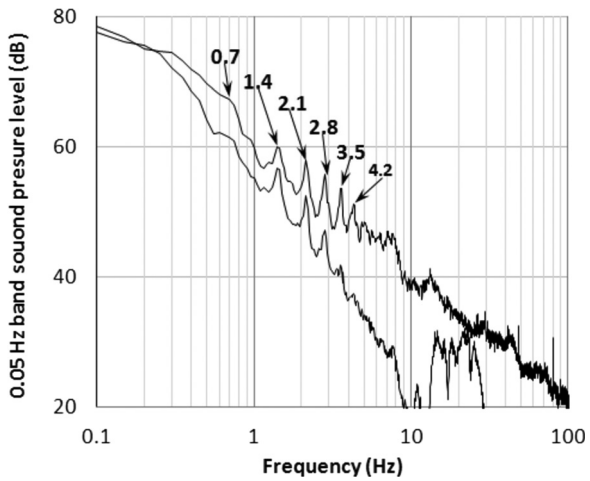


FIG. 3. Spectral plot of the ground-plain outdoor microphone data (upper trace) and indoor data measured in the living room of Residence 2 (lower trace).

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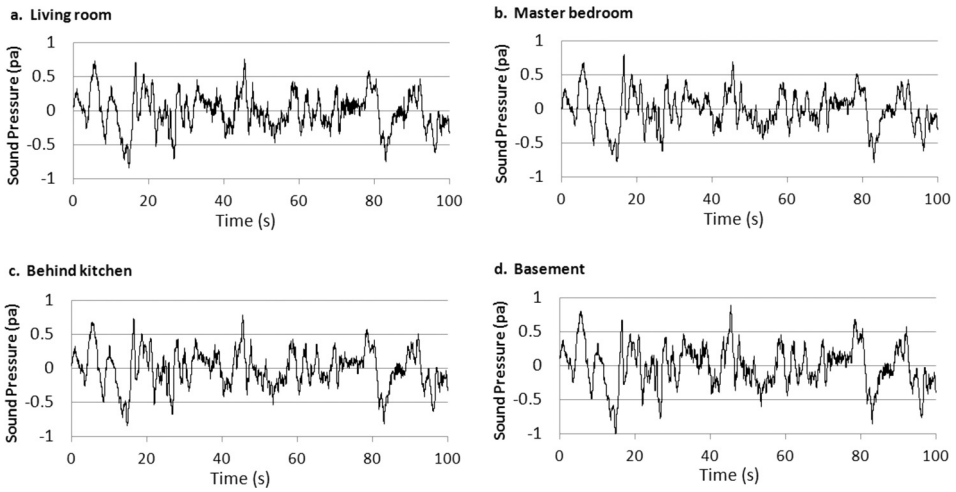


FIG. 4. Sound pressure versus time for of the data collected at the four indoor measurement locations indicated in Fig. 2 and for the first minute of data from the data set used for Fig. 2. Note that the sound pressure versus time is very similar for all indoor locations.

evident in the measurements at residence 2 are the very low frequencies ranging from the blade passage frequency of 0.7 Hz to up to about 7 Hz. This conclusion is consistent with the residents' reports that the effects were similar from one space to another but a little to somewhat improved in the basement, the effects were independent of the direction of the rotor and generally not related to audible sound.

Figure 4 shows the sound pressure level for the first minute of the 10 min represented on Fig. 2, above. This figure, which is sensitive to the lowest frequencies, shows that at these very low frequencies, the sound pressure levels in all four spaces are quite similar. The small changes from different positions in the house also suggests that the house is small compared to the wavelength so that the insides of the house are acting like a closed cavity with uniform pressure throughout being driven by very low-frequency infrasound.

The measurements support the hypothesis developed in the preceding text that the primary frequencies are very low, in the range of several tenths of a hertz up to several hertz. The coherence analysis shows that only the very low frequencies appear throughout the house and are clearly related to the blade passage frequency of the turbine. As Fig. 4 shows, the house is acting like a cavity and indeed at 5 Hz and below, where the wavelength is 60 m or greater, the house is small compared to the wavelength.

While we would have liked to have been able to draw conclusions on measurements at all three sites, that was not possible because the energy company was not generating much power during the measurements of R1 and R3, and even just over 50% during the measurements at R2.[3]

III. THE MOTION SICKNESS HYPOTHESIS

A. The Navy's nauseogenic region

As a starting point we consider a paper by Kennedy *et al.* (1987) entitled: "Motion sickness symptoms and postural changes following flights in motion-based flight trainers." This paper was motivated by Navy pilots becoming ill from using flight simulators. The problems encountered by the Navy pilots appear to be similar to those reported by about five of the Shirley residents. This 1987 paper focused on whether the accelerations in a simulator might cause symptoms similar to those caused by motion sickness or seasickness. Figure 5 (Fig. 1 from the reference) shows the advent of motion sickness in relation to frequency, acceleration level and duration of exposure. To develop these data, subjects were exposed to various frequencies, acceleration levels, and exposure durations, and the Motion Sickness Incidence (MSI) was developed as the percentage of subjects who vomited. Figure 5 shows two delineated regions. The lower region is for an MSI of 10%. The top end of this region is for an exposure duration of 30 min and the bottom end is for 8 hr of exposure. The upper delineated region has the same duration limits but is for an MSI of 50%.

What is important here is the range encompassed by the delineated regions of Fig. 5. Essentially, this nauseogenic condition appears to occur primarily below 1 Hz. Note that the Navy criteria are for acceleration, while in Shirley we are dealing with pressures in a closed cavity, the house. The similarity between force on the vestibular components of the inner ear from acceleration and pressure on these from being in a closed cavity suggests that the mechanisms and frequencies governing the nauseogenic region might be similar for both pressure and acceleration, and much of this paper is concerned with showing the plausibility of the ear responding in like fashion to accelerations of a moving vehicle and acoustic pressures at these same infrasonic frequencies (e.g., 0.7 Hz).

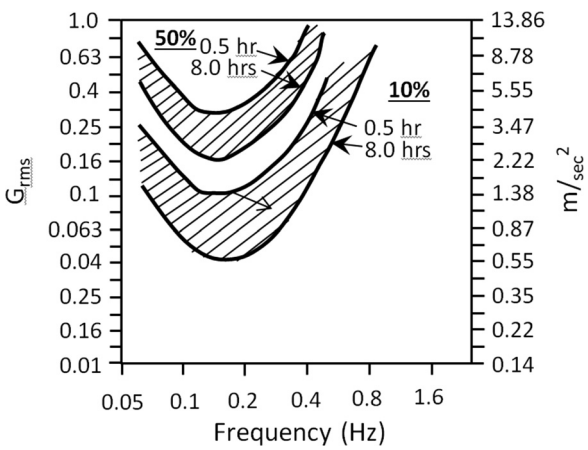


FIG. 5. The nauseogenic region as developed by the U.S. Navy (after Kennedy *et al.*, 1987).

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As the generated electric power of a wind turbine doubles, the sound power doubles and the blade passage frequency decreases by about 1/3 of an octave (Møller and Pedersen, 2011).[4] The wind turbines at Shirley have a blade passage frequency of about 0.7 Hz. This suggests that a wind turbine producing 1 MW would have a blade passage frequency of about 0.9 Hz, and on Fig. 5, a change from 0.7 to 0.9 Hz requires a doubling of the acceleration for the same level of response. Thus it is very possible that this nauseogenic condition has not appeared frequently heretofore because older wind farms were built with smaller wind turbines. However, the 2.5 MW, 0.7 Hz wind turbines clearly have moved well into the nauseogenic frequency range.

B. Motion sickness like symptoms and their implications

We systematically listed the symptoms of low frequency noise, as given by the two papers cited in the preceding text (Dawson, 1982; Tesarz *et al.*, 1997), and on the same basis, we listed the symptoms of sea-sickness, using two journal papers (Stevens and Parsons, 2002; Bittner and Guignard, 1988) and the symptoms listed by the National Health Service (2014) and C-Health (2013). Table I compares the various frequencies of the indicated symptoms of seasickness and low-frequency infrasound sickness from this published literature. The two sets of symptoms are strikingly similar.

Motion sickness, or kinetosis, is generally related to the vestibular, visual, and somatosensory systems (cf. Griffin, 1990). A common theory of the cause of kinetosis is that of sensory conflict: The information received from two or more sensory systems conflict (e.g., visual inputs in a closed room and vestibular inputs from a rolling boat) producing symptoms similar to that of ingesting a poisonous substance. The result is an evolutionary protective response to rid the body of a harmful foreign substance. Thus motion sickness is not really a sickness but rather is a natural reaction to unusual input information.

At the start of this analysis, the working hypothesis was that wind turbine noise somehow, because of the nauseogenic regions similarity, created symptoms that were similar to those of motion sickness. We now have a much simpler hypothesis—just as some people experience motion sickness when watching movies and videos, wind-turbine acoustic emissions trigger motion sickness in those who are susceptible; it is another form of *pseudo-kinetosis*.

TABLE I. Percent of references citing symptom indicated.[5]

	Composite of four sea sickness studies or information papers	Composite of two low frequency "sound" sickness studies
Not feeling well	100	100
Dizziness	100	100
Headache	100	100
Nausea and vomiting	100	100
Sleepiness, drowsiness, and sleep disturbance	75	100
Fatigue and tiredness	75	100
Difficulty thinking	25	50
Irritation	25	100
Sweating	100	0
Pale	75	0

At Shirley, of the 50 people who reported symptoms after the introduction of wind turbines to the area, 5 of those 50 people reported symptoms similar to motion sickness. We simply have no information on other area residents, except for these 50, and do not know how many of the other residents are participating.[3] Based on the sample of 5 of 50, we can say that the incidence of motion sickness symptoms at Shirley is 10% or less, a figure that is clearly in line with the expected percentage of those in the general population affected by motion sickness.[6] In fact, Montavit (2014) indicates that "about 5% to 10% of the population is extremely sensitive to motion sickness; 5% to 15% are relatively insensitive; and about 75% are only subject to it to a 'normal,' i.e., limited degree."

In our meeting with affected residents discussed in the preceding text, it was stated that each person affected by the wind farm noise in the form of motion sickness symptoms was also motion sickness sensitive. The same is true for Rob Rand and Steve Ambrose, who are two acoustical researchers who have themselves reported suffering strong symptoms from low frequency wind-turbine emissions.

As noted in the preceding text, inconsistent proprioception, accelerations, and visual cues may not be resolved and cause a defensive emetic response. For example, during a car trip, nerves and muscle receptors do not register any movement because the body itself is sitting still. The eyes, on the other hand, send the brain a message of fast motion. The equilibrium organ in the inner ear delivers information of curves, acceleration, and/or ascents that contradict the messages from the other two sources. This contradictory flood of impulses and information overburdens a healthy sense of equilibrium that the brain, in turn, interprets as a danger situation. It then releases stress hormones, which in turn create symptoms of dizziness and nausea.

So to induce a sense of motion where none exists and thereby create the sensory conflict that is requisite to induce motion sickness requires that the acoustic signal cause the vestibular system to "tell the brain" it is accelerating when the ocular system is telling the brain there is no motion.

IV. EXCITATION OF THE OTOLITH

A. The middle ear and inner ear

As shown on Fig. 5, the Navy criteria for the likelihood of sea sickness are functions of three factors: (1) Duration of exposure to the motion, (2), amplitude of the acceleration, and (3) frequency of the acceleration. Moreover, because the blade passage frequency has been decreasing and the acoustic power has been increasing as the turbines get larger, one can imagine a future with greater, more frequent problems like those in Shirley (Møller and Pedersen, 2011) (footnote 4). There is one main question that greatly affects the likelihood of this eventuality. This main question relates to the fact that the Navy criteria are based on acceleration, while the wind-turbine acoustic emissions are very low frequency acoustic pressure waves.

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In the following, we show only that it appears that an acoustic wave at 0.5–0.7 Hz can generate a similar response as the signal generated by acceleration at 0.5–0.7 Hz. This discussion analyzes the linear motion sensing function of the ear and explains how the ear could respond to wind turbine emissions. We are concerned primarily with the inner ear.

Figure 6 shows just the inner ear, which contains the cochlea, the organ that transforms the sound wave into locally acting vibration at frequencies ranging from about 10 Hz to about 20 kHz (Obrist, 2011). The inner ear also contains the vestibular system, which controls and facilitates balance and motion. The system of semicircular canals has evolved to be able to sense rotational movements of the head while remaining rather insensitive to forces arising either from translational acceleration of the body or gravity: The cupulae normally have a similar specific gravity to that of the endolymph. The vestibular perception of translational forces originates normally from sensory systems (maculae) located within the utricle and saccule.

As shown in Fig. 7, the classical description for the maculae are flat gelatinous masses (otollithic membrane) covered with minute crystals (otoconia) connected to an area of the utricle and saccule by cells, including hair cells. A suitably oriented translational force will cause the mass to exert a shear force, resulting in a variation in the firing rate of the hair cells. The maculae cover an area of a few square millimeters. They are located on the floor and lateral wall of the utricle and, in an orthogonal plane, on the anterior wall of the saccule (Griffin, 1990).

These six inner ear organs, the cochlea, the three SCCs, the saccule, and the utricle, open into the inner space, the vestibule. The inner ear is divided into distinct fluid-filled chambers containing perilymph and endolymph. A hard bone and fluid (perilymph) surrounds the scala media, which are filled with endolymph, and the only openings to the "outside" are two windows, the round window, which separates the air-filled middle ear from the fluid-filled inner ear by a thin membrane, and the oval window, which connects to the stapes, and also separates the inner ear from the middle ear by means of a thin (round window) membrane (Obrist, 2011).

As the acoustic pressure impinges on the tympanic membrane, it travels through the middle ear and into and through the inner ear from the oval window to the round window. Like a transformer in an electric circuit, the middle ear increases the pressure by 29 dB with a corresponding decrease in velocity. This transformer matches the impedance of air to the impedance of the inner ear fluids. At high frequencies, the tympanic membrane develops modes that affect the transmission of sound across the middle ear. Low frequencies do not create these vibration modes and the membrane vibrates as a "plate." The round window is compliant and responds to the pressure wave that travels up the scala vestibuli and down the scala tympani to create shear forces in the cochlea. These two "tunnels" surround the basilar membrane. Additionally, there is a communication between the scala vestibuli and the vestibular system by means of which acoustic pressure might be transmitted to the otoliths.

B. Classical model of the otolith

We have shown there is a plausible path for the infrasound pressures to reach the inner ear and in particular the otoliths. The classical model of the otolith is shown pictorially in Fig. 7. The otoconial layer is a rather dense, firmer layer of the otolith. It thickens at the surface. The otoconial layer gets its density from embedded calcium carbonate crystals (otoconia). The otoconial layer creates an inertial force when accelerated owing to its mass. This force is transferred to the gel layer (cupula), which then bends the hair cells causing them to transmit signals to the brain. Figure 7 shows in a simple way how the mass in the otoconial layer creates an inertial force that results in shear forces in the cupula and bending of the hair cells coupled into the cupula. So the fundamental measurement by the otolith is the inertial force of the otoconial layer (Grant and Best, 1986); the otolith is measuring force.

C. Calculations of forces acting on the otolith

In this section, we approximate and compare two potential forces acting on the otoliths: (1) Inertial force to accelerations and (2) forces due to the instantaneous pressure in an acoustic wave.

Although the more complete solution for modeling the motion of the otolith is given by a parabolic partial differential equation (Grant and Best, 1986), the frequency response of the otoliths is flat from DC to about 10 Hz (McGrath, 2003), the

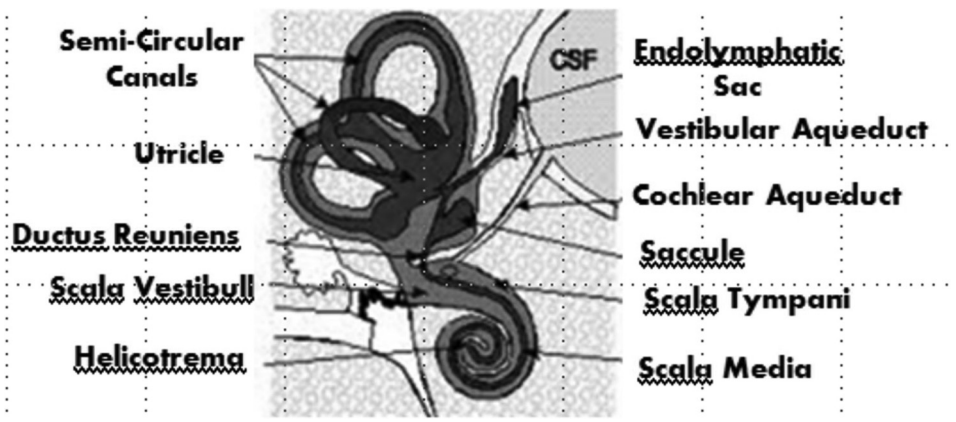


FIG. 6. The inner ear (after Salt, unpublished data).

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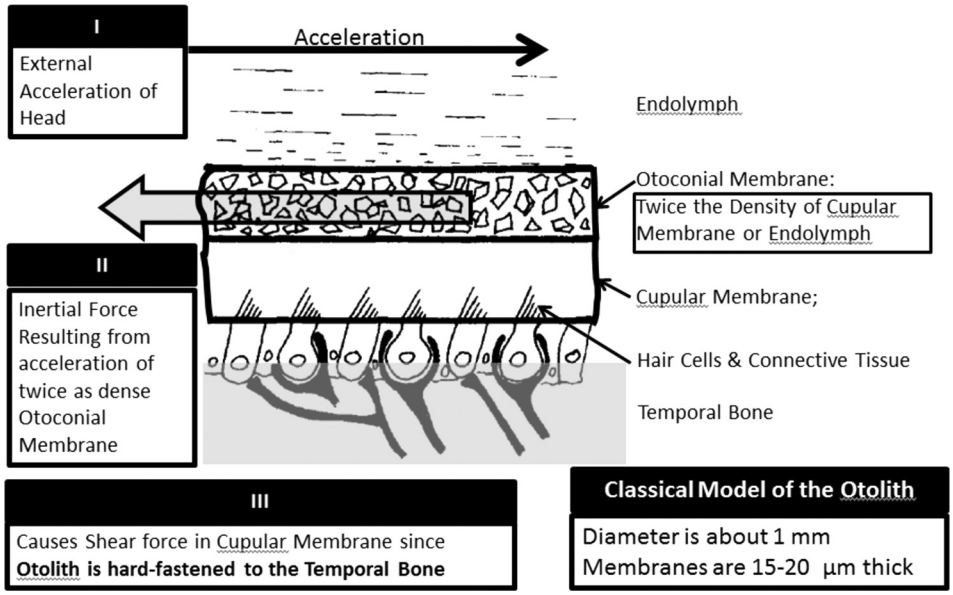


FIG. 7. Schematic sectional drawing of the classical model for the otolith.

position of the poles in the response being functions of assumptions for values of certain parameters describing physical attributes of the layers and their constituents. For an order of magnitude calculation, we simply consider $F = \text{ma}$, where the acceleration is precisely the acceleration of the head, and the mass is the differential density of the otoconial layer minus the density of the surrounding fluid and the cupular membrane times the volume of the otoconial layer. Although calcium carbonate has a density of 2.7 g/cm^3, the density of the otoconial layer is taken to be 2 g/cm^3 because it is a combination of the dense calcium carbonate and the less dense gel material. The density of the cupular membrane and of the endolymph, which has properties given as being similar to water, is taken as 1 g/cm^3, so the differential density is 1 g/cm^3 or 1000 kg/m^3. As can be seen in the classical model of the otoliths (Fig. 7), they are approximated as round and their diameter is about 1 mm. The thickness of the otoconial layer has been given as 15–20 μm (Grant and Best, 1986). Therefore we calculate: the mass = density $*$ height $*$ top surface area or, mass(kg) $= 10^3$ (kg/m^3) $* 18 * 10^{-6}$ m $* \pi * 0.5 * 10^{-3} * \text{m} * 0.5 * 10^{-3} * \text{m} = 18 * \pi/4 * 10^{-9} \approx 1.4 * 10^{-8}$ kg, where density $= 10^3$ (kg/m^3), height $= 18 * 10^{-6}$ m, and top surface area $= \pi * 0.5 * 10^{-3} * \text{m} * 0.5 * 10^{-3} * \text{m}$. With reference to Fig. 7, we take the acceleration to be 5 m/s^2, so the acceleration force,

$$F_{\text{accel}} = 7 * 10^{-8}\text{N}.$$

In terms of the pressure of an acoustic wave, we take the sound pressure level (SPL) to be 54 dB, which corresponds to 0.01 Pa, and because of the "transformer" function of the middle ear, we assume a 29 dB gain in pressure. Therefore the acoustic force, $F_{\text{acous}} = 28 * 0.01 * \pi/4 * 10^{-6}$ N $\approx 22 * 10^{-8}$ N.

D. Excitation of the otoliths

More recent research tends to confirm the model presented in the preceding text for the excitation of the saccule. It is shaped something like an elongated hemi-sphere with the base of the hemi-sphere rigidly attached to the temporal bone and the otoconial layer on the top where under the force of acceleration shear forces can be set up in the cupula. However, there is radically new information about the utricle. Uzun-Coruhlu *et al.* (2007) have used x-ray microtomography and a method of contrast enhancement to produce data revealing "that the saccular maculae are closely attached to the curved bony surface of the temporal bone as traditionally believed, but the utricular macula is attached to the temporal bone only at the anterior region of the macula" (see Fig. 8). This changes the model for excitation of the utricular macula. According to Uzun-Coruhlu *et al.* in the classical view of the utricular macula

"…the sub-surface of utricular macula is implied (if not actually stated) to be rigid; these models do not accommodate the "floating" utricular macula which we have shown and which is consistent with other anatomical evidence (e.g. Schuknecht, 1974). Since the hair cell receptors on the utricular macula are stimulated by forces there would be a major difference in modeling the sensory transduction of the macula to such forces if the forces acted on a tenuously supported flexible membrane or acted on a membrane which is rigidly attached to bone. As an example, modeling the magnitude of utricular hair cell displacement to an increased dorso-ventral g-load during centrifugation will be quite different if the whole membrane is deflected by the g-load or if it remains fixed in place. The latter rigid attachment has been explicitly or tacitly assumed, whereas our results show the macula is not rigidly attached to bone."

"The key information which is now required for realistic modeling of utricular transduction is information about the flexibility of the utricular membrane to determine the extent to which it would be deflected by such forces."

Essentially, Uzun-Coruhlu *et al.* are saying that the excitation of the otolith in the utricle depends on the flexibility of the utricular macula. Because the macula is not rigidly attached to the temporal bone, the classical model (Fig. 7) for excitation of the otolith by acceleration does not work. One way for inertial forces on the otolith to create bending forces is if the stiffness of the utricular membrane varies with position. Then inertial forces on the otolith will make

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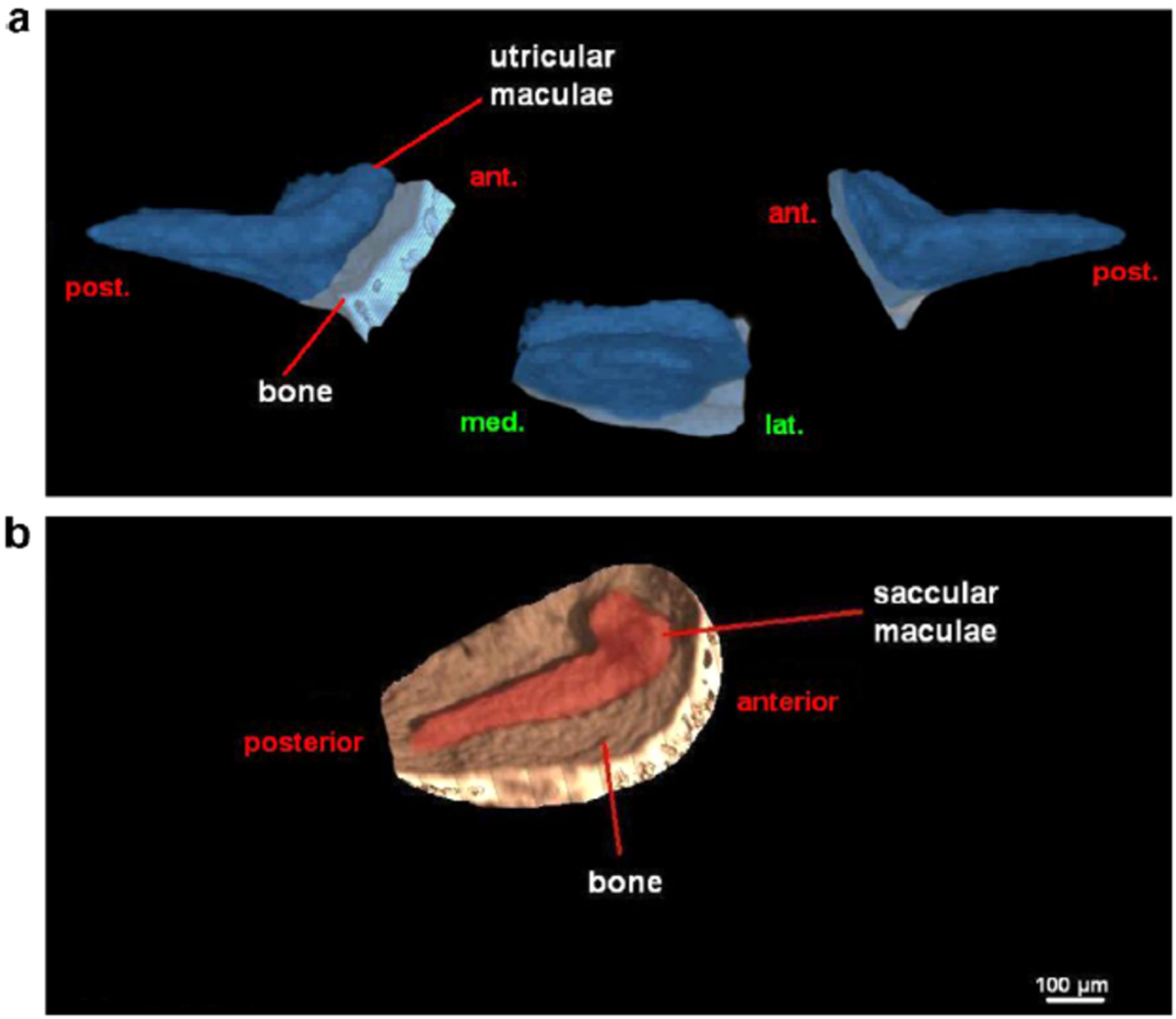


FIG. 8. (Color online) Artist rendered three-dimensional images of the utricular and the saccular maculae of a guinea pig (from Uzun-Coruhlu *et al.*, 2007).

the otolith "bulge" where it is less stiff and contract where it is stiffer, producing bending forces that will trigger the hair cells. Precisely the same thing will happen if the force is externally applied through the endolymph as when the force is internally applied through the otoconial layer. In this model, if there is external force on the utricle, it will expand where it is less stiff and contract where it is stiffer. In particular, the acoustic pressure that reaches the otolith through the eardrum and middle ear pathway described earlier should cause the utricular macula to signal the brain in virtually identical fashion to signals generated by inertial forces, i.e., forces generated by acceleration of the head. That is, the utricular macula should respond in like fashion to acoustic pressure fluctuations and direct acceleration of the head at the same frequency.

E. An example that indicates these theories may be correct

The pressure in the endolymph is a scalar; its "direction" is everywhere normal to the surface. Therefore in contrast to true inertial forces that are vectors, the acoustic pressure will always excite the same hair cells independent of the orientation of the head. So one who experiences this effect should always feel the same motions. And this is exactly what both Steve Ambrose and Rob Rand, who are both acousticians, each experienced. Rob Rand, one of the acoustical researchers on this project, the one who is sensitive to wind turbine acoustic emissions, said of his work in Falmouth, MA in April 2011: "I went outside hoping to feel better. I looked straight at a tree with my eyes, and my brain said the tree was about 20 to 30 degrees elevated and about 20 to 30 degrees to the right. Then I tried to focus on a bush looking straight at it, and again my brain said the bush was off to the right and elevated at about the same angle as before; and the same for the house. For everything I looked at, immediately my brain would say it was elevated and off to the right." Steve Ambrose had exactly the same experience, only not the same angles.

V. CONCLUSIONS

The wind turbine clearly emits acoustic energy at the blade passage frequency, which for the Nordex N100 is

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0.7 Hz and about the first six harmonics of 0.7 Hz. This very low infrasound was only found at R2, but that was the only day in which significant power was being generated (about 58%).

Most residents do not hear the wind-turbine sound; noise annoyance is not an issue. The issue is physiological responses that result from the very low frequency infrasound and that appears to trigger motion sickness mainly in some of those who are susceptible to it. These results suggest a relation between wind turbines and motion sickness symptoms in what appears to be a small fraction of those exposed. This finding does not prove our hypothesis that the otoliths are responding to the wind turbine infrasonic emissions. Rather, we can say that the pathway for inducing this condition appears to be the same as airborne transmission through the middle ear and thence to the vestibular sensory cells, but confirmatory research of the pathway is recommended.

Finally, it is shown that the force generated on the otoliths by the pressure from the infrasonic emissions of the wind turbines is perhaps three times larger than the force that would be generated by an acceleration that was in accordance with the U.S. Navy's nauseogenic criteria (Fig. 5 herein). That is, a 0.7 Hz "tone" at 54 dB produces about the same to three times the force as does a 5 m/s^2 acceleration.

VI. ADDITIONAL RESEARCH AND DATA COLLECTION RECOMMENDATIONS

Research to date has not tended to study the effects on humans reported anecdotally in what is probably a minority of wind farms even though these reports are exactly what is to be expected in accordance with ISO 1996-1 (2003). This paper provides part of the foundation upon which such research could be accomplished. Some of the necessary research is listed below. The first item in the list, perform sensing, is discussed in more detail in the Appendix.

(a) Perform the "sensing" tests outlined in the Appendix of this paper.
(b) Demonstrate electric signals going to the brain that emanate from the otoliths; signals that are in sync with the wind turbine emissions, where depending on method this testing would be done with surrogate species.
(c) Develop an understanding of why this phenomenon seems to affect residents near only a small minority of wind farms.
(d) Establish who is and who is not affected by wind turbine infrasonic emissions in various ways.
(e) Establish why this all occurs.

Currently the wind turbine industry presents only A-weighted octave-band[7] data down to 31 Hz, or, frequently 63 Hz, as a minimum. They have stated that the wind turbines do not produce low frequency sound energies. The measurements at Shirley have shown that low frequency infrasound is clearly present and relevant. As indicated by ISO 1996-1 (2003), A-weighting is inadequate and inappropriate for description of infrasound.

ACKNOWLEDGMENTS

The authors wish to acknowledge the extraordinary effort and trust that went into making the testing at the Shirley wind farm possible. First, there is the extraordinary effort of David and George Hessler and their client, Clean Wisconsin, who made these tests happen at the Shirley wind farm. Coupled with this effort were the extraordinary efforts by Glen Reynolds and Forest Voice who also made this test happen. Additionally, our acknowledgment goes to George Hessler for repeated reviews of the paper with helpful inputs and questions, and much credit is due to Bruce Walker for his development of a custom multi-channel time-domain very low frequency, 0.1 Hz, measurement system necessary for advanced signal processing and analysis between and among channels and his custom reprinting of the coherence and spectral plots herein from Shirley. Additionally, credit goes to Robert Rand for repeatedly being a firsthand source of knowledge about the effects of wind turbine emissions and for general thoughts and ideas. Our acknowledgment goes to Dr. Sarah Laurie (Southern Australia), Dr. Robert McMurtry (Ontario, Canada), and Dr. Jay Tibbitts (central Wisconsin); three physicians from around the world who searched their records to provide information on symptoms and histories. And finally, acknowledgments, Alec Salt for providing key references about the otoliths that led us in the right direction; Sumuk Sundarum, MD Ph.D. internal medicine, for review of an early draft; Stephen Chadwick, MD otolaryngology, for initial ideas and review of an early draft; Paul Schomer's good friend Michael Rosnick, MD family medicine, for correcting a misconception about the Eustachian Tube; and to Paul Schomer's daughter Beth Miller, Ph.D., for initial lessons and information on the anatomy and physiology of the ear.

APPENDIX: A TEST FOR PERCEPTION OF THE ACOUSTIC EMISSIONS FROM WIND TURBINES

In Shirley, residents stated that some of them could sense the turning on and off of the wind turbines without any visual or audible clue. This assertion is readily tested; however, it requires the cooperation of the energy company.

Consider the two houses at Shirley where there is no audible sound; the R-1 house and the R-3 house. The residents of the houses, and others who would be subjects, would arrive at the house with the wind turbines off. The test itself would take something like 2 h to perform. Sometime during the first hour, the wind turbines(s) that had been designated by the residents as the turbines they could sense, might or might not be turned on. It would be the residents' task to sense this "turn on" within some reasonable time designated by the residents–say 10 or 30 min. Correct responses (hits) would be sensing a "turn on" when the turbines were turned on, or sensing no change if they were not turned on. Incorrect responses (misses) would be failure to sense a turn on when the turbines were turned on, or (false alarms) would be "sensing" a turn on when the turbines were not turned on.

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Similar tests could not necessarily be done starting with the turbines initially on because the subjects, when sensitized find it more difficult to sense a turn off.

[1]The family in the closest dwelling, R-2, reported that the wife and their then 2-yr-old son had the problems; the husband did not have problems. This totally stopped upon their leaving the vicinity of the wind turbines.

[2]Traditionally, participating households are those that receive a share of the proceeds in exchange for having wind turbines or ancillary facilities or equipment on their property. As a part of these agreements, these households are required to agree to not complain about the wind turbines. At Shirley, the energy company also had their "good" neighbor policy wherein all residents who were not eligible to be participating were offered payments for agreeing not to make complaints or take any legal action.

[3]A report, including conclusions and recommendation, was written and signed by these five Shirley technical participants. One of the many interested parties and /or legal entities did not like the conclusions and expunged these from the report without obtaining the approval of the authors while retaining the signature block as it was. Both versions were eventually placed in the record and the complete version as written and signed can be found at the following link: http://psc.wi.gov/apps40/dockets/conten/detail.aspx?dockt_id=2535-CE-100c, go to *"Documents"*; then to "January 2, 2013, 8:40 A.M." (Ex. -Forest Voice-Rand2) (Last viewed 9/29/2014).

[4]Møller and Pedersen present data from 41 wind turbines. In Fig. 1, they plot the turbine sound versus power. These 41 data points form two clumps based on power; one at about 700 kW and the second at about 2 MW. Regression lines fit to two measures of the power both show that the sound level is increasing at a rate of about 12 dB for a tenfold increase in power or about 3.6 dB per decade. Normalized spectra for these same two groups exhibit about a one-third of an octave decrease in the spectrum for the higher power relative to the lower power (Sec. D, Fig. 16). There is also a third much smaller clump of 4 turbines with power ratings of about 100 kW that are not used for much in the paper.

[5]A major effort was made to logically group the "symptoms" in Table I. It is possible that this grouping should have gone further and grouped "sleepiness, drowsiness, and sleep disturbance" with "fatigue and tiredness." That combined "symptom" would have resulted in 100% for the two categories that make up the table.

[6]Montavit (2014) states that 5%–10% of the population are "extremely sensitive" and that 5%–15% are "relatively insensitive." So 5%–10% of the population is probably closer to the percentage that we should be using rather than 15%.

[7]One of the reviewers questioned the use of A-weighted octave band levels. The authors also question this, but the IEC standard requires that the data be reported this way and the wind farm industry concurs.

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DR. RIINA I. BRAY BASc, MSc, MD, FCFP, MHSc - ENVIRONMENTAL HEALTH CONSULTANT

Date: November 28th, 2018

Human Health and the Environment
Assessment and Management of Chronic Complex Conditions
13069 Keele Street
King City, Ontario
L7B 1G1

Hon. Sam Oosterhoff, Niagara West, Parliamentary Assistant to the Minister of Education
Mowat Block, 22nd Floor, 900 Bay St., Toronto, ON M7A 1L2, sam.oosterhoffco@pc.ola.org
Dr. Shanker Nesathurai, MD, MPH, FRCPC, Medical Officer of Health.
Haldimand Norfolk Health Unit, 117 Forest St. E., Dunnville, ON, Shanker.Nesathurai@hnhss.ca
Dr. M. Mustafa Hirji, Medical Officer of Health,
Niagara Public Health Unit, Thorold, ON , L2V 4T7, mustafa.hirji@niagararegion.ca
John Burnett CPHI, Team Leader, Environmental Health
Niagara Region Public Health, Thorold, ON, john.burnett@niagararegion.ca
Paul Widmeyer, District Manager (A), Hamilton District Office – West Central Region, Ministry of the Environment, Conservation and Parks, 199 King Street West, Hamilton ON L8P 4Y7,
Paul.Widmeyer@ontario.ca
Jason Hoffman, CIH, Health and Wellness Manager, Hydro One Networks Inc.
Jason.Hoffman@HydroOne.com

Dear Honourable MPP Oosterhoff, colleagues,

I am writing to express concern about the potential for harm for human health represented by Ontario's Industrial Wind Turbines (IWTs) and their supporting infrastructure. I have shared these concerns with your colleagues on a provincial level, but, given observations by residents shared with me, I am also specifically interested in the potential hazards represented for those living within and near the Niagara Regional Wind Farm.

Research has demonstrated how various various forms of pollutant from IWTs can adversely affect human health.[1] These emissions include noise, infra-sound, dirty electricity, and ground current which can each, along with shadow flicker, contribute to ill health among those who live near wind turbines.[2]

Havas and Colling's research draw on Frey and Hadden's work to note that "most people who live near wind turbines and complain of ill effects blame the effects on the noise generated by the turbines."[3] Indeed, research globally has suggested that noise from turbines does indeed contribute to ill-health, and the literature suggests best practices for IWT placement to avoid noise issues.[4] [5]

Havas and Colling also draw on existing research to note that "pressure waves at levels outside the range of human hearing can also have unpleasant side effects". The combination of low-frequency noise and infra-sound may produce, in patients, "a set of symptoms that include depression, irritability, aggressiveness, cognitive dysfunction, sleep disorder, fatigue, chest pain/pressure, headaches, joint pain, nausea, dizziness, vertigo, tinnitus, stress, heart palpitations, and other symptoms."[6] This combination of symptoms has been described by Pierpont as 'wind turbines syndrome'[7] and elsewhere

[1] Havas, M. and D. Colling (2011) Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. Bulletin of Science Technology & Society. 414-26. DOI: 10.1177/0270467611417852

[2] Ibid

[3] Frey, B. J., & Hadden, P. J. (2007). *Noise radiation from wind turbines installed near homes: Effects on health–With an annotated review of the research and related issues*. Retrieved from http://docs.wind-watch.org/wtnoisehealth.pdf

[4] Chouard, C.-H. (2006). Le retentissement du fonctionnement des eoliennes sur la sante de l'homme [Repercussions of wind turbine operations on human health]. *Panorama du medecin*. Retrieved from http://ventdubocage.net/documentsoriginaux/sante/eoliennes.pdf

[5] Shepherd, D and Billington, R. (2011) Mitigating the Acoustic Impacts of Modern Technologies: Acoustic, Health, and Psychosocial Factors Informing Wind Farm Placement. Bulletin of Science Technology & Society. 389–398.

[6] Havas, M. and D. Colling (2011) Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. Bulletin of Science Technology & Society. 414-26. DOI: 10.1177/0270467611417852

[7] Pierpont, N. (2009). *Wind turbine syndrome: A report on a natural experiment*. Santa Fe, NM: K-Selected Books.

as vibroacoustic disease.[8] [9] They note how U.S. Military research has also demonstrated that acoustic infrasound can have dramatic and serious effects on human physiology.[10] This research states that:

> Acoustic, infrasound: very low frequency sound which can travel long distances and easily penetrate most buildings and vehicles. Transmission of long wave- length sound creates biophysical effects, nausea, loss of bowels, disorientation, vomiting, potential organ damage or death may occur. Superior to ultrasound because it is "inband," meaning it does not lose its properties when it changes mediums such as air to tissue. By 1972 an infrasound generator had been built in France, which generated waves at 7Hz. When activated it made the people in range sick for hours.[11]

A significant impact on human health from IWTs can also result from electromagnetic pollution. The inverters and other technologies present within the turbines generate high levels of electrical distortion on the 60HZ sine wave of electrical current put on to the electrical grid by the renewable source.[12] This research around high levels of electrical distortion is confirmed by research by the Wind Plant Collector System Design Working Group, a part-industry organization, and published by the Institute of Electrical and Electronics Engineers (IEEE).[13] Also resulting from power generation in IWTs are increased levels of ground current often measured as voltage and often described as 'stray voltage.'[14] The circulation of these levels of distorted high-frequency signals, also known in the vernacular as 'dirty electricity,' as well as ground current or stray voltage in areas extending kilometers beyond individual IWT sites can contribute to electromagnetic injury and sensitivity to electromagnetic emissions.

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[8] Castelo Branco, N. A., & Alves-Pereira, M. (2004). Vibroacoustic disease. *Noise & Health*, *6*(23), 3-20.

[9] Castelo Branco, N. A. (1999). The clinical stages of vibroacoustic disease. *Aviation, Space, and Environmental Medicine*, *70*(3, Pt. 2), A32-A39.

[10] Bunker, R. J. (Ed.). (1997). *Nonlethal weapons: Terms and references* (INSS Occasional Paper No. 15). Colorado Springs, CO: USAF Institute for National Security Studies. Retrieved from http://www.aquafoam.com/papers/Bunker.pdf

[11] Ibid.

[12] Lobos, T., Rezmer, J., Sikorski, T., & Waclawek, Z. (2008). Power distortion issues in wind turbine power systems under transient states. *Turkish Journal of Electrical Engineering & Computer Sciences*, *16*, 229-238.

[13] Bradt, M. Badrzadeh, E. Camm, D. Mueller, J. Schoene, T. Siebert, T. Smith, M. Starke, R. Walling (2012). Harmonics and Resonance Issues in Wind Power Plants. IEEE PES Wind Plant Collector System Design Working Group. *IEEE*.

[14] Havas, M. and D. Colling (2011). Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. *Bulletin of Science Technology & Society*. 414-26.

Sensitivity to EMF has been termed Electromagnetic Hypersensitivity (EHS).[15] It is thought to occur in 3-20 per cent of our population and poses the greatest risk to patients with pre-existing cardiac, neurological, dermatological and immunological conditions.[16] [17] [18] [19] [20] However, healthy individuals are often affected as well and those affected complain of sleep disturbances, headaches, fatigue and difficulty concentrating. Symptoms are reduced by avoidance measures. Long-term and serious health effects can also result for those not immediately experiencing initial sensitivity.[21] [22]

This cumulative effect of these various health impacting factors combined with the prevalence of IWTs across the province suggest that significant steps at various levels and in various areas need to be taken to:

1) widely acknowledge the potential risks that IWTs represent
2) fully respond to the thousands of demonstrated complaints of adverse effects of IWTs across the province[23]

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[15] Bevington,M. (2010). *Electromagnetic-sensitivityandelectromagnetic- hypersensitivity: A summary*. London, England: Capability Books.

[16] Austrian Medical Association. (2012). Guideline of the Austrian Medical Association for the diagnosis and treatment of EMF- related health problems and illnesses (EMF syndrome) *Consensus paper of the Austrian Medical Association's EMF Working Group.* Vienna, Austria: Austrian Medical Association.

[17] Baliatsas C, Van Kamp I, Lebret E, Rubin GJ. Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): a systematic review of identifying criteria. BMC Public Health 2012, 12:643.

[18] Belpomme, D., Campagnac, C., & Irigaray, P. (2015). Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder. Reviews on Environmental Health, 30(4), 251–271.

[19] McCarty, D. E., Carrubba, S., Chesson, A. L., Frilot, C., Gonzalez-Toledo, E., & Marino, A. A. (2011). Electromagnetic hypersensitivity: evidence for a novel neurological syndrome. *The International Journal of Neuroscience,* 121(12), 670–67.

[20] Slottje, P., van Moorselaar, I., van Strien, R., Vermeulen, R., Kromhout, H., & Huss, A. (2016). Electromagnetic hypersensitivity (EHS) in occupational and primary health care: A nation-wide survey among general practitioners, occupational physicians and hygienists in the Netherlands. *International Journal of Hygiene and Environmental Health*.

[21] Carpenter D. Human disease resulting from exposure to electromagnetic fields. *Rev Environ Health 2013*; 28(4):159-172.

[22] Pall, M. L. (2014). Microwave electromagnetic fields act by activating voltage-gated calcium channels: why the current international safety standards do not predict biological hazard. *Recent Res. Devel. Mol. Cell. Biol*., (7).

[23] Wind Concern Ontario (2018). Response to Wind Turbine Noise Complaints by the Ontario Ministry of Environment and Climate Change. *Second Report: Complaints 2015-16*. Wind Concern Ontario.

3) carefully measure noise, infrasound, and electromagnetic emissions in and around all of Ontario's IWT installations
4) follow mitigative steps around electromagnetic pollution (high frequency distortion, ground current/stray voltage) as suggested by the wind industry's own publications and by other non-invested experts
5) re-site IWTs to other locations without human populations when mitigation cannot be effectively undertaken

The risks for the short and long-term health of Ontarians of not undertaking such mitigating and remediating steps is significant.

Sincerely, Riina Bray

Riina Bray

Riina I. Bray BAsc, MSc, MD, FCFP, MHSc
Medical Director, Environmental Health Clinic, Women's College Hospital
Assistant Professor, Department of Family and Community Medicine, University of Toronto
Cross-Appointment Dalla Lana School of Public Health

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APPENDIX A

Summary of references in alphabetical order

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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	EL19-027 **APPLICANT'S RESPONSES TO AMBER CHRISTENSON'S FINAL SET OF DATA REQUESTS TO APPLICANT**

Attached please find Applicant's Responses to Amber Christenson's Final Set of Data Requests to Applicant.

1-1) Provide the exact turbine **model** number of each turbine you intend to use in the project.

Response: Crowned Ridge Wind II will use nameplate 2.1 MW and 2.3 MW wind turbines in the General Electric 2 MW 116 model series.

Respondent: Mark Thompson, Manager Wind Engineering

2-2) Provide an updated sound study incorporating the lack of LNTE attachments in the Crowned Ridge 1 project.

Response: Crowned Ridge Wind II objects to Data Request 3-2 because it seeks a study that is not relevant and is not reasonably calculated to lead to the discovery of admissible evidence in this proceeding before the PUC, given that the LNTE attachments for Crowned Ridge Wind I will be installed on or before September 15, 2020 well prior to the Crowned Ridge Wind II becoming operational in the fourth quarter of October of 2020.

Respondent: Miles Schumacher, Attorney

1-3) Specifically correct the turbine **model** numbers used on EACH turbine in Crowned Ridge 1.

Response: Crowned Ridge Wind II objects to Data Request 3-3, because it seeks information that is not reasonably calculated to lead to the discovery of admissible evidence in this proceeding before the PUC. Without waiving and subject to the objection, Crowned Ridge Wind I responds that it constructed nameplate 2.3 MW wind turbines in the General Electric 2 MW 116 model series.

Respondent: Mark Thompson, Manager Wind Engineering

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ADMINISTRATIVE RECORD - Scan 4 - Page 71 of 125

Dated January 27, 2020.

Miles F. Schumacher
Attorneys for Applicant
Lynn, Jackson, Shultz & Lebrun, PC
110 N. Minnesota Ave., Suite 400
Sioux Falls, SD 57104

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	EL19-027 **APPLICANT'S RESPONSES TO STAFF'S THIRD SET OF DATA REQUESTS TO APPLICANT**

3-1) Referring to Appendix N, Decommissioning Plan, please explain why the MN DNR and the MN Board of Water and Soil Resources is referenced on page 6.

Response: The references to MN DNR and the MN Board of Water and Soil Resources were not intended to be included, and, therefore, have been deleted in Attachment 1 to Data Request 3-1 (revised Decommissioning Plan).

Respondent: Tyler Wilhelm, Senior Project Manager

3-2) Please provide a detailed breakdown for the $10-15 million decommissioning cost estimate provided in Appendix N.

Response: A detailed breakdown for the $10-15 million decommissioning cost is set forth in Attachment 1.

Respondent: Tyler Wilhelm, Senior Project Manager

3-3) When decommissioning the collector system, the Decommissioning Plan reads as if the landowners can decide if they want the cables removed. If a landowner requests the collector system and fiber optic cables removed, will Crowned Ridge II be obligated to remove those cables? Please explain.

Response: Yes, if during decommissioning a landowner requests the collector system and fiber optic cables be removed, CRW II will remove these facilities located up to four (4) feet below surface. However, if a landowner requests that the collector system and fiber optic cables located up to four (4) feet below surface on their property remain in place and not be removed, then CRW II will coordinate with the landowner and county, as needed, to have these facilities remain in place.

Respondent: Tyler Wilhelm, Senior Project Manager

- Page 946 -

ADMINISTRATIVE RECORD - Scan 4 - Page 73 of 125

008404

3-4) Please provide updated shapefiles of the project facilities that account for the changes presented in Crowned Ridge's supplemental testimony.

Response: The updated shapefiles are provided as Confidential Attachment 1.

Respondent: Sarah Sappington, Consultant

3-5) (a) Referring to Crowned Ridge's response to DR 2-1 and Exhibit TW-S-2 attached to Mr. Wilhelm's supplemental testimony, is the property with the possibility of losing a collection line easement the property of Michael Raml? (b) If so, does Exhibit TW-S-2 identify that the collection line was rerouted off Mr. Raml's property? (c) Does Crowned Ridge commit to not crossing Mr. Raml's property that is of concern?

Response:

a. No, because the collection line proposed for Mr. Raml's property has already been removed. The property with the possibility of losing a collection easement belongs to landowner Jeffrey M. Lenards which is located just west of Mr. Raml's property. Mr. Lenards has verbally agreed to the location of collection on his property, and is expected to execute an easement agreement with CRW II by January 31, 2020.
b. Exhibit TW-S-2 accurately identifies that the collection line was removed from Mr. Raml's property.
c. Yes, CRW has committed to not crossing Mr. Raml's property.

Respondent: Tyler Wilhelm, Senior Project Manager

3-6) Does Crowned Ridge plan to use any turbine models not identified in the application or used in the sound modeling completed by Mr. Haley? Please explain.

Response: No.

Respondent: Tyler Wilhelm, Senior Project Manager

3-7) Please confirm that Crowned Ridge will comply with SDCL 49-41B-25.2.

i) Has Crowned Ridge received approval from the FAA for the ADLS? If not, please identify when Crowned Ridge expects to receive approval.

ii) If Crowned Ridge does not receive approval from the FAA for the ADLS, please explain how the project will comply with SDCL 49-41B-25.2.

iii) Will the ADLS be installed and operating by the commercial operation date of 4th Quarter 2020?

Response: Yes, Crowned Ridge Wind II will comply with SDCL 49-41B-25.2.

i) No. CRW II anticipates receiving FAA approval of the ADLS by July 10, 2020.

ii) CRW II objects to Data Request 3-7, because it calls for a legal conclusion. Subject to and without waiving the objection, CRW II commits to have the ADLS operational prior to commercial operations.

iii) Yes, provided (1) the FAA approves the use of ADLS at the Project, and (2) there are no issues that result in delays that are beyond CRW II's control.

Respondent: Tyler Wilhelm, Senior Project Manager

3-8) Please provide updated Figures 3a and 3b that account for the changes made in Crowned Ridge's supplemental testimony or any updates since the supplemental testimony was filed.

Response: Updated Figures 3a and 3b that account for the changes made in CRW II's supplemental testimony or any updates since the supplemental testimony was filed is provided as Attachment 1. Also, see response to Data Request 3-5 for current status of Lenards.

Respondent: Tyler Wilhelm, Senior Project Manager

3-9) Please provide a map identifying the turbines that will have a 2.1 MW nameplate rating and the turbines that will have a 2.3 MW nameplate rating. Further, please identity on the map what turbines will have an 80-meter hub height and what turbines will have a 90-meter hub height.

Response: A map identifying the turbines that will have a 2.1 MW nameplate rating (i.e., safe harbor turbines) and the turbines that will have a 2.3 MW nameplate rating is provided as Attachment 1 to Data Request 3-8, which is the same map provided in response to Supplemental Response to Intervener 2-15 as Attachment 2 identifying turbines with an 80 and 90-meter hub height.

Respondent: Tyler Wilhelm, Senior Project Manager

3-10) Referring to page 1 of Exhibit JH-S-1 (Sound Study), please explain how the model calculates sound pressure levels at a distance of 50 feet from the perimeter of a structure.

Response: Coordinates for the structures were provided by CRW II. I used the coordinates to create a 50-foot radius ring of 12 noise receptors around each structure. The highest sound pressure level predicted for the 12 receptors was taken as the predicted sound pressure level for the structure.

Respondent: Jay Haley, Winder Engineer

3-11) Referring to the response to data request 2-12, what is the intent of the additional bat acoustic surveys being completed and when will the results be available?

Response: CRW II has completed a second round of acoustic surveys in September 10, 2029 – November 12, 2019 to be responsive to a request by the US Fish and Wildlife Service. The objective of the survey was to determine the bat species present within areas of potentially suitable northern long-eared bat habitat during the survey period. Consistent with results of the CRW II initial acoustic survey, no northern long-eared bat calls were recorded during the 2019 effort. These results support the overall conclusion that northern long-eared bats are unlikely to be present in the Project Area as described in the Application, Section 11.3.1.2.2. The survey report is being prepared and will be filed in the CRW II docket in early February 2020.

Respondent: Sarah Sappington, Consultant

3-12) Are all turbine locations sited based on the required setback distances for turbines with a 90-meter hub height? If not, please explain.

Response: Yes, all turbine locations that were sited using the 90-meter hub height turbine meet required setback distances.

Respondent: Tyler Wilhelm, Senior Project Manager

3-13) Referring to Exhibit SS-S1, please provide a copy of the Level III archaeological survey report. Further please provide a project map showing places of historical significance in accordance with ARSD 20:10:22:11.

Response: Copies of the Level III Archaeological Survey reports and the Architectural report are provided as Confidential Attachment 1. Places of historical significance are provided in shapefiles, which are provided as Confidential Attachment 2.

Respondent: Sarah Sappington, Consultant

3-14) Please provide the amendment to the aquatic resources survey as identified in Crowned Ridge's response to Staff DR 1-28.

Response: CRW II originally intended to complete an addendum to the aquatic resources survey report, which provides the tabular and graphic results of the surveys. However, CRW IIsince elected to follow the process used by CRW I, whereby the Applicant has prioritized developing the Nationwide Permit 12 Self-Verification memorandum over a survey report addendum. The Nationwide Permit 12 Self-Verification memorandum provides results in the context of all potential intersections with the Project Construction Easement and project infrastructure. Additionally, the memorandum also provides CRW II's construction team with guidance regarding best management practices that must be implemented to avoid and minimize impacts to aquatic resources. The proposed approach essentially accomplishes the same goal of documenting all existing potential wetlands or waters that an addendum would accomplish, and adds in impacts and demonstrates in a tabular and map form how each complete crossing complies with the requirements of the Nationwide Permit 12. CRW II will submit the Nationwide Permit 12 Self-Verification memorandum during the compliance phase as it did in CRW I, Docket No. EL19-003.

Respondent: Sarah Sappington, Consultant

Exhibit AC-6

Crowned Ridge Wind II, LLC - Wind Tower Decommission Breakdown

1.0 Turbines and Towers

	Quantity	Unit Cost	Extended Cost
1.1 Dismantle Turbine & Towers	132 ea	$ 62,000.00	$ 8,184,000
1.2 Removal of Transformers	132 ea	$ 1,700.00	$ 224,400
			$ 8,408,400

2.0 Tower Foundations

	Quantity	Unit Cost	Extended Cost
2.1 Foundation Removal, Disposal and Grading	132 ea	$ 6,460.00	$ 852,720
2.2 Transformer Pad Removal and Disposal	132 ea	$ 1,130.00	$ 149,160
			$ 1,001,880

3.0 Substation

	Quantity	Unit Cost	Extended Cost
3.1 Substation Equipment, Foundations, Fence, Steel and Grading	1 ea	$ 210,000.00	$ 210,000
3.2 Tranformer and Apparatus Removal	1 ea	$ 55,059.00	$ 55,059
3.3 Seeding and Site Restoration	1 ea	$ 8,500.00	$ 8,500
			$ 273,559

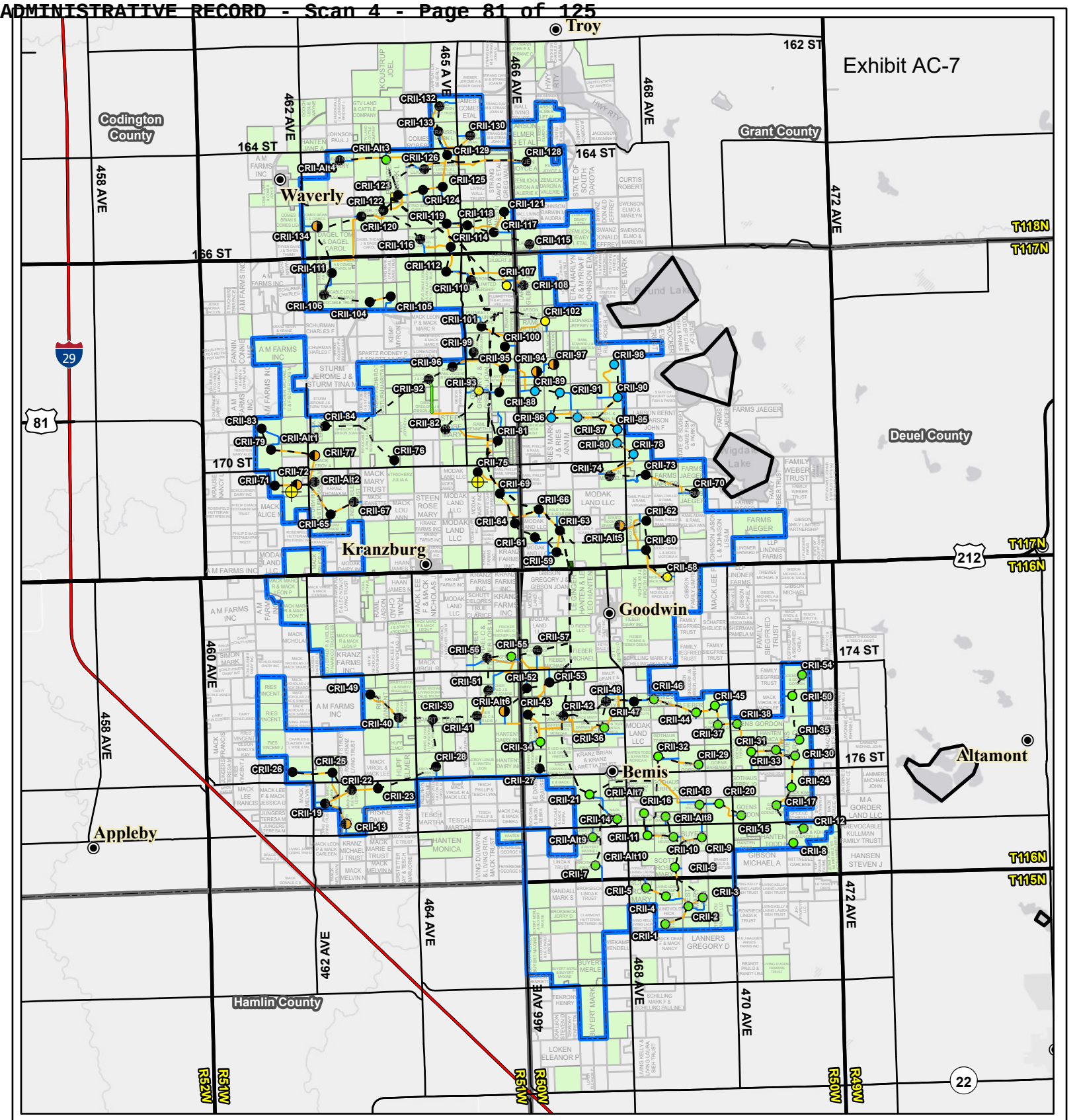
4.0 Tower Access and Site Roads

	Quantity	Unit Cost	Extended Cost
4.1 Remove Access Roads	190,238 lf	$ 7.00	$ 1,331,669
			$ 1,331,669

5.0 Collection System			
	Quantity	Unit Cost	Extended Cost
5.1 Remove collection system terminations	132 ea	$ 1,620.00	$ 213,840
			$ 213,840

6.0 Mobilization/Demobilization			
	Quantity	Unit Cost	Extended Cost
6.1 Mobilization/Demob	1 LS	$ 340,900.00	$ 340,900
			$ 340,900

Total Decommissioning:	$ 11,570,248



PUC Supplemental

Crowned Ridge II Wind Farm

- MET Tower
- City

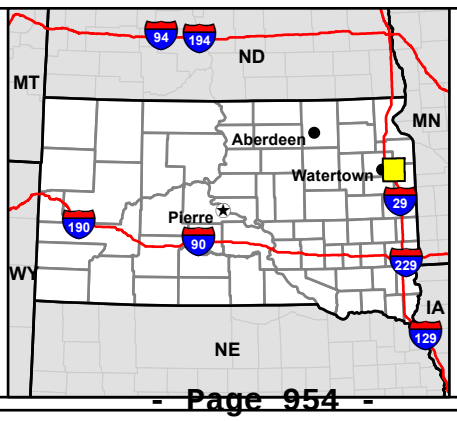
100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary

* CRII-103, CRII-113 and CRII-131 eliminated as explained in Supplemental Response to Intervener IR 2-15.



Kilometers
0 2.5 5

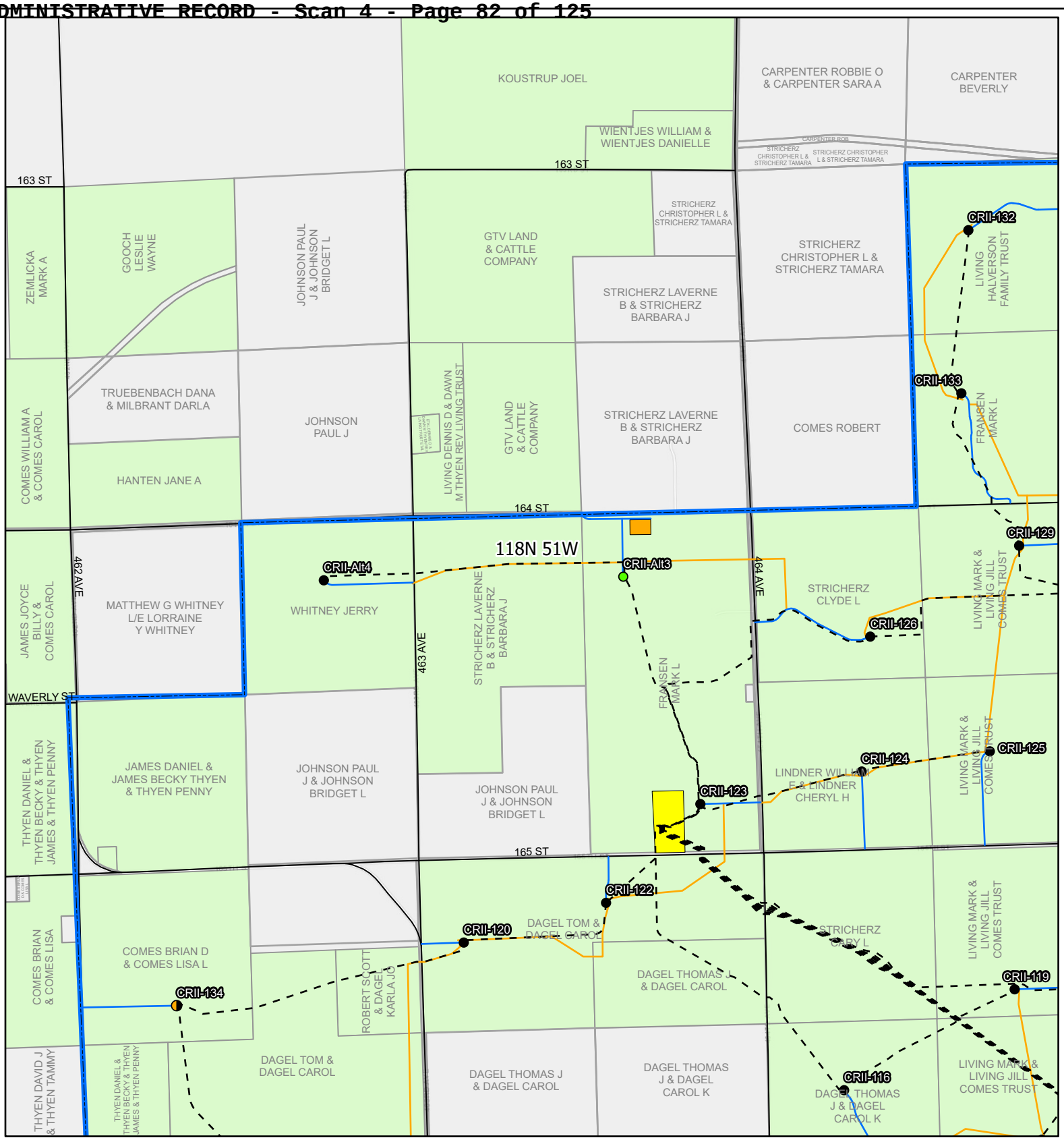
Miles
0 2.5 5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Codington, Deuel, and Grant Counties, South Dakota

008411

Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

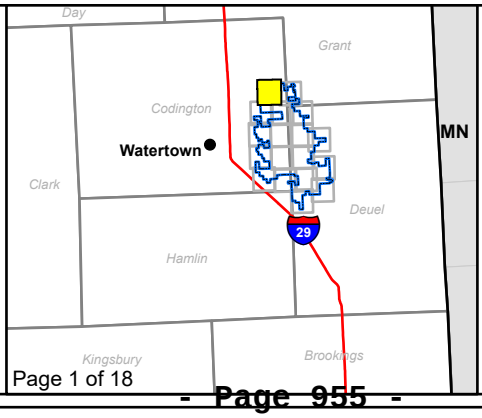
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



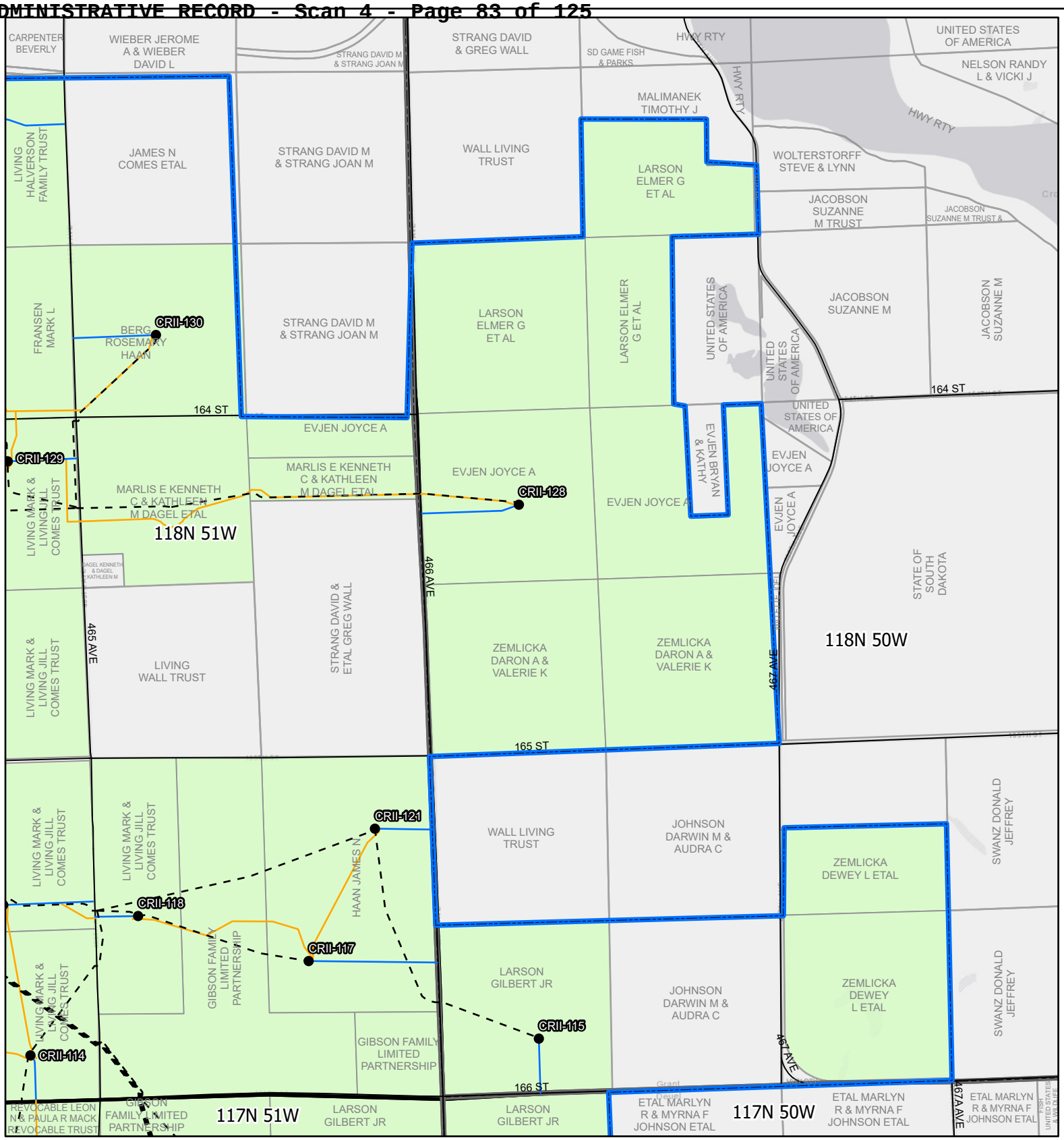
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: South Shore (1973), Kranzburg (1970)
Township/Range: T118N, R51W

Codington County, South Dakota 008412
Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

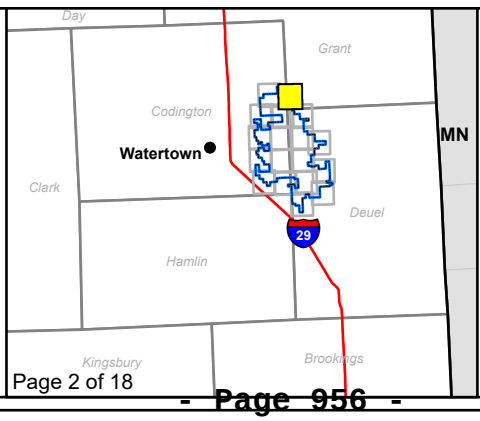
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



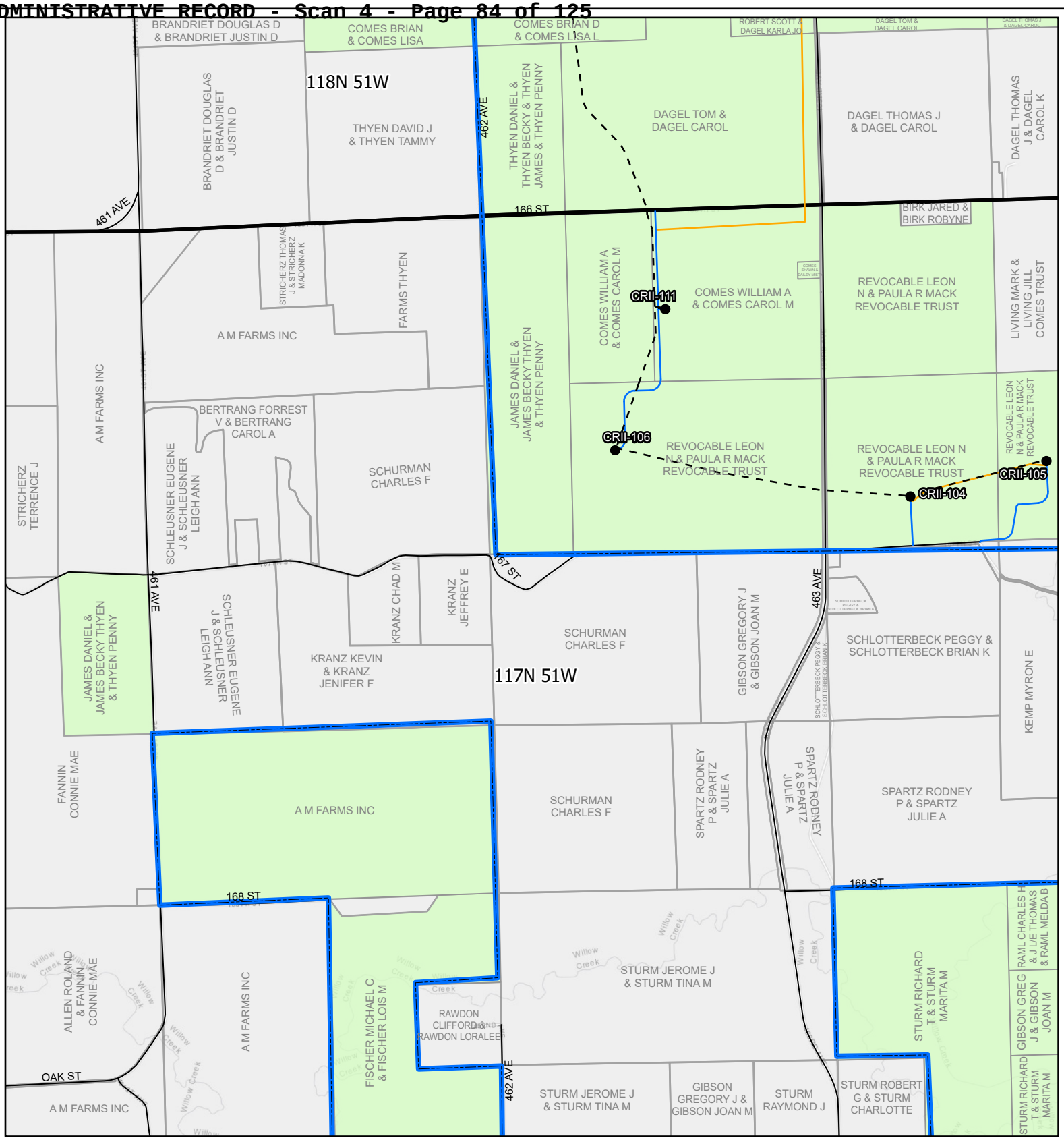
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: South Shore (1973), Kranzburg (1970), Stockholm (1973), Goodwin (1970)
Township/Range: T118N, R51W & T118N, R51W & T117N, R51W & T117N, R50W
Codington and Grant Counties, South Dakota
Projection: NAD 1983 UTM Zone 14N

008413

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

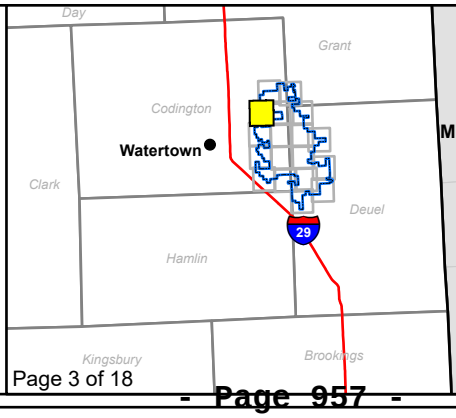
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



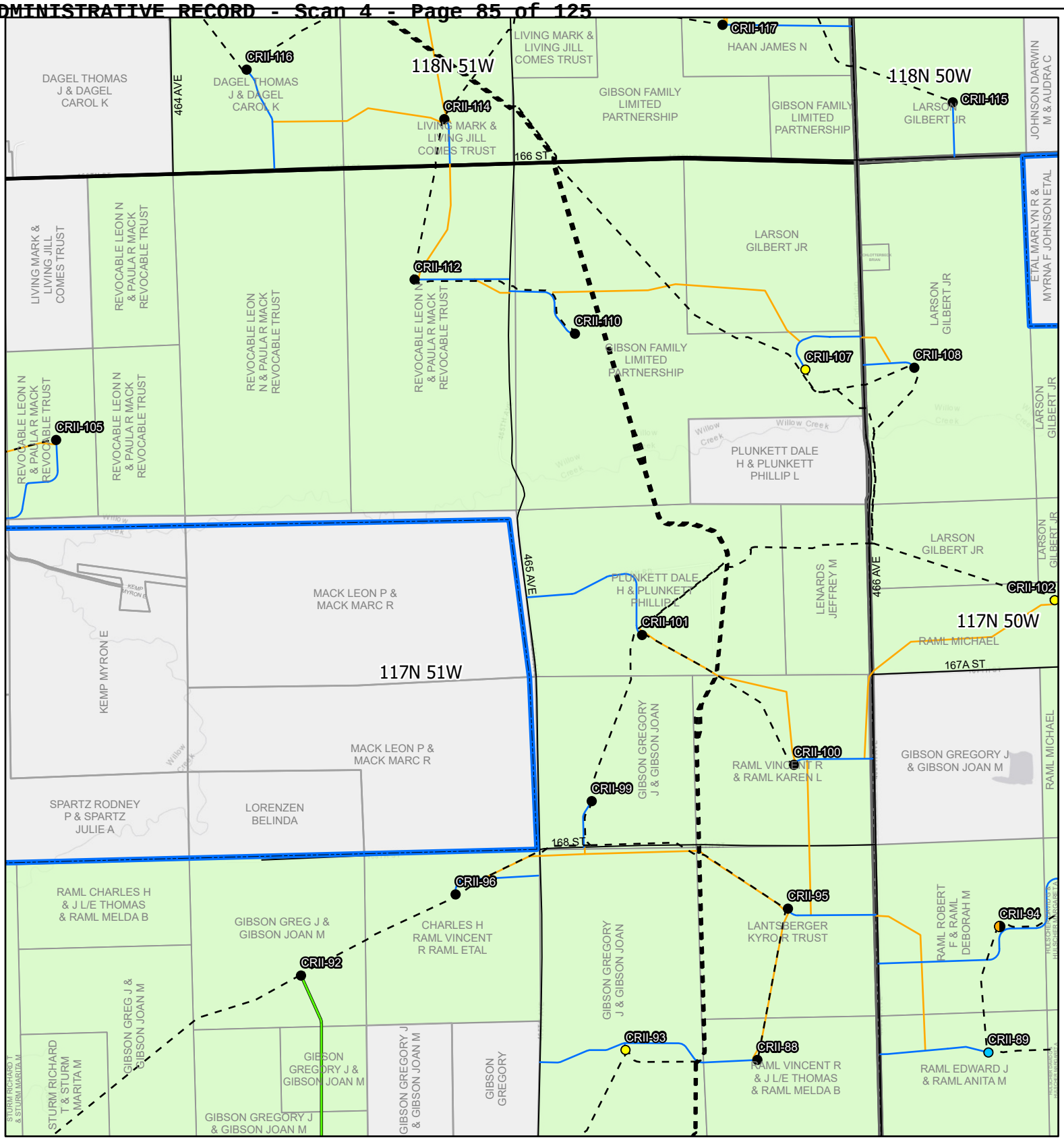
Kilometers
0 0.5 1

Miles
0 0.25 0.5

N W E S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970),
Kranzburg (1970)
Township/Range: T118N, R51W &
T117N, R51W
Codington County, South Dakota 008414
Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

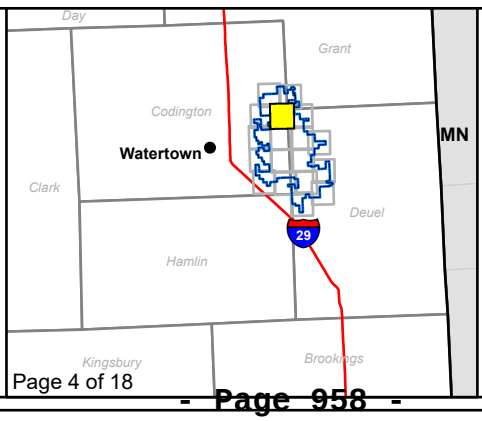
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



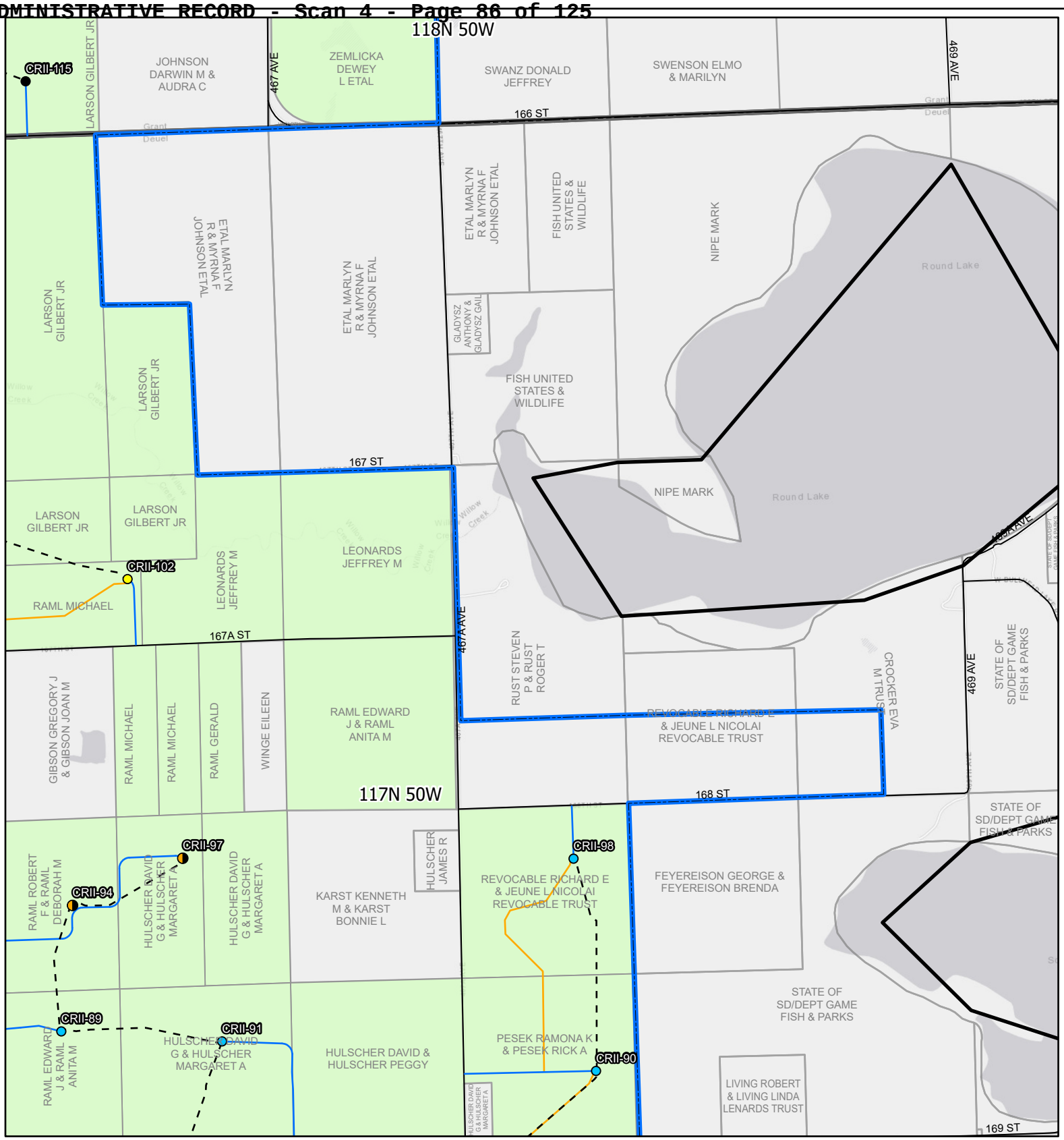
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Goodwin (1970)
Township/Range: T118N, R51W & T118N, R51W & T117N, R51W & T117N, R50W
Codington, Deuel, and Grant Counties, South Dakota
Projection: NAD 1983 UTM Zone 14N

008415

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

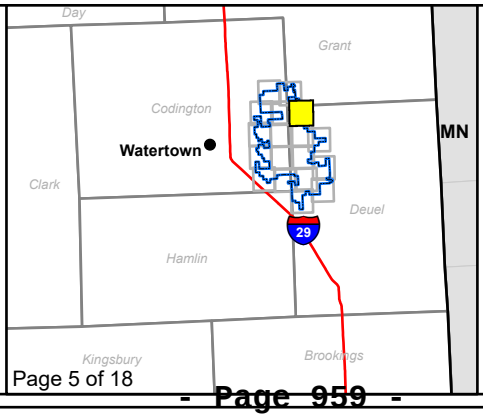
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



Kilometers
0 0.5 1

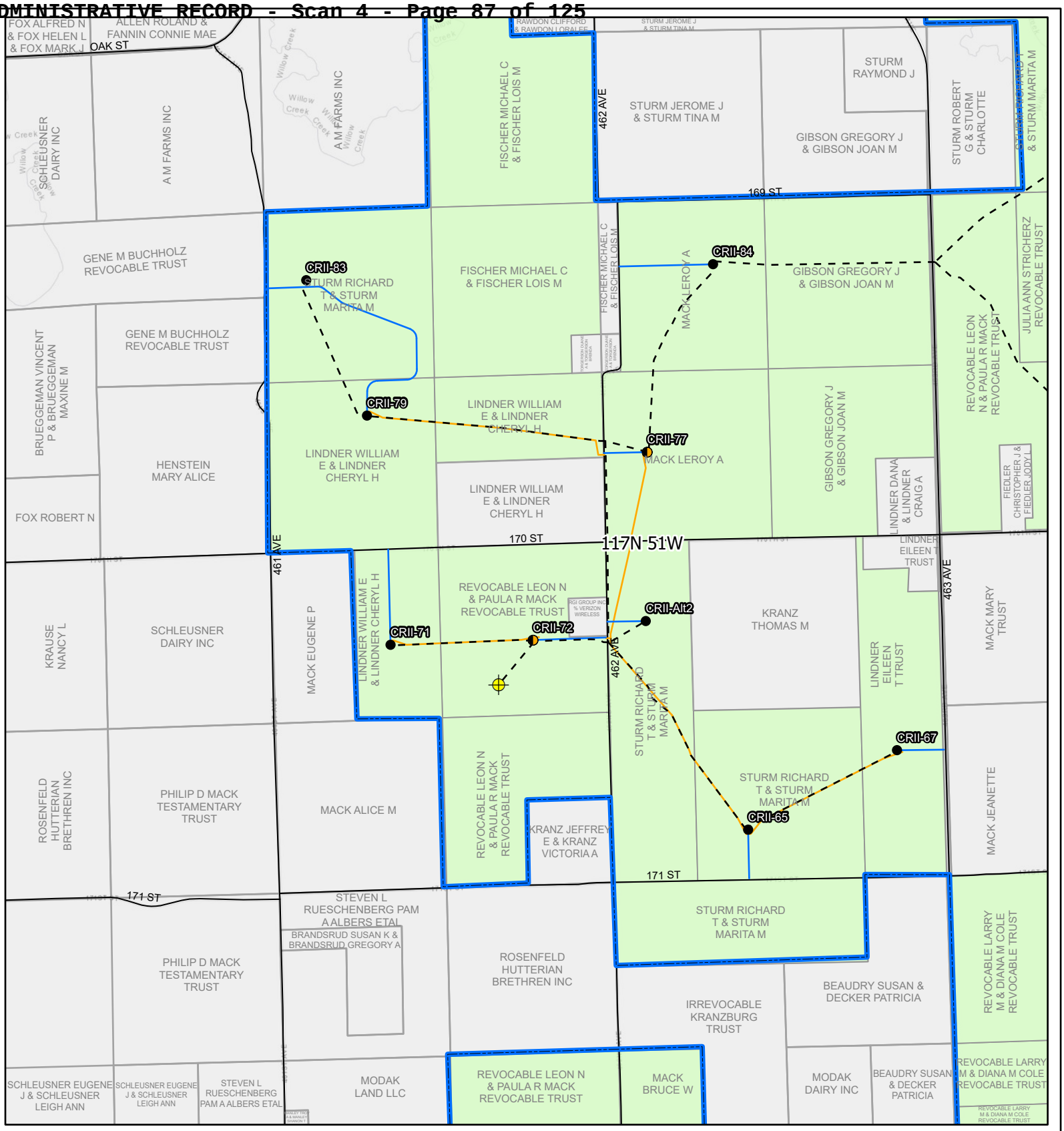
Miles
0 0.25 0.5

N
W E
S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Goodwin (1970)
Township/Range: T118N, R50W & T117N, R50W
Codington County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008416

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

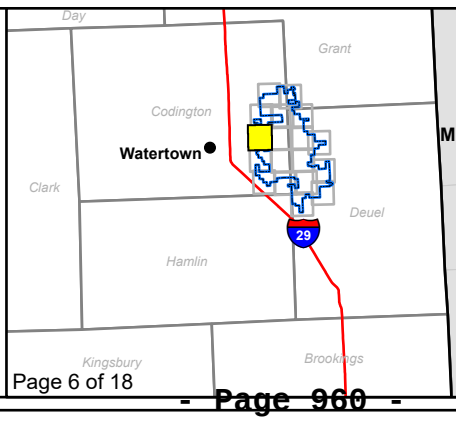
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



Kilometers
0 0.5 1

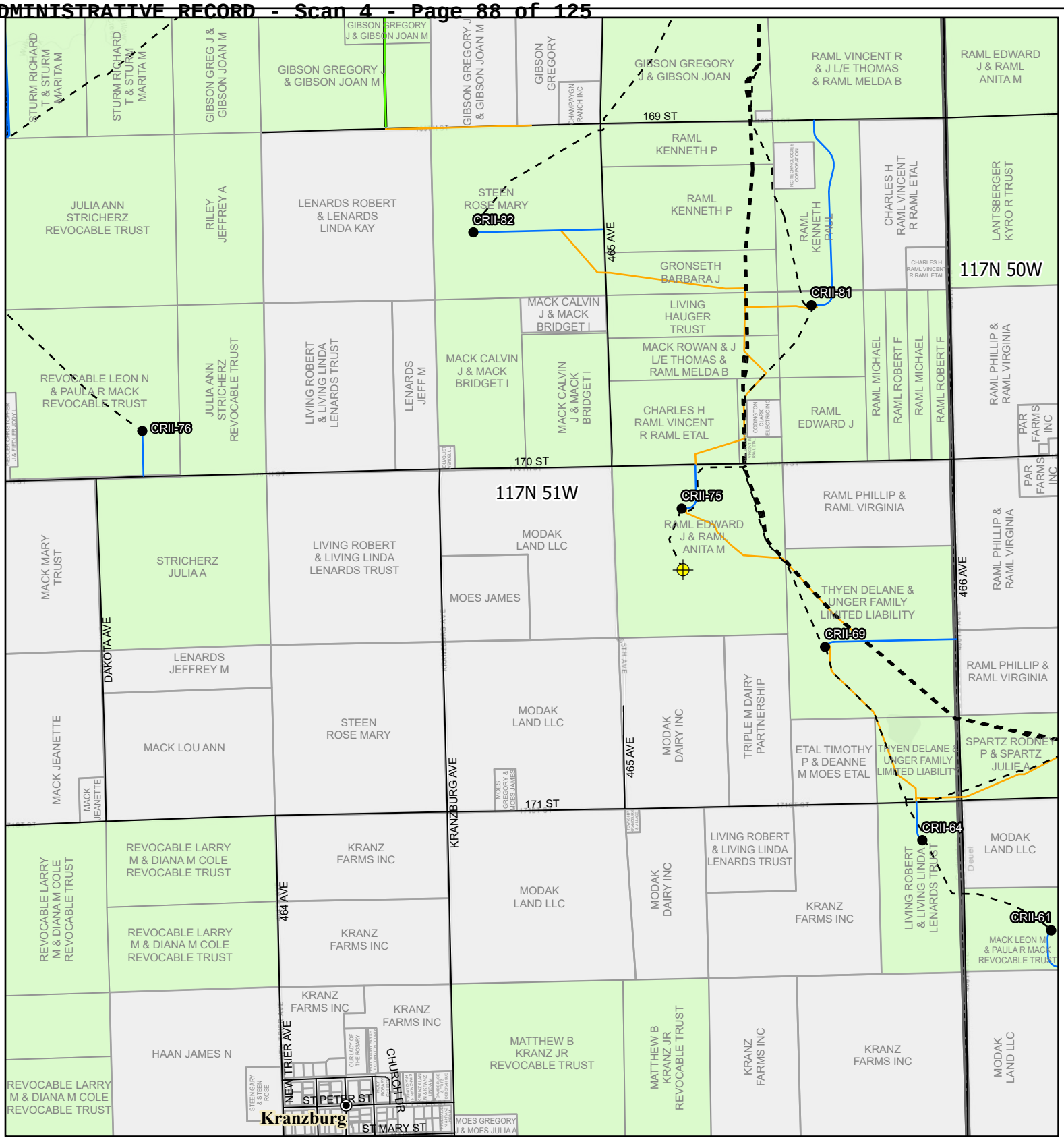
Miles
0 0.25 0.5

N W E S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Kranzburg (1970)
Township/Range: T117N, R51W

Codington County, South Dakota 008417
Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

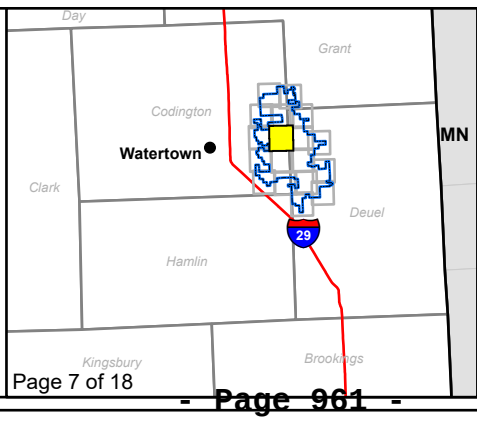
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



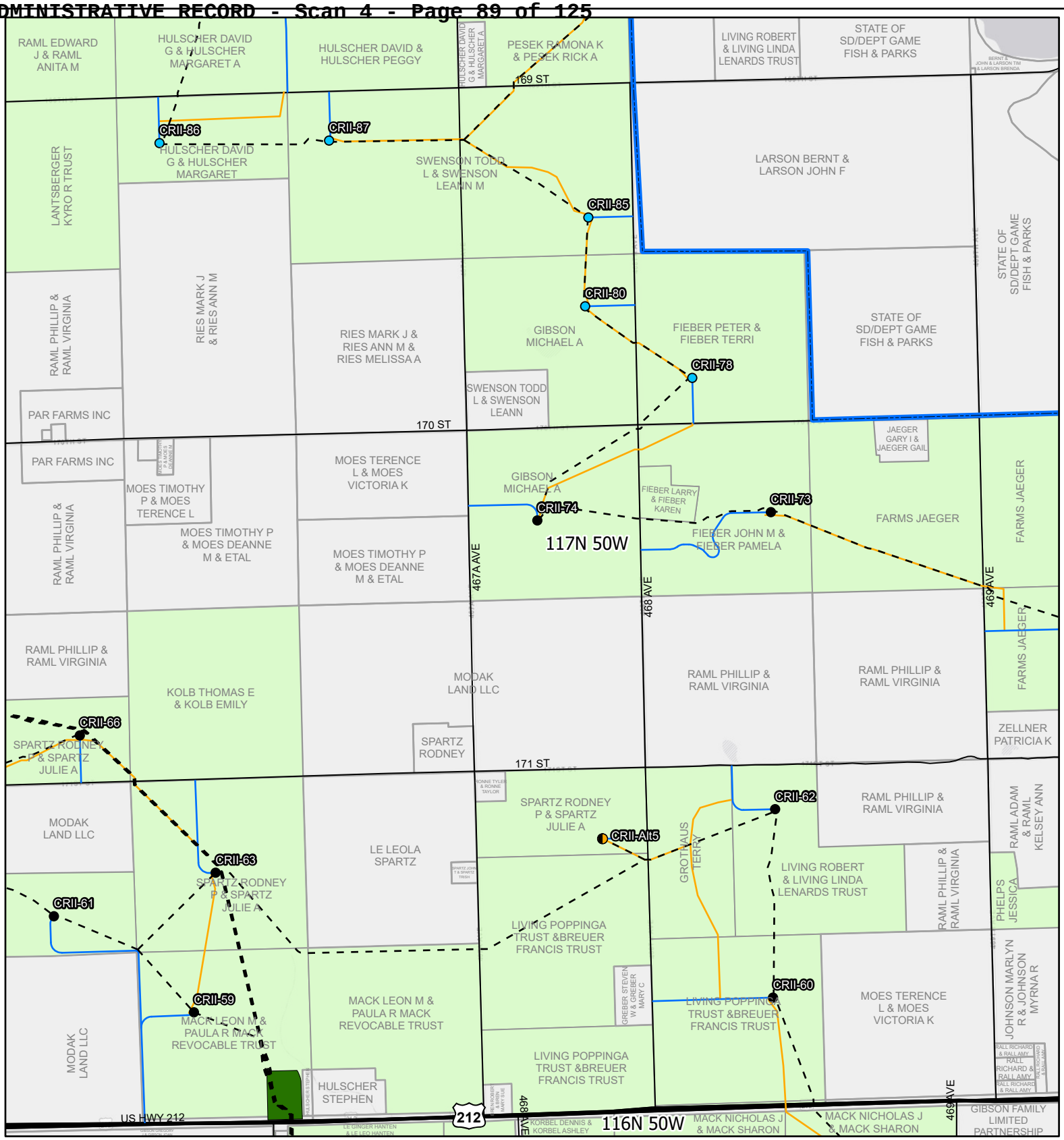
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970),
Kranzburg (1970)
Township/Range: T117N, R51W & T117N, R50W
Codington and Deuel Counties, South Dakota
Projection: NAD 1983 UTM Zone 14N

008418

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

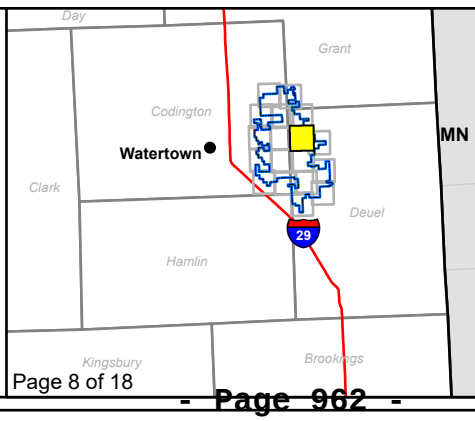
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



Kilometers
0 0.5 1

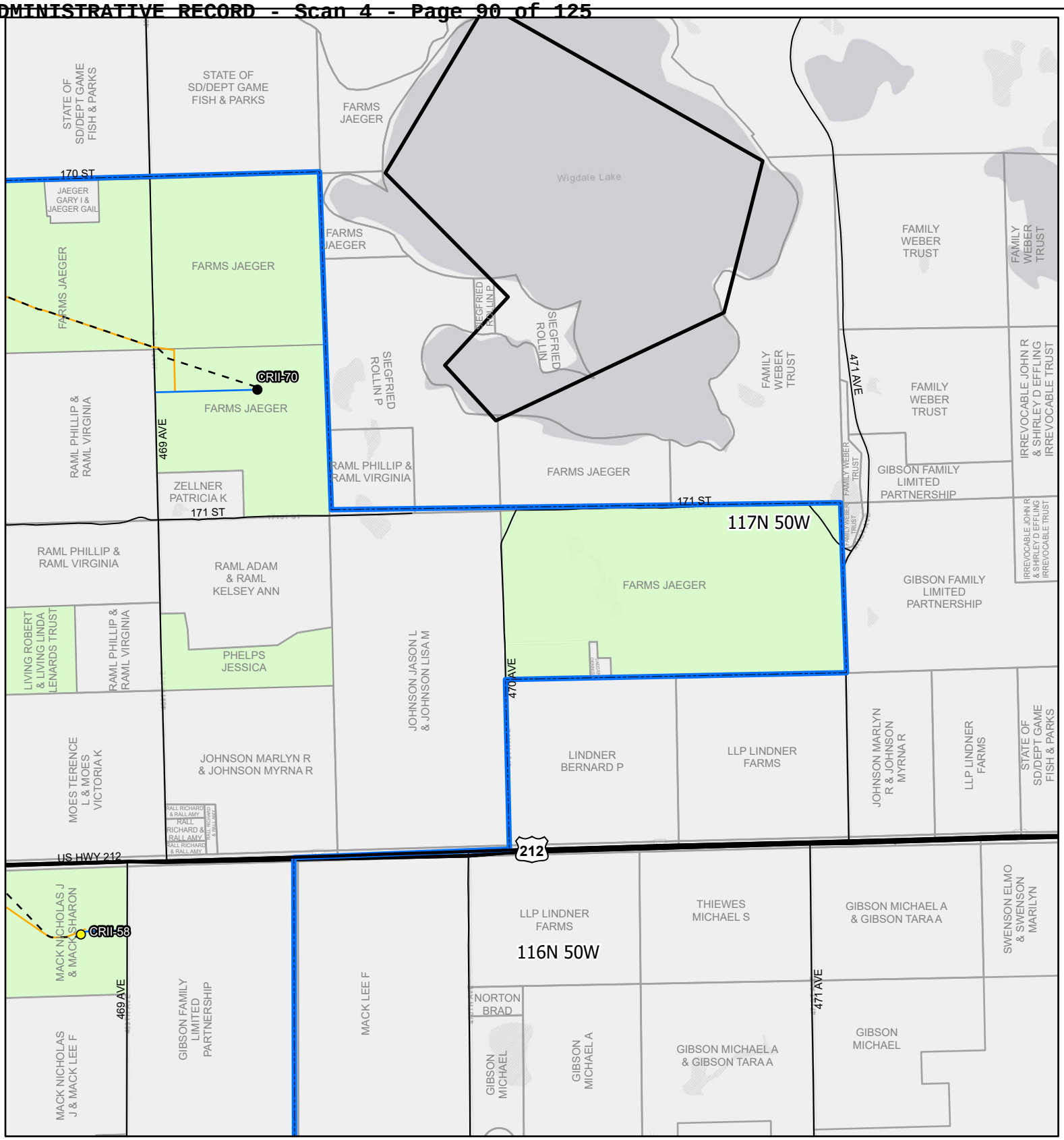
Miles
0 0.25 0.5

N
W E
S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Goodwin (1970)
Township/Range: T117N, R50W

Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008419 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

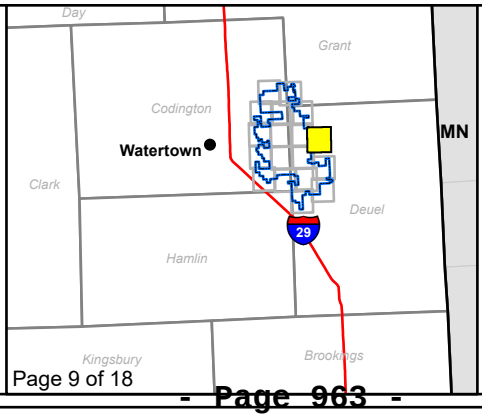
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary

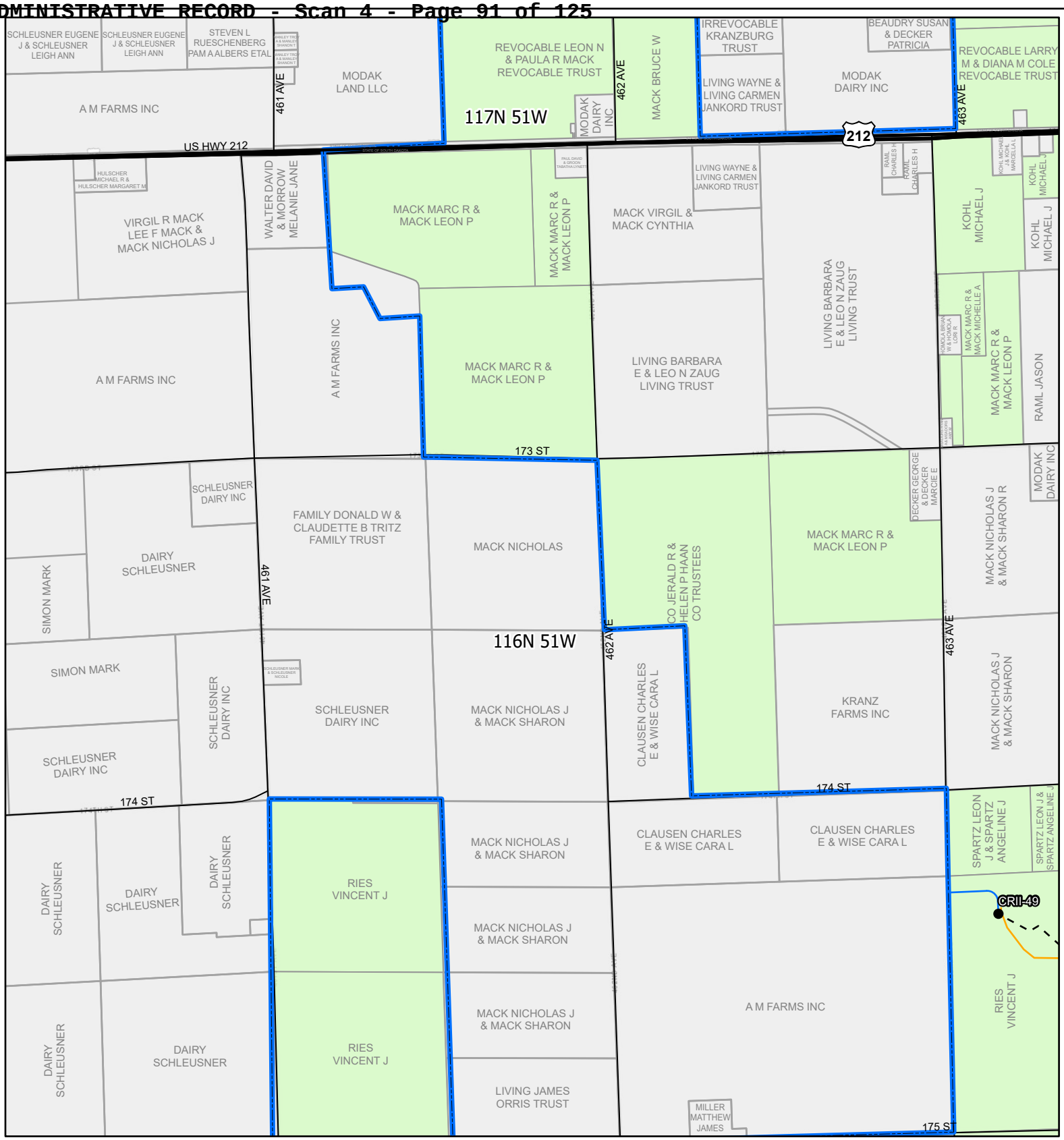


Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: South Shore (1973), Kranzburg (1970)
Township/Range: T117N, R50W & T116N, R50W
Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008420 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

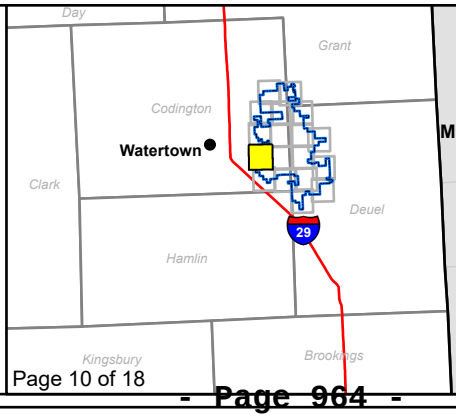
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary

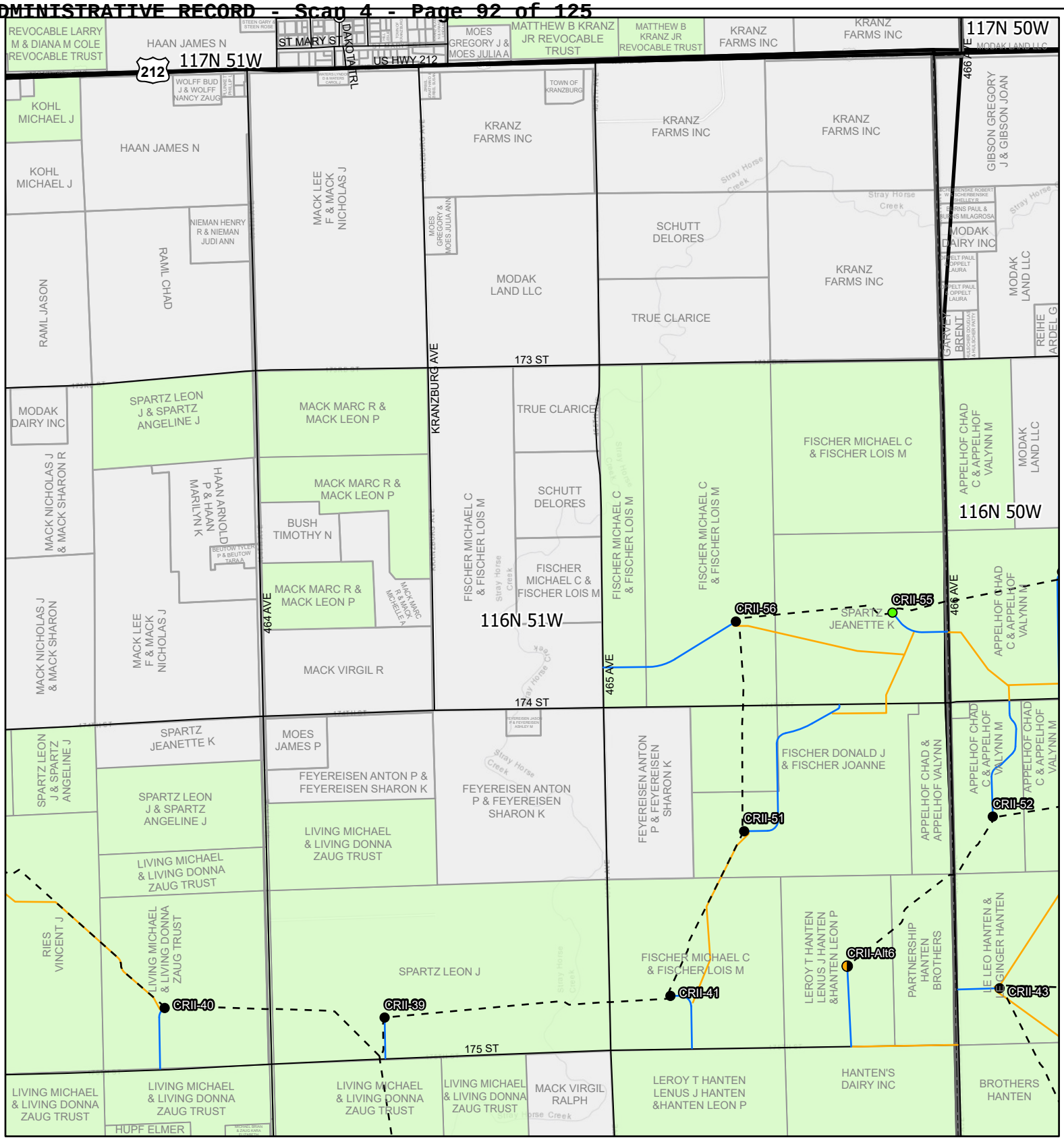


Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Kranzburg SW (1981)
Township/Range: T117N, R51W & T116N, R51W
Codington County, South Dakota 008421
Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

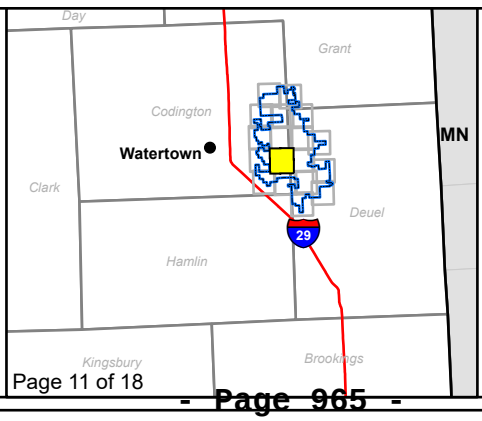
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



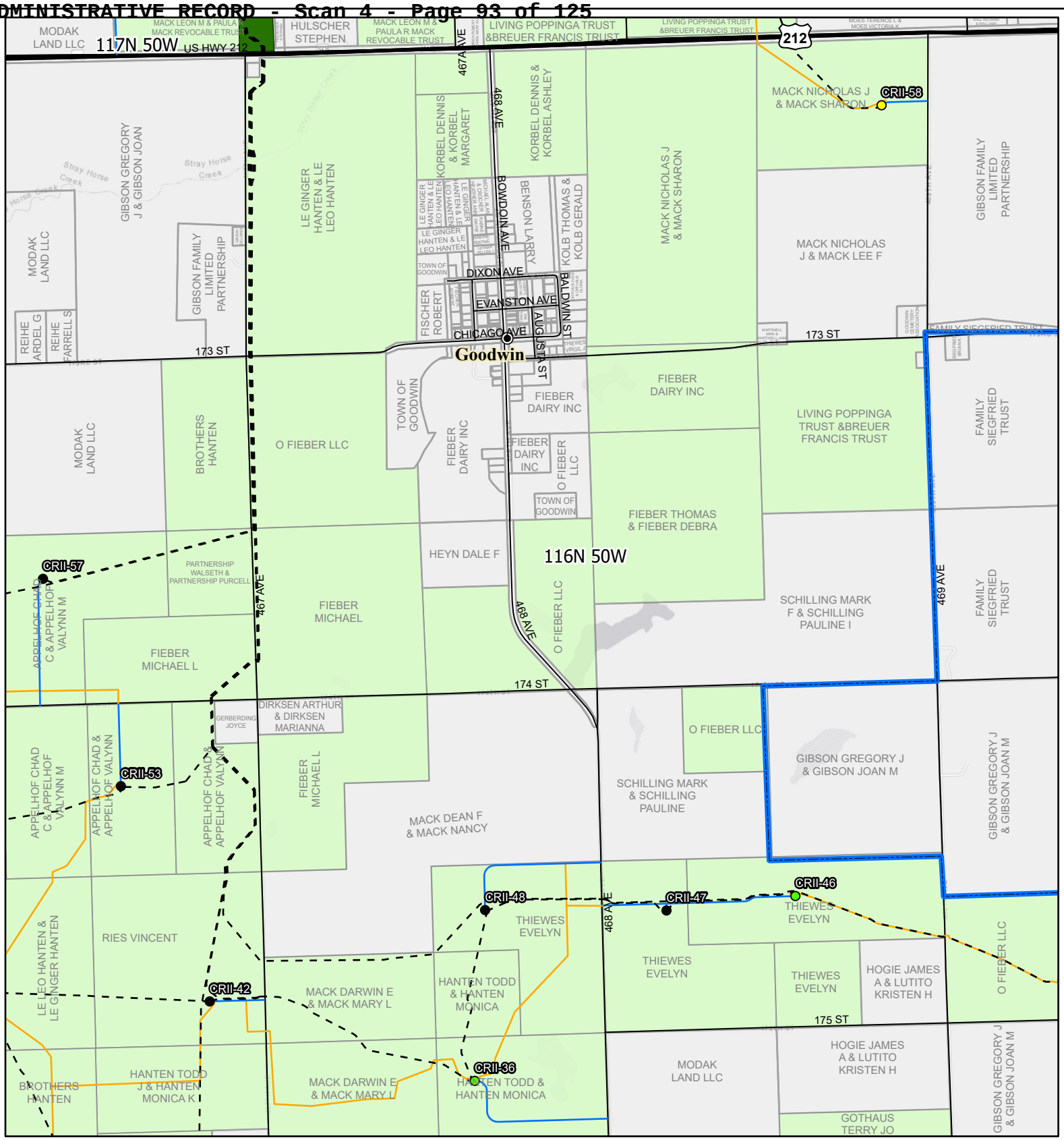
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Kranzburg SW (1981)
Township/Range: T117N, R51W & T117N, R50W & T116N, R51W & T116N, R50W
Codington and Deuel Counties, South Dakota
Projection: NAD 1983 UTM Zone 14N

008422

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

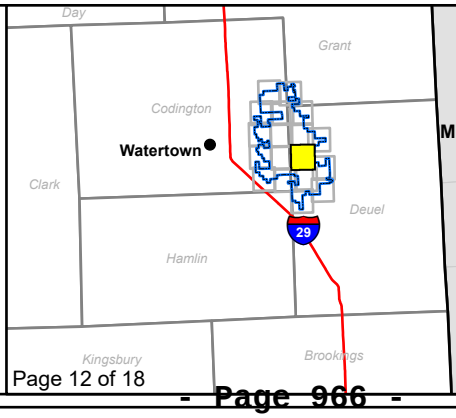
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary

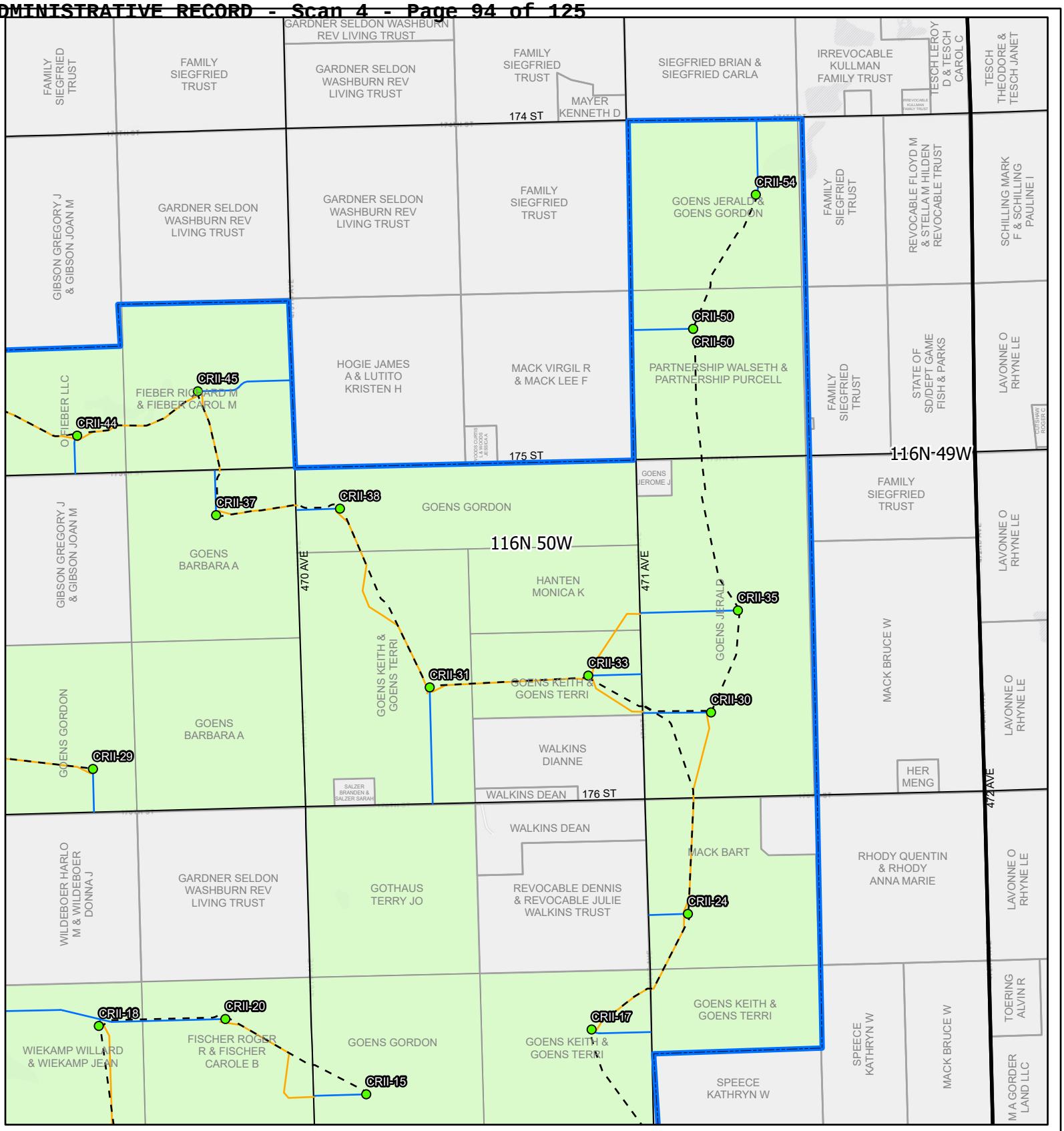


Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg (1970), Goodwin (1970), Kranzburg SW (1981), Bemis (1978)
Township/Range: T117N, R50W & T116N, R50W
Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008423 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

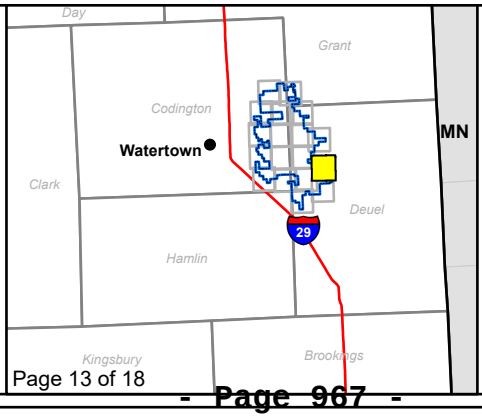
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
- Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
- Turbine from Primary to Alternate (90m hh)
- Turbine from Alternate to Primary (90m hh)
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- State Highway
- Secondary Road
- Substation
- O&M Facility
- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



Kilometers
0 0.5 1

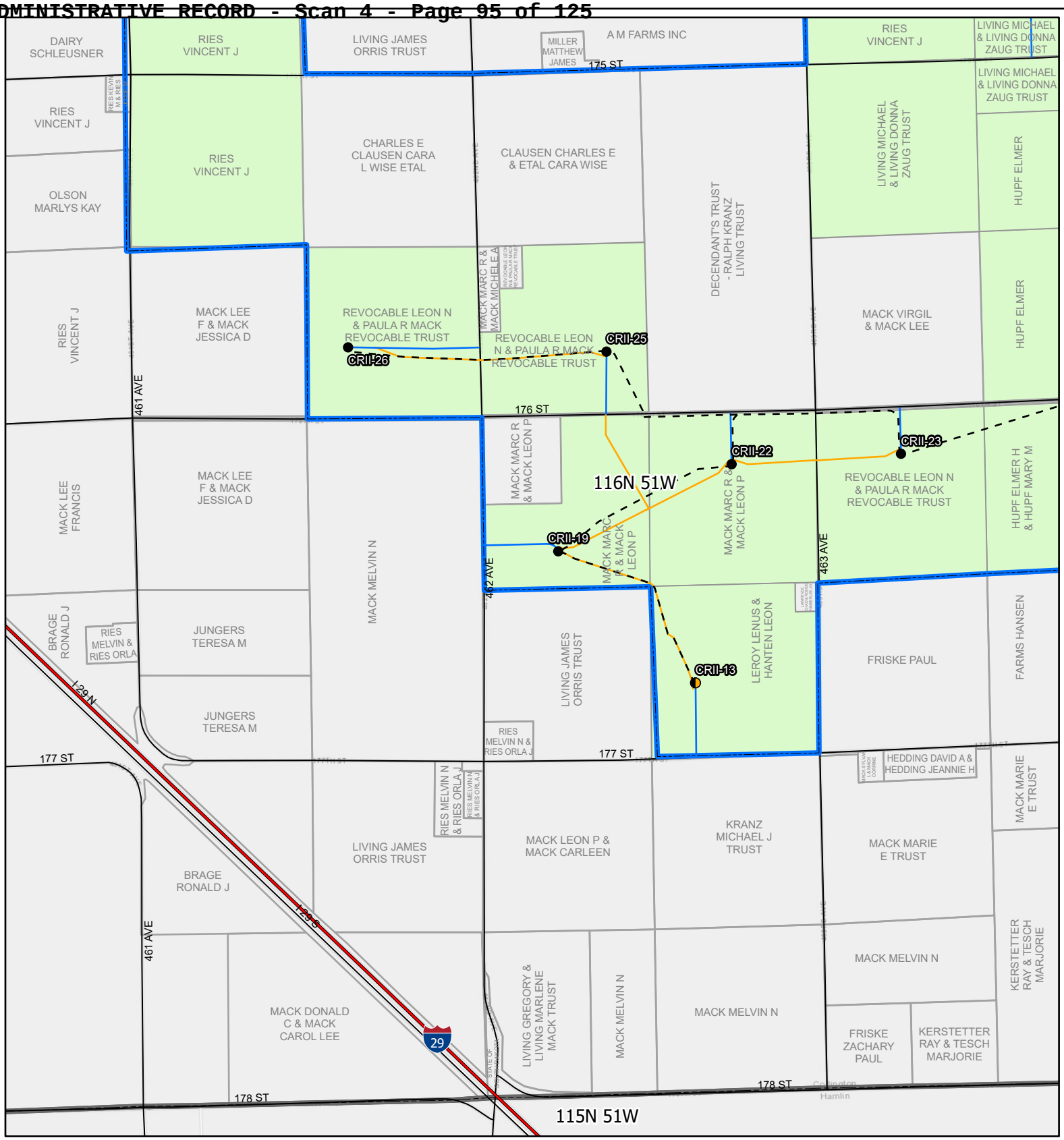
Miles
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Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Bemis (1978)

Township/Range: T118N, R51W

Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008424 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

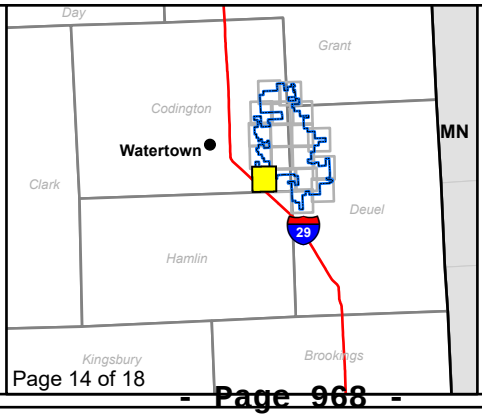
MET Tower
City

100 MW Array
Turbine (90m hh)
Safe Harbor Turbine (80m hh)

200 MW Array
Turbine (90m hh)
Alternate Turbine Location (90m hh)
Safe Harbor Turbine (80m hh)

CRW's Hessler Proposal
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Collector Line
Crane Path
Interstate Highway
U.S. Highway
State Highway
Secondary Road
Substation
O&M Facility
Batch Plant
Project Boundary
Township/Range Boundary
County Boundary

Land Status
Lease, Signed
Pending Approval
Parcel Boundary

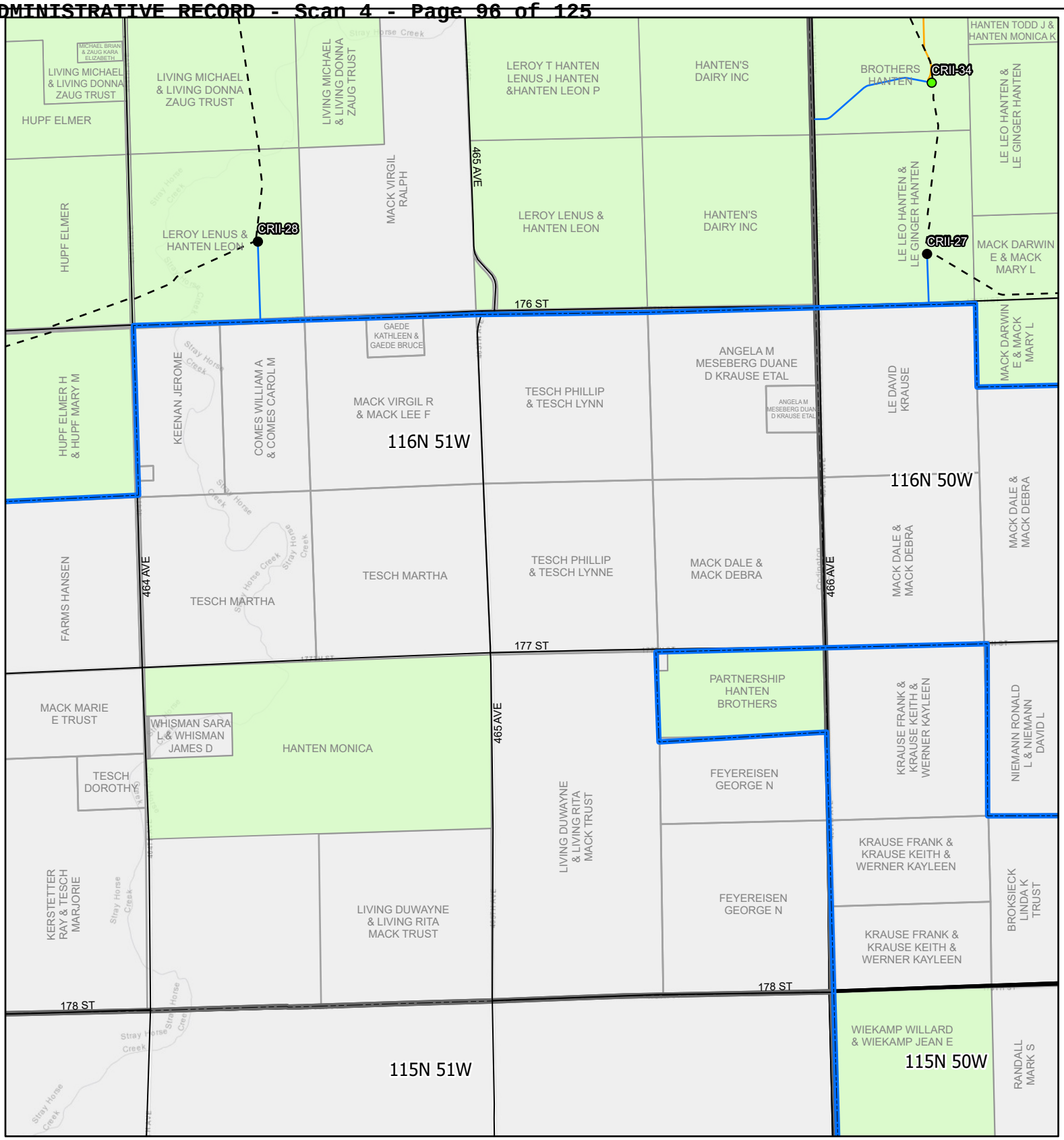


Kilometers
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Miles
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Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg SW (1981), Kranzburg (1970)
Township/Range: T116N, R51W

Codington County, South Dakota 008425
Projection: NAD 1983 UTM Zone 14N

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

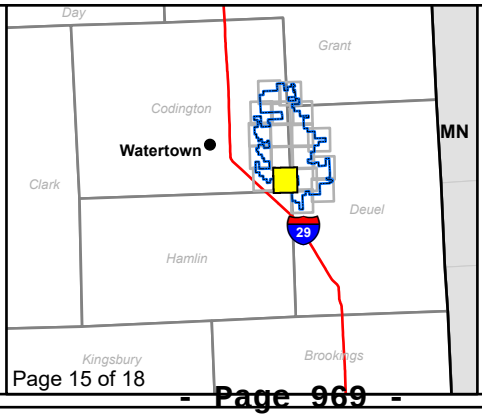
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
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- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
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- Pending Approval
- Parcel Boundary



Kilometers
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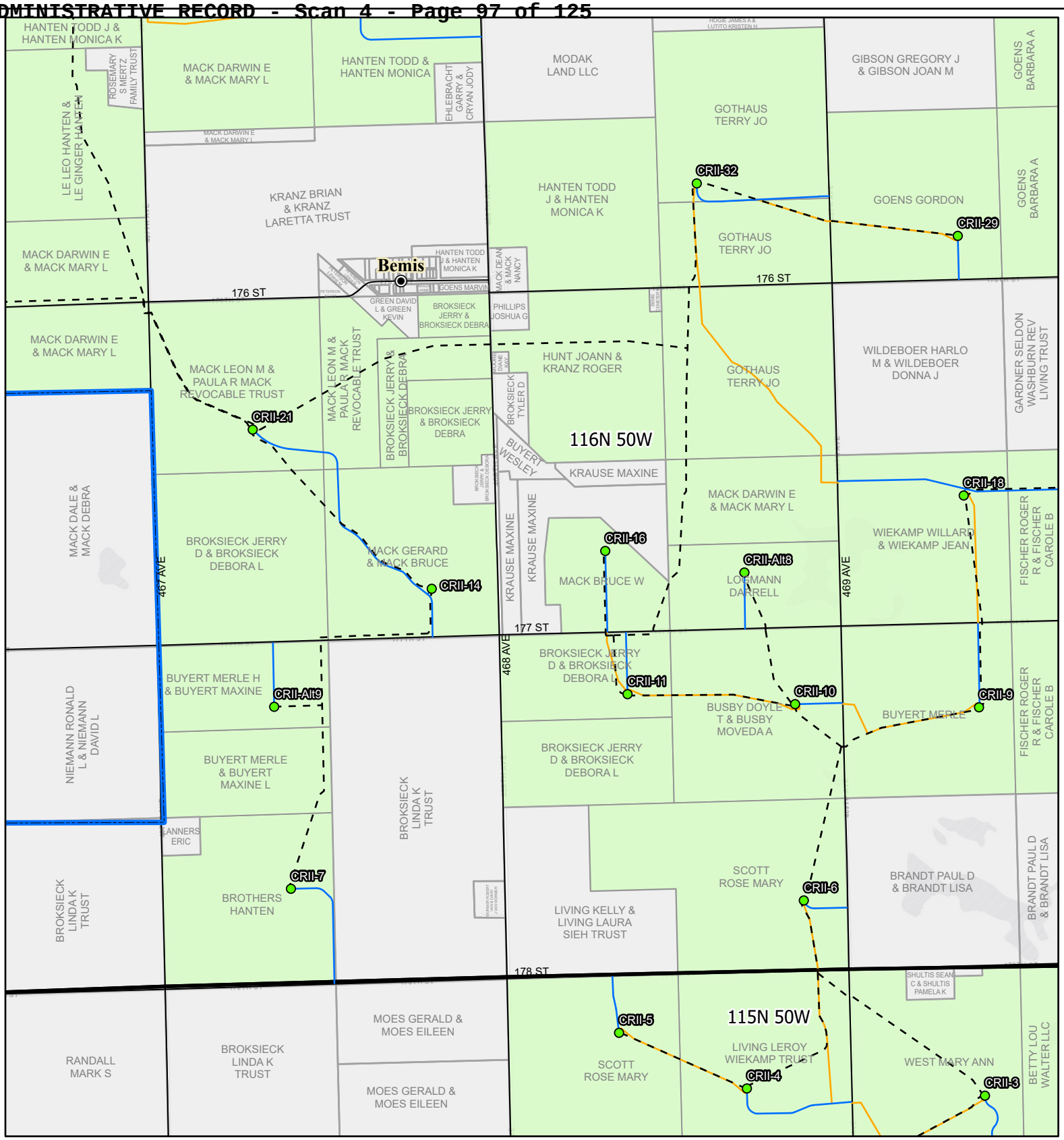
Miles
0 0.25 0.5

N
W E
S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg SW (1981), Bemis (1978)
Township/Range: T116N, R51W & T116N, R50W & T115N, R50W
Codington and Deuel Counties, South Dakota
Projection: NAD 1983 UTM Zone 14N

008426

SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

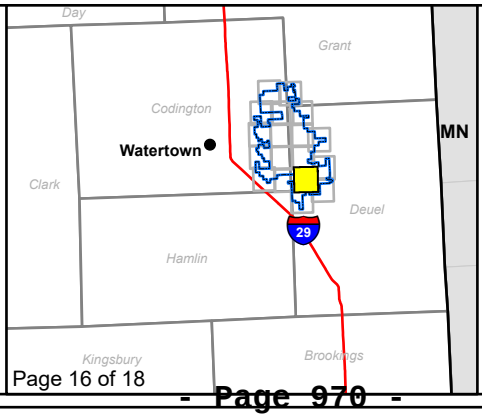
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
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- County Boundary

Land Status
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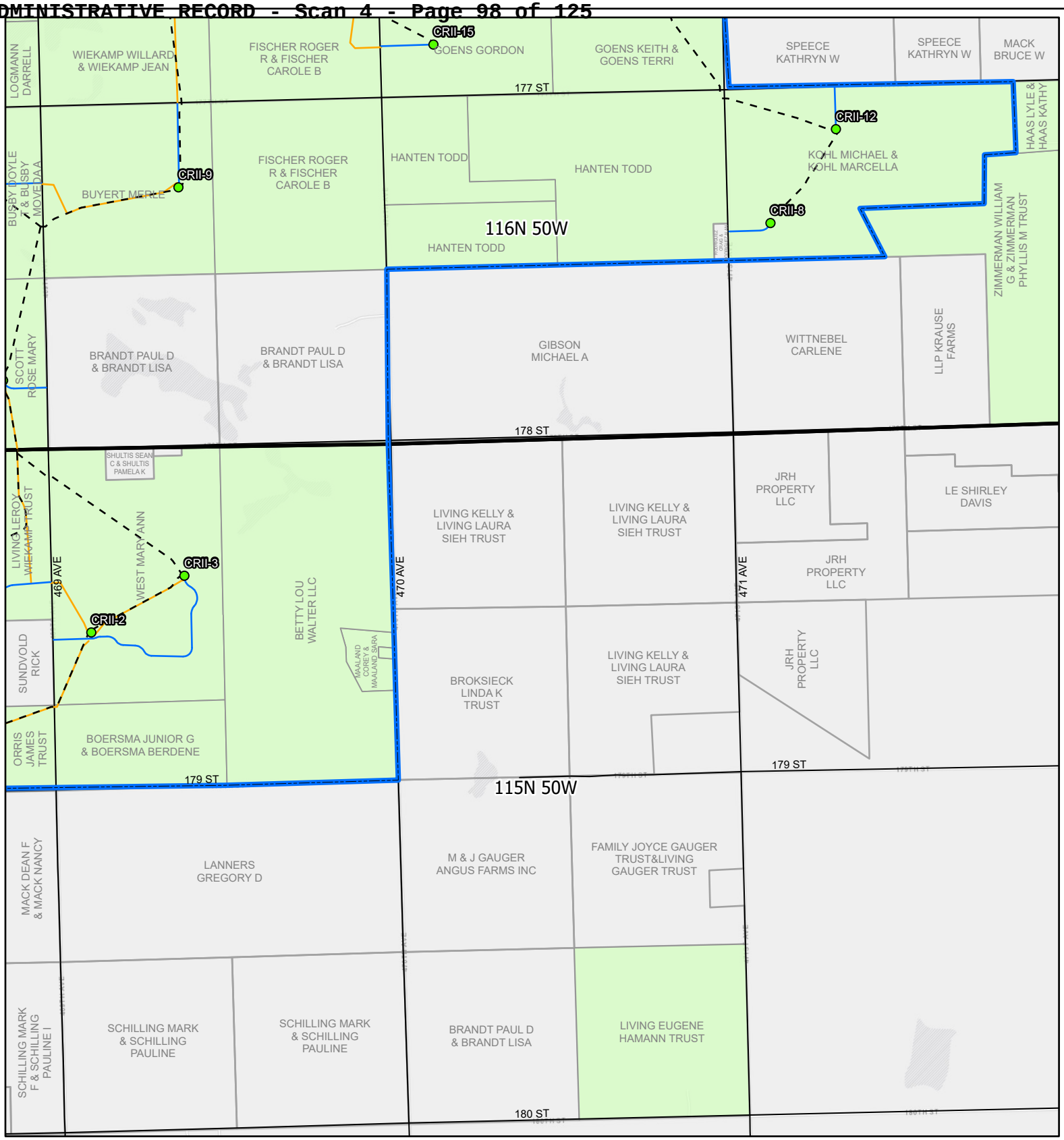
Kilometers
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Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Bemis (1978)

Township/Range: T116N, R50W & T115N, R50W
Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008427 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

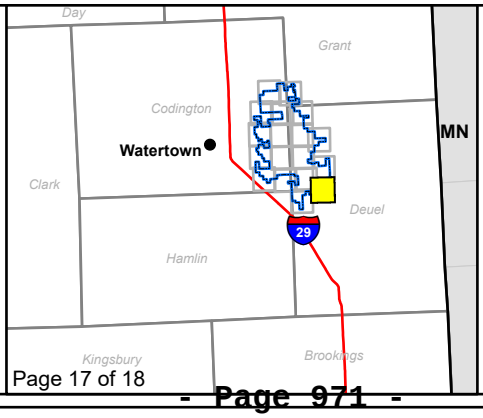
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
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- Batch Plant
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- County Boundary

Land Status
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- Pending Approval
- Parcel Boundary



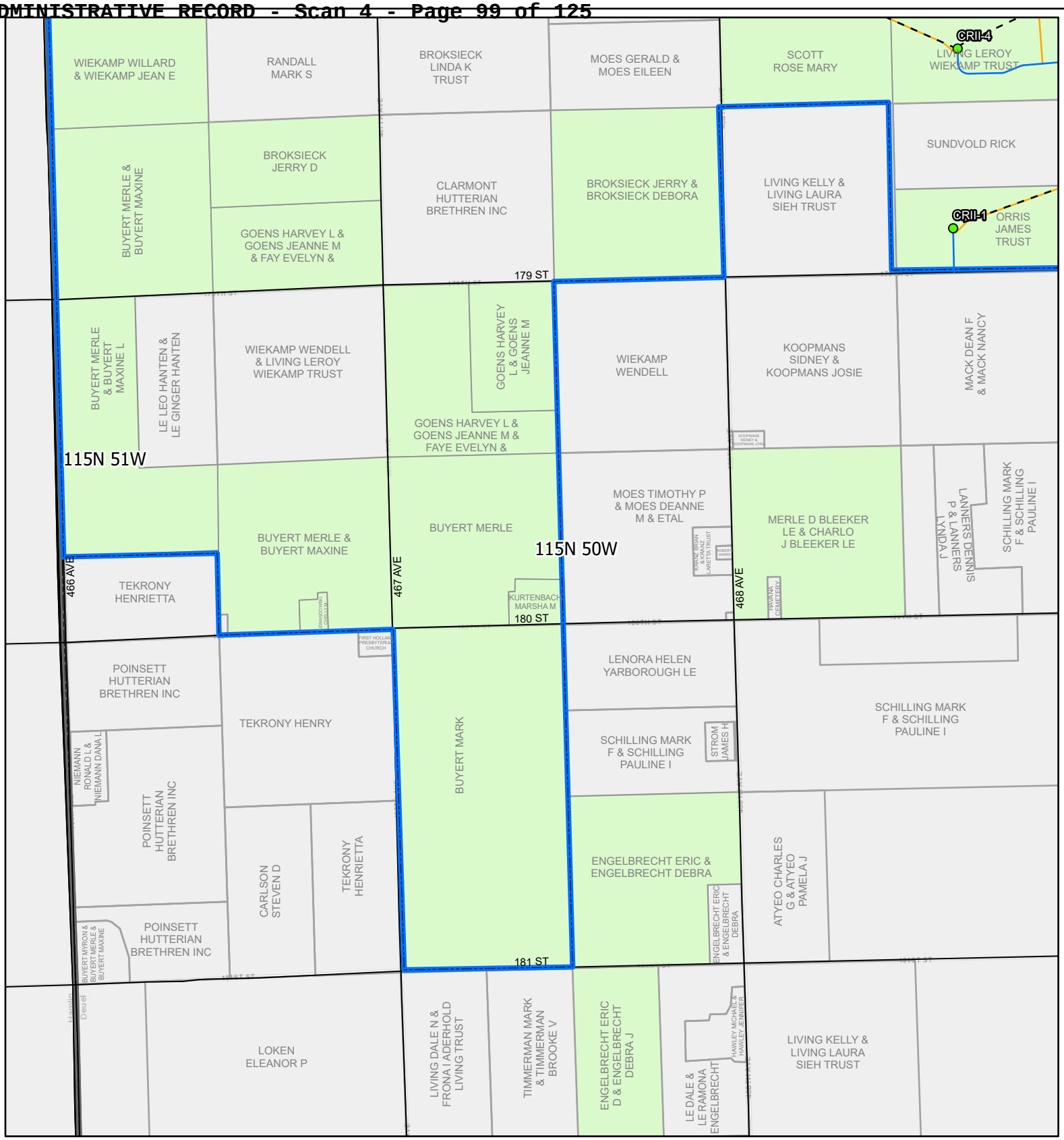
Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Bemis (1978)

Township/Range: T116N, R50W & T115N, R50W
Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008428 SWCA ENVIRONMENTAL CONSULTANTS



PUC Supplemental

Crowned Ridge II Wind Farm

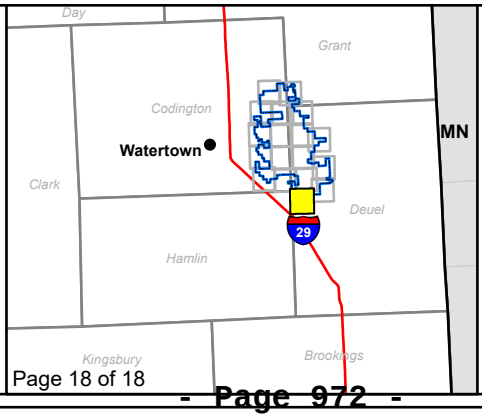
- MET Tower
- City

100 MW Array
- Turbine (90m hh)
- Safe Harbor Turbine (80m hh)

200 MW Array
- Turbine (90m hh)
- Alternate Turbine Location (90m hh)
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- State Highway
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- Batch Plant
- Project Boundary
- Township/Range Boundary
- County Boundary

Land Status
- Lease, Signed
- Pending Approval
- Parcel Boundary



Kilometers
0 0.5 1

Miles
0 0.25 0.5

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Quadrangle: Kranzburg SW (1981), Bemis (1978)
Township/Range: T115N, R50W

Deuel County, South Dakota
Projection: NAD 1983 UTM Zone 14N

008429 SWCA ENVIRONMENTAL CONSULTANTS

Exhibit AC-8

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	)	EL19-027
	)	**APPLICANT'S SUPPLEMENTAL RESPONSES TO STAFF'S SECOND SET OF DATA REQUESTS TO APPLICANT**

2-1) Referring to Crowned Ridge's response to Staff data request 1-15 and the supplemental testimony of Tyler Wilhelm, please identify the project facilities that need to have the three expiring easements renewed. If the landowners choose not to renew the easement, please identify the impact that will have on the project.

Original Response: Since Crowned Ridge Wind II's filed response to Staff Data Request 1-15 and the supplemental testimony of Tyler Wilhelm, one of the three easement agreements slated to expire prior to construction was renewed. In the event the other two project landowners do not renew their easement agreements prior to expiration, the following are the impacts to the project:

- Turbine location CRII-131 and all associated infrastructure would be removed from the landowner's property and one of the project's alternate turbine locations would be utilized; and
- An underground collection easement would be removed from the landowner's property and the collection easement would be relocated onto adjacent, participating landowner's property located within Section 12, Township 117 N., Range 51 W. and Section 7, Township 117 N., Range 50W.

Supplemental Response: Turbine location CRII-131 and all associated infrastructure would be removed from the project due to the landowner deciding not to execute an easement. To see a map depicting the removal, please see Attachment 2 map to Supplemental Response to Intervener 2-15.

The underground collection easement for the second bullet is remains pending.

Respondent: Tyler Wilhelm, Senior Project Manager

2-15) The Applicant has provided a variance of sound and flicker properties for a 200 MW project. Please provide a map and overhead photos (as required by the ARSD) associated with the corresponding 200 MW project showing all turbines, connections, crane paths, feeder lines and any other associated changes with a reduction to 200 MW.

Original Response: The requested map was filed as Exhibit TW-S-2 to Tyler Wilhelm's Supplemental Testimony filed on September 20, 2019, which can be obtained by downloading it on the Commission's Docket No. EL19-027 web site.

Supplemental Response: Please see Attachment 1 which is a map that shows the primary and alternative turbines and hub heights of turbines in the original 300 MW array filed with the Application. Also, see Attachment 2 which is a map that shows primary and alternative turbines and hub heights of turbines associated with Crowned Ridge Wind 200 MW array and deferral of 100 MWs until such time that the MISO and SPP studies support the construction of the 100 MWs. The 200 MW array and 100 MW deferral array set for in Attachment 2 is the basis for the sound and shadow flicker studies set forth in Mr. Haley's Supplemental and Rebuttal Testimony, with the refinement that the sound (Exhibit JH-R-1) and shadow flicker (Exhibit JH-R-2) studies in the Rebuttal Testimony also took into account the elimination of Turbine Nos. CRII-103 and CRII-113 from the 200 MW array due to constructability issues. Turbine No. CRII-131 is also being eliminated from the 100 MW deferred array due to the landowner deciding not to execute an easement. Mr. Haley's sound (Exhibit JH-R-1) and shadow flicker (JH-R-2) studies did not account for the elimination of Turbine No. CRII-131.

Respondent: Tyler Wilhelm, Senior Project Manager and Jay Haley, Wind Engineer

Exhibit AC-9

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	EL19-027 **APPLICANT'S RESPONSES TO INTERVENORS AMBER CHRISTENSON, KRISTI MOGEN AND ALLEN ROBISH'S SECOND SET OF DATA REQUESTS TO APPLICANT**

Attached please find Applicant's Responses to Intervenors Amber Christenson, Kristi Mogen and Allen Robish's Second Set of Data Requests to Applicant.

Dated December 12, 2019.

Miles F. Schumacher
Attorneys for Applicant
Lynn, Jackson, Shultz & Lebrun, PC
110 N. Minnesota Ave., Suite 400
Sioux Falls, SD 57104

2-1) Please provide a manufacturers diagram with specifics of each style of blade that will be used in the CRWII project.

Response: Crowned Ridge Wind II objects to Data Request 2-1, because it requests third-party confidential information and the third-party does not consent to the disclosure of the information. Therefore, no information is provided.

Respondent: Miles Schumacher, Attorney.

2-2) Please provide photographs of each style of blade that will be used in the CRWII project. Include photographs of all sides of the blade, with special attention to LNTE.

Response: Please find photos of turbine blades with LNTE and without LNTE that are similar to those that will be used by CRW II provided in Attachment 1.

Respondent: Mark Thompson, Manager Wind Engineer

2-3) Please provide the weight of each blade to be used in the CRWII facility.

Response: The weight of each blade to be used for Crowned Ridge Wind II is 25,203.46 pounds.

Respondent: Mark Thompson, Manager Wind Engineer

2-4) Are the blades being used, including LNTE blades, the best available technology?

Response: Crowned Ridge Wind II objects to the term "best available technology" as vague and subject to different interpretations. Subject to and without waiving the objection, Crowned Ridge Wind responses that to the best of the knowledge of Crowned Ridge, LNTE blades are widely used and the best available technology for the purpose stated in the Application at page 21, which is to reduce the sound pressure levels in order to achieve compliance with county regulations by increasing the flexibility in turbine locations to meet setback requirements.

Respondent: Mark Thompson, Manager Wind Engineer

2-5) Please provide the company, country of origin and date of purchase of the components of each turbine of the project. Include the tower sections, blades, and nacelle housing.

Response: Response: General Electric is the supplier of all turbine components, including tower sections, blades and nacelle housing as a complete unit. The date of purchase of the safe harbor turbines was June 28, 2016, and the non-safe harbor turbines was September 26, 2018.

Crowned Ridge Wind II objects to the request for the country or origin of the turbine components, because it seeks information that is not reasonably calculated to lead to the discovery of admissible evidence in this proceeding before the PUC. Subject to and without waiving the objection, Crowned Ridge does not know the country of origin of the turbine components.

Respondent: Mark Thompson, Manager Wind Engineer

2-6) Referring to your application, Page 24, Concrete batch plant "A large amount of concrete is needed for turbine foundations. " How many tons of concrete is used in each style of turbine foundation (spread foot style and P&H style)?

Response: There are approximately 391 cubic yards of concrete in a spread foot style foundation. There are approximately 168 cubic yards of concrete in a P&H style foundation.

Respondent: Mark Thompson, Manager Wind Engineer

2-7) Referring to your application, Page 33, Geological "However, the relatively inert turbine foundation materials..." How many tons of rebar is used in each style of turbine foundations (spread foot style and P&H style)?

Response: There are approximately 27 tons of rebar in a spread foot style foundation. There is approximately 1 ton of rebar in a P&H style foundation.

Respondent: Mark Thompson, Manager Wind Engineer

2-8) a. Will the Applicant adhere to the Conditional Use Permits and Special Exception Permit issued by the respective counties?

b. By way of explanation, does Crowned Ridge Wind II agree to follow the application and presentation it submitted to each county and abide by its representations to the Board and the Public? If any variation is expected from what has been permitted in each county, explain the variation in detail and provide the notification to the respective county and the approval the Applicant has received.

Response: a. Yes, Crowned Ridge Wind will comply with the Conditional Use Permits and Special Exception Permit issued by the respective counties, and has no plans to vary from the the Conditional Use Permits and Special Exception Permit. b. Crowned Ridge Wind II objects to Data Request 2-8, because it calls for a legal conclusion and seeks information that is not reasonably calculated to lead to the discovery of admissible evidence in this proceeding before the PUC.

Respondent: a. Tyler Wilhelm, Senior Project Manager; b. Miles Schumacher, Attorney

2-9) In accordance with ASRD 20:10:22:09 "applicant *shall* describe the estimated construction cost …" provide the construction cost, specifically.

Response: Section 5 of the Application provides a $425 million estimate for the cost of construction.

Respondent: Mark Thompson, Manager Wind Engineer

2-10) Page 18 of the application, section 5.0, estimated costs of facility, "Fluctuations in capital costs could be as much as 20% for the Project, dependent on final micro-siting and MISO interconnection costs." Please provide the document that requires the applicant to pay for MISO interconnection costs.

Response: See Attachment 1, which is the Generator Interconnection Agreement.

Respondent: Tyler Wilhelm, Senior Project Manager

2-11) Has the applicant completed full title searches on each parcel of land the applicant claims to have property rights?

Response: Applicant has ordered title commitments from Stewart Title Guaranty Company for each parcel of land with proposed project infrastructure. At this time, 100% of the title commitments have been received and are under review by Applicant. We anticipate that title review will be completed by the end of January, 2020.

Respondent: Tyler Wilhelm, Senior Project Manager

2-12) Will the applicant mortgage or leverage the assets of the project?

Response: The Applicant has no current plans to mortgage or leverage the assets of the project, with the understanding that after the transfer of Crowned Ridge Wind II to Northern States Power Company (NSP), NSP may issue bonds or raise other financing which uses the project's assets as collateral.

Respondent: Tyler Wilhelm, Senior Project Manager

2-13) Is the CRWII project still being purchased by Excel Energy?

Response: Data Request 2-13 incorrectly references Xcel as the purchaser for the wind project, instead of Northern States Power Company (NSP), the entity that executed the Purchase and Sale Agreement. Yes, Crowned Ridge Wind II, LLC will still be purchased by NSP.

Respondent: Tyler Wilhelm, Senior Project Manager

2-14) If the manufacturer of the turbines should go bankrupt, how would that affect the warranty and viability of the project?

Response: Crowned Ridge Wind II objects to Data Request 2-14, because it calls for speculation regarding future events and for a legal conclusion. Subject to and without waiving the objection Crowned Ridge Wind II responds that to the best of Crowned Ridge Wind II's knowledge there should be no impact to the viability of the project due to a wind turbine manufacturer going into bankruptcy. Any impacts of a bankruptcy of a wind turbine manufacturer on the project would depend on the facts and circumstances of the bankruptcy.

Respondent: Tyler Wilhelm, Senior Project Manager

2-15) The Applicant has provided a variance of sound and flicker properties for a 200 MW project. Please provide a map and overhead photos (as required by the ARSD) associated with the corresponding 200 MW project showing all turbines, connections, crane paths, feeder lines and any other associated changes with a reduction to 200 MW.

Response: The requested map was filed as Exhibit TW-S-2 to Tyler Wilhelm's Supplemental Testimony filed on September 20, 2019, which can be obtained by downloading it on the Commission's Docket No. EL19-027 web site.

Respondent: Tyler Wilhelm, Senior Project Manager

2-16) Considering the 200 MW version of the project, has each county been notified of the substantial reduction of the project? Please provide all correspondence.

Response: Crowned Ridge Wind II objects to the characterization of the project as "substantial" reduced. As explained in the Supplemental Testimonies of Hart and Wilhelm, Crowned Ridge Wind II has deferred 100 MWs of the wind project until it receives the results of interconnection studies. Attachment 1 includes the correspondence explaining the potential deferral of 100 MWs with Grant, Codington, and Deuel counties.

Respondent: Tyler Wilhelm, Senior Project Manager

2-17) In the last two years, has the Purchase Sale Agreement with Excel changed to reflect a different number of megawatts to be developed for Excel? If so, what changed?

Response: Data Request 2-17 incorrectly references Xcel as the purchaser for the wind project, instead of Northern States Power Company (NSP), the entity that executed the Purchase and Sale Agreement (PSA). The PSA with NSP provided for the development and sale of a wind project with a maximum size of 300.6 megawatts, and with the ability, under certain circumstances, for NSP to elect to downsize the project to a maximum size of 200 megawatts. NSP exercised its downsize rights on August 16, 2019. However, an amendment to the PSA also requires the parties to work together in good faith to determine if other mutually agreeable opportunities may exist to increase the project size back to 300.6 megawatts, including the potential utilization of alternative interconnection queue positions, including MISO queue position J722, which is explained in the supplemental testimony of witness Hart.

Respondent: Daryl Hart, Director Business Development

2-18) Has the applicant done any studies on human, plant and animal communities, including terrestrial ecosystems and aquatic ecosystems in regard to the effects listed in section 5.2 of the applicant's wind easement/land lease? Specifically, "5.2 Effects Easement. Owner grants to Operator a non-exclusive easement for audio, visual, view, light, flicker, noise, shadow, vibration, air turbulence, wake, electromagnetic, electrical and radio frequency interference, and any other effects attributable to the Wind Farm or activity located on the Owner's Property or on adjacent properties over and across the Owner's Property ("Effects Easement")." https://puc.sd.gov/commission/dockets/electric/2019/EL19-027/attachmentb.pdf . If so, provide the studies.

Response: Crowned Ridge Wind II has completed a number of studies in support of its application that have been filed in this docket and can be downloaded from the Commission's docket, and some of these studies also address subjects that are listed in Section 5.2 of the referenced easement.

Respondent: Daryl Hart, Director Business Development

Exhibit AC-11









GENERATOR INTERCONNECTION AGREEMENT (GIA)

THIS AMENDED AND RESTATED GENERATOR INTERCONNECTION AGREEMENT ("GIA") is made and entered into this 9th day of August, 2019, by and between **Crowned Ridge Wind II, LLC** organized and existing under the laws of the State of Delaware ("Interconnection Customer" with a Generating Facility), and **Otter Tail Power Company**, a corporation organized and existing under the laws of the State of Minnesota ("Transmission Owner"), and the **Midcontinent Independent System Operator, Inc**., a non-profit, non-stock corporation organized and existing under the laws of the State of Delaware ("Transmission Provider") and replaces the G736's Amended GIA executed on March 16, 2017 and terminates J442's GIA executed August 21, 2017. Interconnection Customer, Transmission Owner and Transmission Provider each may be referred to as a "Party," or collectively as the "Parties."

RECITALS

WHEREAS, Transmission Provider has functional control of the operations of the Transmission System, as defined herein, and is responsible for providing Transmission Service and Interconnection Service on the transmission facilities under its control; and

WHEREAS, Interconnection Customer intends to own, lease and/or control and operate the Generating Facility identified as a Generating Facility in Appendix A to this GIA; and

WHEREAS, Transmission Owner owns or operates the Transmission System, whose operations are subject to the functional control of Transmission Provider, to which Interconnection Customer desires to connect the Generating Facility, and may therefore be required to construct certain Interconnection Facilities and Network Upgrades, as set forth in this GIA; and

WHEREAS, Interconnection Studies are complete and this GIA was amended due that completion and amended to include updated Affected System upgrades; and

WHEREAS, this GIA is being amended a second time to incorporate changes in G736's generating facility to include a capacitor bank breaker station for this project and to incorporate MISO project J442's Interconnection Service with project G736's Interconnection Service; and

WHEREAS, this GIA is being amended a second time to include additional Network Upgrades as a result of J442's interconnection service.

NOW, THEREFORE, in consideration of and subject to the mutual covenants contained herein, it is agreed:

ARTICLE 1. DEFINITIONS

When used in this GIA, terms with initial capitalization that are not defined in Article 1 shall have the meanings specified in the Article in which they are used. Those capitalized terms used in this GIA that are not otherwise defined in this GIA have the meaning set forth in the Tariff.

Adverse System Impact shall mean the negative effects due to technical or operational limits on conductors or equipment being exceeded that may compromise the safety and reliability of the electric system.

Affected System shall mean an electric transmission or distribution system or the electric system associated with an existing generating facility or of a higher queued Generating Facility, which is an electric system other than the Transmission Owner's Transmission System that is affected by the Interconnection Request. An Affected System may or may not be subject to FERC jurisdiction.

Affected System Operator shall mean the entity that operates an Affected System.

Affiliate shall mean, with respect to a corporation, partnership or other entity, each such other corporation, partnership or other entity that directly or indirectly, through one or more intermediaries, controls, is controlled by, or is under common control with, such corporation, partnership or other entity.

Ancillary Services shall mean those services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the Transmission System in accordance with Good Utility Practice.

Applicable Laws and Regulations shall mean all duly promulgated applicable federal, state and local laws, regulations, rules, ordinances, codes, decrees, judgments, directives, or judicial or administrative orders, permits and other duly authorized actions of any Governmental Authority having jurisdiction over the Parties, their respective facilities and/or the respective services they provide.

Applicable Reliability Council shall mean the Regional Entity of NERC applicable to the Local Balancing Authority of the Transmission System to which the Generating Facility is directly interconnected.

Applicable Reliability Standards shall mean Reliability Standards approved by the Federal Energy Regulatory Commission (FERC) under section 215 of the Federal Power Act, as applicable.

Base Case shall mean the base case power flow, short circuit, and stability databases used for the Interconnection Studies by Transmission Provider or Interconnection Customer.

Breach shall mean the failure of a Party to perform or observe any material term or condition of this GIA.

Breaching Party shall mean a Party that is in Breach of this GIA.

Business Day shall mean Monday through Friday, excluding Federal Holidays.

Calendar Day shall mean any day including Saturday, Sunday or a Federal Holiday.

Commercial Operation shall mean the status of a Generating Facility that has commenced generating electricity for sale, excluding electricity generated during Trial Operation.

Commercial Operation Date (COD) of a unit shall mean the date on which the Generating Facility commences Commercial Operation as agreed to by the Parties pursuant to Appendix E to this GIA.

Common Use Upgrade (CUU) shall mean an Interconnection Facility, Network Upgrade, System Protection Facility, or any other classified addition, alteration, or improvement on the Transmission System or the transmission system of an Affected System, not classified under Attachment FF as a Baseline Reliability Project, Market Efficiency Project, or Multi-Value Project, that is needed for the interconnection of multiple Interconnection Customers' Generating Facilities and which is the shared responsibility of such Interconnection Customers.

Confidential Information shall mean any proprietary or commercially or competitively sensitive information, trade secret or information regarding a plan, specification, pattern, procedure, design, device, list, concept, policy or compilation relating to the present or planned business of a Party, or any other information as specified in Article 22, which is designated as confidential by the Party supplying the information, whether conveyed orally, electronically, in writing, through inspection, or otherwise, that is received by another Party.

Default shall mean the failure of a Breaching Party to cure its Breach in accordance with Article 17 of this GIA.

Definitive Planning Phase Queue Position shall mean the order of a valid Interconnection Request, relative to all other pending valid Interconnection Requests, in the Definitive Planning Phase. The Definitive Planning Phase Queue Position is established based upon the date Interconnection Customer satisfies all of the requirements of Section 7.2 to enter the Definitive Planning Phase.

Demonstrated Capability shall mean the continuous net real power output that the Generating Facility is required to demonstrate in compliance with Applicable Reliability Standards.

Dispute Resolution shall mean the procedure for resolution of a dispute between or among the Parties in which they will first attempt to resolve the dispute on an informal basis.

Distribution System shall mean the Transmission Owner's facilities and equipment, or the Distribution System of another party that is interconnected with the Transmission Owner's Transmission System, if any, connected to the Transmission System, over which facilities Transmission Service or Wholesale Distribution Service under the Tariff is available at the time Interconnection Customer has requested interconnection of a Generating Facility for the purpose of either transmitting electric energy in interstate commerce or selling electric energy at wholesale in interstate commerce and which are used to transmit electricity to ultimate usage points such as homes and industries directly from nearby generators or from interchanges with higher voltage transmission networks which transport bulk power over longer distances. The voltage levels at which distribution systems operate differ among Local Balancing Authorities and other entities owning distribution facilities interconnected to the Transmission System.

Distribution Upgrades shall mean the additions, modifications, and upgrades to the Distribution System at or beyond the Point of Interconnection to facilitate interconnection of the Generating Facility and render the delivery service necessary to affect Interconnection Customer's wholesale sale of electricity in interstate commerce. Distribution Upgrades do not include Interconnection Facilities.

Effective Date shall mean the date on which this GIA becomes effective upon execution by the Parties subject to acceptance by the Commission, or if filed unexecuted, upon the date specified by the Commission.

Emergency Condition shall mean a condition or situation: (1) that in the reasonable judgment of the Party making the claim is imminently likely to endanger, or is contributing to the endangerment of, life, property, or public health and safety; or (2) that, in the case of either Transmission Provider or Transmission Owner, is imminently likely (as determined in a non-discriminatory manner) to cause a material adverse effect on the security of, or damage to the Transmission System, Transmission Owner's Interconnection Facilities or the electric systems of others to which the Transmission System is directly connected; or (3) that, in the case of Interconnection Customer, is imminently likely (as determined in a non-discriminatory manner) to cause a material adverse effect on the security of, or damage to, the Generating Facility or Interconnection Customer's Interconnection Facilities. System restoration and blackstart shall be considered Emergency Conditions; provided that Interconnection Customer is not obligated by this GIA to possess blackstart capability. Any condition or situation that results from lack of sufficient generating capacity to meet load requirements or that results solely from economic conditions shall not constitute an Emergency Condition, unless one of the enumerated conditions or situations identified in this definition also exists.

Energy Displacement Agreement shall mean an agreement between an Interconnection Customer with an existing generating facility on the Transmission Provider's Transmission System and an Interconnection Customer with a proposed Generating Facility seeking to interconnect with Net Zero Interconnection Service. The Energy Displacement Agreement specifies the term of operation, the Generating Facility Interconnection Service limit, and the mode of operation for energy production (common or singular operation).

Energy Resource Interconnection Service (ER Interconnection Service) shall mean an Interconnection Service that allows Interconnection Customer to connect its Generating Facility to the Transmission System or Distribution System, as applicable, to be eligible to deliver the Generating Facility's electric output using the existing firm or non-firm capacity of the Transmission System on an as available basis. Energy Resource Interconnection Service does not convey transmission service.

Engineering & Procurement (E&P) Agreement shall mean an agreement that authorizes Transmission Owner to begin engineering and procurement of long lead-time items necessary for the establishment of the interconnection in order to advance the implementation of the Interconnection Request.

Environmental Law shall mean Applicable Laws or Regulations relating to pollution or protection of the environment or natural resources.

Federal Holiday shall mean a Federal Reserve Bank holiday for a Party that has its principal place of business in the United States and a Canadian Federal or Provincial banking holiday for a Party that has its principal place of business located in Canada.

Federal Power Act shall mean the Federal Power Act, as amended, 16 U.S.C. §§ 791a *et seq*.

FERC shall mean the Federal Energy Regulatory Commission, also known as Commission, or its successor.

Force Majeure shall mean any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, any order, regulation or restriction imposed by governmental, military or lawfully established civilian authorities, or any other cause beyond a Party's control. A Force Majeure event does not include an act of negligence or intentional wrongdoing by the Party claiming Force Majeure.

Generating Facility shall mean Interconnection Customer's device(s) for the production and/or storage for later injection of electricity identified in the Interconnection Request, but shall not include the Interconnection Customer's Interconnection Facilities.

Generating Facility Capacity shall mean the net capacity of the Generating Facility and the aggregate net capacity of the Generating Facility where it includes multiple energy production devices.

Generator Interconnection Agreement (GIA) shall mean the form of interconnection agreement, set forth herein.

Generator Interconnection Procedures (GIP) shall mean the interconnection procedures set forth in Attachment X of the Tariff.

Generator Upgrades shall mean the additions, modifications, and upgrades to the electric system of an existing generating facility or of a higher queued Generating Facility at or beyond the Point of Interconnection to facilitate interconnection of the Generating Facility and render the Transmission Service necessary to affect Interconnection Customer's wholesale sale of electricity in interstate commerce.

Good Utility Practice shall mean any of the practices, methods and acts engaged in or approved by a significant portion of the electric industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region.

Governmental Authority shall mean any federal, state, local or other governmental regulatory or administrative agency, court, commission, department, board, or other governmental subdivision, legislature, rulemaking board, tribunal, or other governmental authority having jurisdiction over the Parties, their respective facilities, or the respective services they provide, and exercising or entitled to exercise any administrative, executive, police, or taxing authority or power; provided, however, that such term does not include Interconnection Customer, Transmission Provider, Transmission Owner, or any Affiliate thereof.

Group Study(ies) shall mean the process whereby more than one Interconnection Request is studied together, instead of serially, for the purpose of conducting one or more of the required Studies.

Hazardous Substances shall mean any chemicals, materials or substances defined as or included in the definition of "hazardous substances," "hazardous wastes," "hazardous materials," "hazardous constituents," "restricted hazardous materials," "extremely hazardous substances," "toxic substances," "radioactive substances," "contaminants," "pollutants," "toxic pollutants" or words of similar meaning and regulatory effect under any applicable Environmental Law, or any other chemical, material or substance, exposure to which is prohibited, limited or regulated by any applicable Environmental Law.

HVDC Facilities shall mean the high voltage direct current transmission facilities, including associated alternating current facilities, if any, that are subject to Section 27A of the Tariff and that are specifically identified in (i) any Agency Agreement pertaining to such facilities between Transmission Provider and Transmission Owner that owns or operates such facilities, or (ii) in any other arrangement that permits or will permit Transmission Provider to provide HVDC Service over such facilities as set forth in Section 27A of the Tariff.

HVDC Service shall mean Firm and Non-Firm Point-To-Point Transmission Service provided by Transmission Provider on HVDC Facilities pursuant to Section 27A of the Tariff.

Initial Synchronization Date shall mean the date upon which the Generating Facility is initially synchronized and upon which Trial Operation begins.

In-Service Date (ISD) shall mean the date upon which Interconnection Customer reasonably expects it will be ready to begin use of the Transmission Owner's Interconnection Facilities to obtain backfeed power.

Interconnection Customer shall mean any entity, including Transmission Provider, Transmission Owner or any of the Affiliates or subsidiaries of either, that proposes to interconnect its Generating Facility with the Transmission System.

Interconnection Customer's Interconnection Facilities (ICIF) shall mean all facilities and equipment, as identified in Appendix A of this GIA, that are located between the Generating Facility and the Point of Change of Ownership, including any modification, addition, or upgrades to such facilities and equipment necessary to physically and electrically interconnect the Generating Facility to the Transmission System or Distribution System, as applicable. Interconnection Customer's Interconnection Facilities are sole use facilities.

Interconnection Facilities shall mean the Transmission Owner's Interconnection Facilities and the Interconnection Customer's Interconnection Facilities. Collectively, Interconnection Facilities include all facilities and equipment between the Generating Facility and the Point of Interconnection, including any modification, additions or upgrades that are necessary to physically and electrically interconnect the Generating Facility to the Transmission System. Interconnection Facilities shall not include Distribution Upgrades, Generator Upgrades, Stand Alone Network Upgrades or Network Upgrades.

Interconnection Facilities Study shall mean a study conducted by Transmission Provider, or its agent, for Interconnection Customer to determine a list of facilities (including Transmission Owner's Interconnection Facilities, System Protection Facilities, and if such upgrades have been determined, Network Upgrades, Distribution Upgrades, Generator Upgrades, Common Use Upgrades, and upgrades on Affected Systems, as identified in the Interconnection System Impact Study), the cost of those facilities, and the time required to interconnect the Generating Facility with the Transmission System.

Interconnection Facilities Study Agreement shall mean the form of agreement contained in Appendix 4 of the Generator Interconnection Procedures for conducting the Interconnection Facilities Study.

Interconnection Request shall mean an Interconnection Customer's request, in the form of Appendix 1 to the Generator Interconnection Procedures, to interconnect a new Generating Facility, or to increase the capacity of, or make a Material Modification to the operating characteristics of, an existing Generating Facility that is interconnected with the Transmission System.

Interconnection Service shall mean the service provided by Transmission Provider associated with interconnecting the Generating Facility to the Transmission System and enabling

it to receive electric energy and capacity from the Generating Facility at the Point of Interconnection, pursuant to the terms of this GIA and, if applicable, the Tariff.

Interconnection Study (or Study) shall mean any of the studies described in the Generator Interconnection Procedures.

Interconnection Study Agreement shall mean the form of agreement contained in Attachment B to Appendix 1 of the Generator Interconnection procedures for conducting all studies required by the Generator Interconnection Procedures.

Interconnection System Impact Study shall mean an engineering study that evaluates the impact of the proposed interconnection on the safety and reliability of Transmission System and, if applicable, an Affected System. The study shall identify and detail the system impacts that would result if the Generating Facility were interconnected without project modifications or system modifications, or to study potential impacts, including but not limited to those identified in the Scoping Meeting as described in the Generator Interconnection Procedures.

IRS shall mean the Internal Revenue Service.

Local Balancing Authority shall mean an operational entity or a Joint Registration Organization which is (i) responsible for compliance with the subset of NERC Balancing Authority Reliability Standards defined in the Balancing Authority Agreement for their local area within the MISO Balancing Authority Area, (ii) a Party to Balancing Authority Agreement, excluding MISO, and (iii) provided in the Balancing Authority Agreement.

Loss shall mean any and all damages, losses, claims, including claims and actions relating to injury to or death of any person or damage to property, demand, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the other Party's performance, or non-performance of its obligations under this GIA on behalf of the indemnifying Party, except in cases of gross negligence or intentional wrongdoing, by the indemnified party.

Material Modification shall mean those modifications that have a material impact on the cost or timing of any Interconnection Request with a later queue priority date.

Metering Equipment shall mean all metering equipment installed or to be installed at the Generating Facility pursuant to this GIA at the metering points, including but not limited to instrument transformers, MWh-meters, data acquisition equipment, transducers, remote terminal unit, communications equipment, phone lines, and fiber optics.

Monitoring and Consent Agreement shall mean an agreement that defines the terms and conditions applicable to a Generating Facility acquiring Net Zero Interconnection Service. The Monitoring and Consent Agreement will list the roles and responsibilities of an Interconnection Customer seeking to interconnect with Net Zero Interconnection Service and Transmission Owner to maintain the total output of the Generating Facility inside the parameters delineated in the GIA.

NERC shall mean the North American Electric Reliability Corporation or its successor organization.

Net Zero Interconnection Service shall mean a form of ER Interconnection Service that allows Interconnection Customer to alter the characteristics of an existing generating facility, with the consent of the existing generating facility, at the same POI such that the Interconnection Service limit remains the same.

Network Customer shall have that meaning as provided in the Tariff.

Network Resource shall mean any designated generating resource owned, purchased, or leased by a Network Customer under the Tariff. Network Resources do not include any resource, or any portion thereof, that is committed for sale to third parties or otherwise cannot be called upon to meet the Network Customer's Network Load on a non-interruptible basis.

Network Resource Interconnection Service (NR Interconnection Service) shall mean an Interconnection Service that allows Interconnection Customer to integrate its Generating Facility with the Transmission System in the same manner as for any Generating Facility being designated as a Network Resource. Network Resource Interconnection Service does not convey transmission service. Network Resource Interconnection Service shall include any network resource interconnection service established under an agreement with, or the tariff of, a Transmission Owner prior to integration into MISO, that is determined to be deliverable through the integration deliverability study process.

Network Upgrades shall mean the additions, modifications, and upgrades to the Transmission System required at or beyond the point at which the Interconnection Facilities connect to the Transmission System or Distribution System, as applicable, to accommodate the interconnection of the Generating Facility to the Transmission System. Network Upgrade shall not include any HVDC Facility Upgrades.

Notice of Dispute shall mean a written notice of a dispute or claim that arises out of or in connection with this GIA or its performance.

Operating Horizon Study shall mean an Interconnection System Impact Study that includes in service transmission and generation for an identified timeframe to determine either the available injection capacity of an Interconnection Request or Interconnection Facilities and/or Transmission System changes required for the requested Interconnection Service**.**

Optional Interconnection Study shall mean a sensitivity analysis based on assumptions specified by Interconnection Customer in the Optional Interconnection Study Agreement.

Optional Interconnection Study Agreement shall mean the form of agreement contained in Appendix 5 of the Generator Interconnection Procedures for conducting the Optional Interconnection Study.

Party or Parties shall mean Transmission Provider, Transmission Owner, Interconnection Customer, or any combination of the above.

Planning Horizon Study shall mean an Interconnection System Impact Study that includes a future year study to determine either the available injection capacity of an Interconnection Request or Interconnection Facilities and/or Transmission System changes required for the requested Interconnection Service.

Point of Change of Ownership (PCO) shall mean the point, as set forth in Appendix A to the Generator Interconnection Agreement, where the Interconnection Customer's Interconnection Facilities connect to the Transmission Owner's Interconnection Facilities.

Point of Interconnection (POI) shall mean the point, as set forth in Appendix A of the GIA, where the Interconnection Facilities connect to the Transmission System.

Provisional Interconnection Study shall mean an engineering study, performed at Interconnection Customer's request, as a condition to entering into a provisional GIA, that evaluates the impact of the proposed interconnection on the safety and reliability of the Transmission System and, if applicable, any Affected System. The study shall identify and detail the impacts on the Transmission System and, if applicable, an Affected System, from stability, short circuit, and voltage issues that would result if the Generating Facility were interconnected without project modifications or system modifications.

Queue Position shall mean the order of a valid Interconnection Request, relative to all other pending valid Interconnection Requests. The Queue Position is established based upon the date and time of receipt of the valid Interconnection Request by Transmission Provider.

Reasonable Efforts shall have that meaning as provided in the Tariff.

Scoping Meeting shall mean the meeting between representatives of Interconnection Customer, Transmission Owner, Affected System Operator(s) and Transmission Provider conducted for the purpose of discussing alternative interconnection options, to exchange information including any transmission data and earlier study evaluations that would be reasonably expected to impact such interconnection options, to analyze such information, and to determine the potential feasible Points of Interconnection.

Shared Network Upgrade shall mean a Network Upgrade or Common Use Upgrade that is funded by an Interconnection Customer(s) and also benefits other Interconnection Customer(s) that are later identified as beneficiaries.

Site Control shall mean documentation reasonably demonstrating: (1) ownership of, a leasehold interest in, or a right to develop a site for the purpose of constructing the Generating Facility and when applicable (i.e. when Interconnection Customer is providing the site for the TOIFs and Network Upgrades at the POI) the Interconnection Facilities, and; (2) an option to purchase or acquire a leasehold site for such purpose; or (3) an exclusivity or other business relationship between Interconnection Customer and the entity having the right to sell, lease or

grant Interconnection Customer the right to possess or occupy a site for such purpose. Such documentation must support a reasonable determination of 75% of the sufficient land area to support the size and type of Generating Facility proposed. If an Interconnection Customer cannot demonstrate Site Control for Interconnection Facilities as a result of regulatory requirements or obligations, the Interconnection Customer must demonstrate such regulatory requirements or obligations to the Transmission Provider and provide cash in-lieu of Site Control until the time that the regulatory requirements allow the Site Control requirement to be met.

Small Generating Facility shall mean a Generating Facility that has an aggregate net Generating Facility Capacity of no more than five MW and meets the requirements of Section 14 and Appendix 3 of the GIP.

Special Protection System (SPS) shall mean an automatic protection system or remedial action scheme designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components, to maintain system reliability. Such action may include changes in demand (MW and MVar), energy (MWh and MVarh), or system configuration to maintain system stability, acceptable voltage, or power flows. An SPS does not include (a) underfrequency or undervoltage load shedding, (b) fault conditions that must be isolated, (c) out-of-step relaying not designed as an integral part of an SPS, or (d) Transmission Control Devices.

Stand Alone Network Upgrades shall mean Network Upgrades that an Interconnection Customer may construct without affecting day-to-day operations of the Transmission System during their construction. Transmission Provider, Transmission Owner and Interconnection Customer must agree as to what constitutes Stand Alone Network Upgrades and identify them in Appendix A to this GIA.

System Protection Facilities shall mean the equipment, including necessary protection signal communications equipment, required to protect (1) the Transmission System or other delivery systems or other generating systems from faults or other electrical disturbances occurring at the Generating Facility and (2) the Generating Facility from faults or other electrical system disturbances occurring on the Transmission System or on other delivery systems or other generating systems to which the Transmission System is directly connected.

Tariff shall mean the Transmission Provider's Tariff through which open access transmission service and Interconnection Service are offered, as filed with the Commission, and as amended or supplemented from time to time, or any successor tariff.

Transmission Control Devices shall mean a generally accepted transmission device that is planned and designed to provide dynamic control of electric system quantities, and are usually employed as solutions to specific system performance issues. Examples of such devices include fast valving, high response exciters, high voltage DC links, active or real power flow control and reactive compensation devices using power electronics (*e.g.*, unified power flow controllers), static var compensators, thyristor controlled series capacitors, braking resistors, and in some cases mechanically-switched capacitors and reactors. In general, such systems are not considered to be Special Protection Systems.

Transmission Owner shall mean that Transmission Owner as defined in the Tariff, which includes an entity that owns, leases or otherwise possesses an interest in the portion of the Transmission System at which Interconnection Customer proposes to interconnect or otherwise integrate the operation of the Generating Facility. Transmission Owner should be read to include any Independent Transmission Company that manages the transmission facilities of Transmission Owner and shall include, as applicable, the owner and/or operator of distribution facilities interconnected to the Transmission System, over which facilities transmission service or Wholesale Distribution Service under the Tariff is available at the time Interconnection Customer requests Interconnection Service and to which Interconnection Customer has requested interconnection of a Generating Facility for the purpose of either transmitting electric energy in interstate commerce or selling electric energy at wholesale in interstate commerce.

Transmission Provider shall mean the Midcontinent Independent System Operator, Inc. ("MISO"), the Regional Transmission Organization that controls or operates the transmission facilities of its transmission-owning members used for the transmission of electricity in interstate commerce and provides transmission service under the Tariff.

Transmission Owner's Interconnection Facilities (TOIF) shall mean all facilities and equipment owned by Transmission Owner from the Point of Change of Ownership to the Point of Interconnection as identified in Appendix A to this GIA, including any modifications, additions or upgrades to such facilities and equipment. Transmission Owner's Interconnection Facilities are sole use facilities and shall not include Distribution Upgrades, Generator Upgrades, Stand Alone Network Upgrades or Network Upgrades.

Transmission System shall mean the facilities owned by Transmission Owner and controlled or operated by Transmission Provider or Transmission Owner that are used to provide Transmission Service (including HVDC Service) or Wholesale Distribution Service under the Tariff.

Trial Operation shall mean the period during which Interconnection Customer is engaged in on-site test operations and commissioning of the Generating Facility prior to Commercial Operation.

Variable Energy Resource shall mean a device for the production of electricity that is characterized by an energy source that: (1) is renewable; (2) cannot be stored by the facility owner or operator; and (3) has variability that is beyond the control of the facility owner or operator.

Wholesale Distribution Service shall have that meaning as provided in the Tariff. Wherever the term "transmission delivery service" is used, Wholesale Distribution Service shall also be implied.

ARTICLE 2. EFFECTIVE DATE, TERM AND TERMINATION

2.1 Effective Date. This GIA shall become effective upon execution by the Parties subject to acceptance by FERC (if applicable), or if filed unexecuted, upon the date specified by FERC. Transmission Provider shall promptly file this GIA with FERC upon execution in accordance with Article 3.1, if required.

2.2 Term of Agreement. Subject to the provisions of Article 2.3, this GIA shall remain in effect for a period of twenty-five (25) years from the Effective Date and shall be automatically renewed for each successive one-year period thereafter on the anniversary of the Effective Date.

2.3 Termination Procedures. This GIA may be terminated as follows:

2.3.1 Written Notice. This GIA may be terminated by Interconnection Customer after giving Transmission Provider and Transmission Owner ninety (90) Calendar Days advance written notice or by Transmission Provider if the Generating Facility or a portion of the Generating Facility fails to achieve Commercial Operation for three (3) consecutive years following the Commercial Operation Date, or has ceased Commercial Operation for three (3) consecutive years, beginning with the last date of Commercial Operation for the Generating Facility, after giving Interconnection Customer ninety (90) Calendar Days advance written notice. Where only a portion of the Generating Facility fails to achieve Commercial Operation for three (3) consecutive years following the Commercial Operation Date, Transmission Provider may only terminate that portion of the GIA. The Generating Facility will not be deemed to have ceased Commercial Operation for purposes of this Article 2.3.1 if Interconnection Customer can document that it has taken other significant steps to maintain or restore operational readiness of the Generating Facility for the purpose of returning the Generating Facility to Commercial Operation as soon as possible.

2.3.1.1 Net Zero Interconnection Service. Where this GIA provides for Net Zero Interconnection Service and the Energy Displacement Agreement or the Monitoring and Consent Agreement required for Net Zero Interconnection Service are no longer in effect, Interconnection Customer shall immediately cease Commercial Operation of the Generating Facility and this GIA shall be deemed terminated.

2.3.2 Default. Any Party may terminate this GIA in accordance with Article 17.

2.3.3 Notwithstanding Articles 2.3.1 and 2.3.2, no termination shall become effective until the Parties have complied with all Applicable Laws and Regulations applicable to such termination, including the filing with FERC of a notice of termination of this GIA, if required, which notice has been accepted for filing by FERC.

2.4 Termination Costs. If a Party elects to terminate this GIA pursuant to Article 2.3 above, each Party shall pay all costs incurred for which that Party is responsible (including any cancellation costs relating to orders or contracts for Interconnection Facilities, applicable upgrades, and related equipment) or charges assessed by the other Parties, as of the date of the other Parties' receipt of such notice of termination, under this GIA. In the event of termination by a Party, the Parties shall use commercially Reasonable Efforts to mitigate the costs, damages and charges arising as a consequence of termination. Upon termination of this GIA, unless otherwise ordered or approved by FERC:

2.4.1 With respect to any portion of the Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades, Generator Upgrades, and if so determined and made a part of this GIA, upgrades on Affected Systems, that have not yet been constructed or installed, Transmission Owner shall to the extent possible and to the extent of Interconnection Customer's written notice under Article 2.3.1, cancel any pending orders of, or return, any materials or equipment for, or contracts for construction of, such facilities; provided that in the event Interconnection Customer elects not to authorize such cancellation, Interconnection Customer shall assume all payment obligations with respect to such materials, equipment, and contracts, and Transmission Owner shall deliver such material and equipment, and, if necessary, assign such contracts, to Interconnection Customer as soon as practicable, at Interconnection Customer's expense. To the extent that Interconnection Customer has already paid Transmission Owner for any or all such costs of materials or equipment not taken by Interconnection Customer, Transmission Owner shall promptly refund such amounts to Interconnection Customer, less any costs, including penalties incurred by Transmission Owner to cancel any pending orders of or return such materials, equipment, or contracts.

If an Interconnection Customer terminates this GIA, it shall be responsible for all costs incurred in association with that Interconnection Customer's interconnection, including any cancellation costs relating to orders or contracts for Interconnection Facilities and equipment, and other expenses including any upgrades or related equipment for which Transmission Owner has incurred expenses and has not been reimbursed by Interconnection Customer.

2.4.2 Transmission Owner may, at its option, retain any portion of such materials, equipment, or facilities that Interconnection Customer chooses not to accept delivery of, in which case Transmission Owner shall be responsible for all costs associated with procuring such materials, equipment, or facilities. If Transmission Owner does not so elect, then Interconnection Customer shall be responsible for such costs.

2.4.3 With respect to any portion of the Interconnection Facilities, and any other facilities already installed or constructed pursuant to the terms of this GIA, Interconnection Customer shall be responsible for all costs associated with the removal, relocation, reconfiguration or other disposition or retirement of such

materials, equipment, or facilities, and such other expenses actually incurred by Transmission Owner necessary to return the Transmission, Distribution or Generator System, as applicable, to safe and reliable operation.

2.5 Disconnection. Upon termination of this GIA, the Parties will take all appropriate steps to disconnect the Generating Facility from the Transmission or Distribution System, as applicable. All costs required to effectuate such disconnection shall be borne by the terminating Party, unless such termination resulted from the non-terminating Party's Default of this GIA or such non-terminating Party otherwise is responsible for these costs under this GIA.

2.6 Survival. This GIA shall continue in effect after termination to the extent necessary to provide for final billings and payments and for costs incurred hereunder, including billings and payments pursuant to this GIA; to permit the determination and enforcement of liability and indemnification obligations arising from acts or events that occurred while this GIA was in effect; and to permit each Party to have access to the lands of the other Party pursuant to this GIA or other applicable agreements, to disconnect, remove or salvage its own facilities and equipment.

ARTICLE 3. REGULATORY FILINGS

3.1 Filing. Transmission Provider shall file this GIA (and any amendment hereto) with the appropriate Governmental Authority, if required. A Party may request that any information so provided be subject to the confidentiality provisions of Article 22. If that Party has executed this GIA, or any amendment thereto, the Party shall reasonably cooperate with Transmission Provider with respect to such filing and to provide any information reasonably requested by Transmission Provider needed to comply with applicable regulatory requirements.

ARTICLE 4. SCOPE OF SERVICE

4.1 Interconnection Product Options. Interconnection Customer has selected the following (checked) type of Interconnection Service:

Check: _____ NZ or ____ ER and/or _X___ NR (See Appendix A for details)

4.1.1 Energy Resource Interconnection Service (ER Interconnection Service).

4.1.1.1 The Product. ER Interconnection Service allows Interconnection Customer to connect the Generating Facility to the Transmission or Distribution System, as applicable, and be eligible to deliver the Generating Facility's output using the existing firm or non-firm capacity of the Transmission System on an "as available" basis. To the extent Interconnection Customer wants to receive ER Interconnection Service, Transmission Owner shall construct facilities consistent with the studies identified in Appendix A.

An Interconnection Customer seeking ER Interconnection Service for new or added capacity at a Generating Facility may be granted conditional ER Interconnection Service status to the extent there is such capacity available on the Transmission System to accommodate the Interconnection Customer's Generating Facility. At the request of Interconnection Customer, conditional ER Interconnection Service status may be granted subject to the system being able to accommodate the interconnection without upgrades, until such time as a higher queued project(s) with a later service date affecting the same common elements is placed into service. The conditional ER Interconnection Service shall be terminated in the event Interconnection Customer fails to fund the necessary studies and the Network Upgrades necessary to grant the Interconnection Customer's ER Interconnection Service upon the completion of higher queued projects involving the same common elements.

4.1.1.2 Transmission Delivery Service Implications. Under ER Interconnection Service, Interconnection Customer will be eligible to inject power from the Generating Facility into and deliver power across the Transmission System on an "as available" basis up to the amount of MW identified in the applicable stability and steady state studies to the extent the upgrades initially required to qualify for ER Interconnection Service have been constructed. After that date FERC makes effective MISO's Energy Market Tariff filed in Docket No. ER04-691-000, Interconnection Customer may place a bid to sell into the market up to the maximum identified Generating Facility output, subject to any conditions specified in the Interconnection Service approval, and the Generating Facility will be dispatched to the extent the Interconnection Customer's bid clears. In all other instances, no transmission or other delivery service from the Generating Facility is assured, but Interconnection Customer may obtain Point-To-Point Transmission Service, Network Integration Transmission Service or be used for secondary network transmission service, pursuant to the Tariff, up to the maximum output identified in the stability and steady state studies. In those instances, in order for Interconnection Customer to obtain the right to deliver or inject energy beyond the Point of Interconnection or to improve its ability to do so, transmission delivery service must be obtained pursuant to the provisions of the Tariff. The Interconnection Customer's ability to inject its Generating Facility output beyond the Point of Interconnection, therefore, will depend on the existing capacity of the Transmission or Distribution System as applicable, at such time as a Transmission Service request is made that would accommodate such delivery. The provision of Firm Point-To-Point Transmission Service or Network Integration Transmission Service may require the construction of additional Network or Distribution Upgrades.

4.1.2 Network Resource Interconnection Service (NR Interconnection Service).

4.1.2.1 The Product. Transmission Provider must conduct the necessary studies and Transmission Owner shall construct the facilities identified in Appendix A of this GIA, subject to the approval of Governmental Authorities, needed to integrate the Generating Facility in the same manner as for any Generating Facility being designated as a Network Resource.

4.1.2.2 Transmission Delivery Service Implications. NR Interconnection Service allows the Generating Facility to be designated by any Network Customer under the Tariff on the Transmission System as a Network Resource, up to the Generating Facility's full output, on the same basis as existing Network Resources that are interconnected to the Transmission or Distribution System, as applicable, and to be studied as a Network Resource on the assumption that such a designation will occur. Although NR Interconnection Service does not convey a reservation of Transmission Service, any Network Customer can utilize Network Integration Transmission Service under the Tariff to obtain delivery of energy from the Generating Facility in the same manner as it accesses Network Resources. A Generating Facility receiving NR Interconnection Service may also be used to provide Ancillary Services after technical studies and/or periodic analyses are performed with respect to the Generating Facility's ability to provide any applicable Ancillary Services, provided that such studies and analyses have been or would be required in connection with the provision of such Ancillary Services by any existing Network Resource. However, if the Generating Facility has not been designated as a Network Resource by any Network Customer, it cannot be required to provide Ancillary Services except to the extent such requirements extend to all generating facilities that are similarly situated. The provision of Network Integration Transmission Service or Firm Point-To-Point Transmission Service may require additional studies and the construction of additional upgrades. Because such studies and upgrades would be associated with a request for delivery service under the Tariff, cost responsibility for the studies and upgrades would be in accordance with FERC's policy for pricing transmission delivery services.

NR Interconnection Service does not necessarily provide Interconnection Customer with the capability to physically deliver the output of its Generating Facility to any particular load on the Transmission System without incurring congestion costs. In the event of transmission or distribution constraints on the Transmission or Distribution System, as applicable, the Generating Facility shall be subject to the applicable

congestion management procedures in the Transmission System in the same manner as Network Resources.

There is no requirement either at the time of study or interconnection, or at any point in the future, that the Generating Facility be designated as a Network Resource by a Network Customer or that Interconnection Customer identify a specific buyer (or sink). To the extent a Network Customer does designate the Generating Facility as a Network Resource, it must do so pursuant to the Tariff.

Once an Interconnection Customer satisfies the requirements for obtaining NR Interconnection Service, any future Transmission Service request for delivery from the Generating Facility within the Transmission System of any amount of capacity and/or energy, up to the amount initially studied, will not require that any additional studies be performed or that any further upgrades associated with such Generating Facility be undertaken, regardless of whether such Generating Facility is ever designated by a Network Customer as a Network Resource and regardless of changes in ownership of the Generating Facility. To the extent Interconnection Customer enters into an arrangement for long term Transmission Service for deliveries from the Generating Facility to customers other than the studied Network Customers, or for any Point-To-Point Transmission Service, such request may require additional studies and upgrades in order for Transmission Provider to grant such request. However, the reduction or elimination of congestion or redispatch costs may require additional studies and the construction of additional upgrades.

To the extent Interconnection Customer enters into an arrangement for long term Transmission Service for deliveries from the Generating Facility outside the Transmission System, such request may require additional studies and upgrades in order for Transmission Provider to grant such request.

4.1.2.3 Conditional NR Interconnection Service. An Interconnection Customer seeking NR Interconnection Service for new or added capacity at a Generating Facility may be granted conditional NR Interconnection Service status to the extent there is such capacity available on the Transmission System to accommodate the Interconnection Customer's Generating Facility. At the request of Interconnection Customer, conditional NR Interconnection Service status may be granted subject to the system being able to accommodate the interconnection without upgrades, until such time as higher queued project(s) with a later service date affecting the same common elements is placed into service. The conditional NR Interconnection Service status may be converted to ER Interconnection Service if either of the following occurs:

1) Interconnection Customer fails to fund necessary studies and Network Upgrades required to allow the Interconnection Customer's Generating Facility to receive NR Interconnection Service upon the completion of higher queued projects involving the same common elements; or

2) The higher queued project(s) or planned and required Network Upgrades are placed in service and the Network Upgrades required to provide NR Interconnection Service status to the Interconnection Customer's Generating Facility are not in service.

In the event Interconnection Customer fails to fund the necessary studies and Network Upgrades for NR Interconnection Service, the Interconnection Customer's conditional NR Interconnection Service status shall be converted to ER Interconnection Service status unless Interconnection Customer makes a new Interconnection Request. Such new Interconnection Request shall be evaluated in accordance with the GIP and its new queue position.

Some or all of the conditional NR Interconnection Service status may be temporarily revoked if the Network Upgrades are not in service when the higher queued project(s) are placed in service. The availability of conditional NR Interconnection Service status will be determined by Transmission Provider's studies. Upon funding and completion of the Network Upgrades required to establish the Generating Facility's NR Interconnection Service status, the Generating Facility will be granted NR Interconnection Service status.

The Parties agree that the portion of the Generating Facility classified as NR Interconnection Service is the first portion of the output of the combined output of all the units at the Generating Facility except in circumstances where Interconnection Customer otherwise elects this GIA, as amended, to allocate that portion to the output of specific unit(s) at the Generating Facility, the total of which will not exceed the output eligible for NR Interconnection Service as shown by the additional studies. To the extent Interconnection Customer desires to obtain NR Interconnection Service for any portion of the Generating Facility in addition to that supported by such additional studies, Interconnection Customer will be required to request such additional NR Interconnection Service through a separate Interconnection Request in accordance with the GIP.

4.1.3 Net Zero Interconnection Service (NZ Interconnection Service).

4.1.3.1 The Product. Net Zero Interconnection Service is restricted ER Interconnection Service that allows an Interconnection Customer to

increase the gross generating capability at the same Point of Interconnection of an existing generating facility without increasing the existing Interconnection Service limit at that Point of Interconnection.

4.1.3.2 Transmission Delivery Service Implications. Net Zero Interconnection Service does not convey any right to deliver electricity to any specific customer or Point of Delivery.

4.2 Provision of Service. Transmission Provider shall provide Interconnection Service for the Generating Facility at the Point of Interconnection.

4.3 Performance Standards. Each Party shall perform all of its obligations under this GIA in accordance with Applicable Laws and Regulations, Applicable Reliability Standards, and Good Utility Practice. To the extent a Party is required or prevented or limited in taking any action by such regulations and standards, or if the obligations of any Party may become limited by a change in Applicable Laws and Regulations, Applicable Reliability Standards, and Good Utility Practice after the execution of this GIA, that Party shall not be deemed to be in Breach of this GIA for its compliance therewith. The Party so limited shall notify the other Parties whereupon Transmission Provider shall amend this GIA in concurrence with the other Parties and submit the amendment to the Commission for approval.

4.4 No Transmission Delivery Service. The execution of this GIA does not constitute a request for, or the provision of, any transmission delivery service under the Tariff, and does not convey any right to deliver electricity to any specific customer or Point of Delivery.

4.5 Interconnection Customer Provided Services. The services provided by Interconnection Customer under this GIA are set forth in Article 9.6 and Article 13.4.1. Interconnection Customer shall be paid for such services in accordance with Article 11.6.

ARTICLE 5. INTERCONNECTION FACILITIES ENGINEERING, PROCUREMENT, AND CONSTRUCTION

5.1 Options. Unless otherwise mutually agreed to between the Parties, Interconnection Customer shall select: 1) the In-Service Date, Initial Synchronization Date, and Commercial Operation Date based on a reasonable construction schedule that will allow sufficient time for design, construction, equipment procurement, and permit acquisition of Transmission System equipment or right-of-way; and 2) either Standard Option or Alternate Option set forth below for completion of the Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades and Generator Upgrades, as applicable, and set forth in Appendix A, and such dates and selected option shall be set forth in Appendix B. The dates and selected option shall be subject to the acceptance of Transmission Owner taking into account the type of construction to be employed and the regulatory requirements of Governmental Authority, and does not convey any right to deliver electricity to any specific customer or Point of

Delivery, including the need to obtain permits or other authorizations for construction of the Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades, Generator Upgrades, the Generating Facility and Stand-Alone Network Upgrades.

5.1.1 Standard Option. Transmission Owner shall design, procure, and construct the Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades, and Generator Upgrades using Reasonable Efforts to complete the Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades and Generator Upgrades by the dates set forth in Appendix B, Milestones, subject to the receipt of all approvals required from Governmental Authorities and the receipt of all land rights necessary to commence construction of such facilities, and such other permits or authorizations as may be required. Transmission Provider or Transmission Owner shall not be required to undertake any action which is inconsistent with its standard safety practices, its material and equipment specifications, its design criteria and construction procedures, its labor agreements, Applicable Laws and Regulations and Good Utility Practice. In the event Transmission Owner reasonably expects that it will not be able to complete the Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities, Distribution Upgrades and Generator Upgrades by the specified dates, Transmission Owner shall promptly provide written notice to Interconnection Customer and Transmission Provider and shall undertake Reasonable Efforts to meet the earliest dates thereafter.

5.1.2 Alternate Option. If the dates designated by Interconnection Customer are acceptable to Transmission Provider and Transmission Owner, Transmission Provider shall so notify Interconnection Customer within thirty (30) Calendar Days, and Transmission Owner shall assume responsibility for the design, procurement and construction of the Transmission Owner's Interconnection Facilities by the designated dates.

If Transmission Owner subsequently fails to complete the Transmission Owner's Interconnection Facilities by the In-Service Date, to the extent necessary to provide back feed power; or fails to complete Network Upgrades by the Initial Synchronization Date to the extent necessary to allow for Trial Operation at full power output, unless other arrangements are made by the Parties for such Trial Operation; or fails to complete the Network Upgrades by the Commercial Operation Date, as such dates are reflected in Appendix B, Milestones; Transmission Owner shall pay Interconnection Customer liquidated damages in accordance with Article 5.3, Liquidated Damages, provided, however, the dates designated by Interconnection Customer shall be extended day for day for each Calendar Day that Transmission Provider refuses to grant clearances to install equipment.

Transmission Owner and Interconnection Customer may adopt an incentive

payment schedule that is mutually agreeable to encourage Transmission Owner to meet specified accelerated dates. Such payment by Interconnection Customer is not subject to refund.

5.1.3 Option to Build. If the dates designated by Interconnection Customer are not acceptable to Transmission Owner to complete the Transmission Owner's Interconnection Facilities or Stand Alone Network Upgrades, Transmission Provider shall so notify Interconnection Customer within thirty (30) Calendar Days, and unless the Parties agree otherwise, Interconnection Customer shall have the option to assume responsibility for the design, procurement and construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades by the dates originally designated by Interconnection Customer under Article 5.1.2. The Parties must agree as to what constitutes Stand Alone Network Upgrades and identify such Stand Alone Network Upgrades in Appendix A. Except for Stand Alone Network Upgrades, Interconnection Customer shall have no right to construct Network Upgrades under this option.

5.1.4 Negotiated Option. If Interconnection Customer elects not to exercise its option under Article 5.1.3, Option to Build, Interconnection Customer shall so notify Transmission Provider and Transmission Owner within thirty (30) Calendar Days, and the Parties shall in good faith attempt to negotiate terms and conditions (including revision of the specified dates and liquidated damages, the provision of incentives or the procurement and construction of a portion of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades by Interconnection Customer) pursuant to which Transmission Owner is responsible for the design, procurement and construction of the Transmission Owner's Interconnection Facilities and Network Upgrades. If the Parties are unable to reach agreement on such terms and conditions, Transmission Owner shall assume responsibility for the design, procurement and construction of the Transmission Owner's Interconnection Facilities and Network Upgrades pursuant to 5.1.1, Standard Option.

Transmission Owner and Interconnection Customer may adopt an incentive payment schedule that is mutually agreeable to encourage Transmission Owner to meet specified accelerated dates. Such payment by Interconnection Customer is not subject to refund.

5.2 General Conditions Applicable to Option to Build. If Interconnection Customer assumes responsibility for the design, procurement and construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades after receipt of all required approvals from Governmental Authorities necessary to commence construction,

(1) Interconnection Customer shall engineer, procure equipment, and construct the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades (or portions thereof) using Good Utility Practice and using standards

and specifications provided in advance by Transmission Owner, or as required by any Governmental Authority;

(2) Interconnection Customer's engineering, procurement and construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades shall comply with all requirements of law or Governmental Authority to which Transmission Owner would be subject in the engineering, procurement or construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades;

(3) Transmission Provider, at Transmission Provider's option, and Transmission Owner shall be entitled to review and approve the engineering design, equipment acceptance tests(including witnessing of acceptance tests), and the construction (including monitoring of construction) of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades, and shall have the right to reject any design, procurement, construction or acceptance test of any equipment that does not meet the standards and specifications of Transmission Provider, Transmission Owner and any Governmental Authority;

(4) prior to commencement of construction, Interconnection Customer shall provide to Transmission Provider and Transmission Owner a schedule for construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades, and shall promptly respond to requests for information from Transmission Provider and Transmission Owner;

(5) at any time during construction, Transmission Provider and Transmission Owner shall have unrestricted access to the construction site for the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades and to conduct inspections of the same;

(6) at any time during construction, should any phase of the engineering, equipment procurement, or construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades not meet the standards and specifications provided by Transmission Owner, Interconnection Customer shall be obligated to remedy deficiencies in that portion of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades to meet the standards and specifications provided by Transmission Provider and Transmission Owner;

(7) Interconnection Customer shall indemnify Transmission Provider and Transmission Owner for claims arising from the Interconnection Customer's construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades under the terms and procedures applicable to Article 18.1, Indemnity;

(8) Interconnection Customer shall transfer control of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades to Transmission Owner;

(9) Unless Parties otherwise agree, Interconnection Customer shall transfer ownership of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades to Transmission Owner;

(10) Transmission Provider, at Transmission Provider's option, and Transmission Owner shall approve and accept for operation and maintenance the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades to the extent engineered, procured, and constructed in accordance with this Article 5.2 only if the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades meet the standards and specifications of Transmission Provider, Transmission Owner and any Governmental Authority.

(11) Interconnection Customer shall deliver to Transmission Owner "as-built" drawings, information, and any other documents that are reasonably required by Transmission Owner to assure that the Interconnection Facilities and Stand-Alone Network Upgrades are built to the standards and specifications required by Transmission Owner.

5.3 Liquidated Damages. The actual damages to Interconnection Customer, in the event the Transmission Owner's Interconnection Facilities or Network Upgrades are not completed by the dates designated by Interconnection Customer and accepted by Transmission Provider and Transmission Owner pursuant to subparagraphs 5.1.2 or 5.1.4, above, may include Interconnection Customer's fixed operation and maintenance costs and lost opportunity costs. Such actual damages are uncertain and impossible to determine at this time. Because of such uncertainty, any liquidated damages paid by Transmission Owner to Interconnection Customer in the event that Transmission Owner does not complete any portion of the Transmission Owner's Interconnection Facilities or Network Upgrades by the applicable dates, shall be an amount equal to ½ of 1 percent per day of the actual cost of the Transmission Owner's Interconnection Facilities and Network Upgrades, in the aggregate, for which Transmission Owner has assumed responsibility to design, procure and construct.

However, in no event shall the total liquidated damages exceed 20 percent of the actual cost of the Transmission Owner's Interconnection Facilities and Network Upgrades for which Transmission Owner has assumed responsibility to design, procure, and construct. The foregoing payments will be made by Transmission Owner to Interconnection Customer as just compensation for the damages caused to Interconnection Customer, which actual damages are uncertain and impossible to determine at this time, and as reasonable liquidated damages, but not as a penalty or a method to secure performance of this GIA. Liquidated damages, when the Parties agree to them, are the exclusive remedy for the Transmission Owner's failure to meet its schedule.

No liquidated damages shall be paid to Interconnection Customer if: (1) Interconnection Customer is not ready to commence use of the Transmission Owner's Interconnection Facilities or Network Upgrades to take the delivery of power for the Generating Facility's Trial Operation or to export power from the Generating Facility on the specified dates, unless Interconnection Customer would have been able to commence use of the Transmission Owner's Interconnection Facilities or Network Upgrades to take the delivery of power for Generating Facility's Trial Operation or to export power from the Generating Facility, but for Transmission Owner's delay; (2) the Transmission Owner's failure to meet the specified dates is the result of the action or inaction of Transmission Provider, Interconnection Customer or any other earlier queued Interconnection Customer who has entered into an earlier GIA with Transmission Provider and/or a Transmission Owner or with an Affected System Operator, or any cause beyond Transmission Owner's reasonable control or reasonable ability to cure;
(3) Interconnection Customer has assumed responsibility for the design, procurement and construction of the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades; (4) the delay is due to the inability of Transmission Owner to obtain all required approvals from Governmental Authorities in a timely manner for the construction of any element of the Interconnection Facilities, Network Upgrades or Stand Alone Network Upgrades, or any other permit or authorization required, or any land rights or other private authorizations that may be required, and Transmission Owner has exercised Reasonable Efforts in procuring such approvals, permits, rights or authorizations; or (5) the Parties have otherwise agreed.

5.4 Power System Stabilizers. Interconnection Customer shall procure, install, maintain and operate power system stabilizers in accordance with the guidelines and procedures established by the Applicable Reliability Council. Transmission Provider and Transmission Owner reserve the right to reasonably establish minimum acceptable settings for any installed power system stabilizers, subject to the design and operating limitations of the Generating Facility. If the Generating Facility's power system stabilizers are removed from service or are not capable of automatic operation, Interconnection Customer shall immediately notify the Transmission Provider's system operator, or its designated representative. The requirements of this paragraph shall not apply to induction generators.

5.5 Equipment Procurement. If responsibility for construction of the Transmission Owner's Interconnection Facilities, Network Upgrades and/or Distribution Upgrades is to be borne by Transmission Owner, then Transmission Owner shall commence design of the Transmission Owner's Interconnection Facilities, Network Upgrades and/or Distribution Upgrades, and procure necessary equipment as soon as practicable after all of the following conditions are satisfied, unless the Parties otherwise agree in writing:

5.5.1 Transmission Provider has completed the Interconnection Facilities Study pursuant to the Interconnection Facilities Study Agreement; and

5.5.2 Where applicable, Interconnection Customer has provided security to Transmission Owner in accordance with Article 11.6 by the dates specified in Appendix B, Milestones.

5.6 Construction Commencement. Transmission Owner shall commence construction of the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, Distribution Upgrades, and Generator Upgrades for which it is responsible as soon as practicable after the following additional conditions are satisfied:

5.6.1 Approval of the appropriate Governmental Authority has been obtained for any facilities requiring regulatory approval; and

5.6.2 Where applicable, Interconnection Customer has provided security to Transmission Owner in accordance with Article 11.6 by the dates specified in Appendix B, Milestones.

5.7 Work Progress. Transmission Owner and Interconnection Customer will keep each other and Transmission Provider advised periodically as to the progress of their respective design, procurement and construction efforts. Either Transmission Owner or Interconnection Customer may, at any time, request a progress report from the other, with a copy to be provided to the other Parties. If, at any time, Interconnection Customer determines that the completion of the Transmission Owner's Interconnection Facilities, Network Upgrades, or Transmission Owner's System Protection Facilities will not be required until after the specified In-Service Date, Interconnection Customer will provide written notice to Transmission Provider and Transmission Owner of such later date upon which the completion of the Transmission Owner's Interconnection Facilities, Network Upgrades or Transmission Owner's System Protection Facilities will be required. Transmission Owner may delay the In-Service Date of its facilities accordingly.

5.8 Information Exchange. As soon as reasonably practicable after the Effective Date, the Parties shall exchange information regarding the design and compatibility of the Interconnection Facilities and compatibility of the Interconnection Facilities with the Transmission System or Distribution System, as applicable, and shall work diligently and in good faith to make any necessary design changes.

5.9 Limited Operation. If any of the Transmission Owner's Interconnection Facilities, Network Upgrades, or Transmission Owner's System Protection Facilities, Distribution Upgrades or Generator Upgrades are not reasonably expected to be completed prior to the Commercial Operation Date of the Generating Facility, Transmission Provider shall, upon the request and at the expense of Interconnection Customer, perform operating studies on a timely basis to determine the extent to which the Generating Facility and the Interconnection Customer's Interconnection Facilities may operate prior to the completion of the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, Distribution Upgrades or Generator Upgrades consistent with Applicable Laws and Regulations, Applicable Reliability

Standards, Good Utility Practice, and this GIA. Transmission Provider and Transmission Owner shall permit Interconnection Customer to operate the Generating Facility and the Interconnection Customer's Interconnection Facilities in accordance with the results of such studies; provided, however, such studies reveal that such operation may occur without detriment to the Transmission System as then configured and in accordance with the safety requirements of Transmission Owner and any Governmental Authority.

The maximum permissible output of the Generating Facility will be updated on a quarterly basis if the Network Upgrades necessary for the interconnection of the Generating Facility pursuant to this GIA are not in service within six (6) months following the Commercial Operation Date of the Generating Facility as specified in Appendix B of this GIA. These quarterly studies will be performed using the same methodology set forth in Section 11.5 of the GIP. These quarterly updates will end when all Network Upgrades necessary for the interconnection of the Generating Facility pursuant to this GIA are in service.

5.10 Interconnection Customer's Interconnection Facilities. Interconnection Customer shall, at its expense, design, procure, construct, own and install the ICIF, as set forth in Appendix A.

5.10.1 Interconnection Customer's Interconnection Facility Specifications. Interconnection Customer shall submit initial design and specifications for the ICIF, including Interconnection Customer's System Protection Facilities, to Transmission Provider and Transmission Owner at least one hundred eighty (180) Calendar Days prior to the Initial Synchronization Date; and final design and specifications for review and comment at least ninety (90) Calendar Days prior to the Initial Synchronization Date. Transmission Provider at Transmission Provider's option, and Transmission Owner shall review such specifications to ensure that the ICIF are compatible with their respective technical specifications, operational control, and safety requirements and comment on such design and specifications within thirty (30) Calendar Days of Interconnection Customer's submission. All specifications provided hereunder shall be deemed confidential.

5.10.2 Transmission Provider's and Transmission Owner's Review. Transmission Provider's and Transmission Owner's review of Interconnection Customer's final specifications shall not be construed as confirming, endorsing, or providing a warranty as to the design, fitness, safety, durability or reliability of the Generating Facility, or the ICIF. Interconnection Customer shall make such changes to the ICIF as may reasonably be required by Transmission Provider and Transmission Owner, in accordance with Good Utility Practice, to ensure that the ICIF are compatible with the technical specifications, operational control and safety requirements of Transmission Provider and Transmission Owner.

5.10.3 ICIF Construction. The ICIF shall be designed and constructed in accordance with Good Utility Practice. Within one hundred twenty (120) Calendar Days after the Commercial Operation Date, unless the Parties agree on another mutually acceptable deadline, Interconnection Customer shall deliver to Transmission Provider and Transmission Owner "as-built" drawings, information and documents for the ICIF, such as: a one-line diagram, a site plan showing the Generating Facility and the ICIF, plan and elevation drawings showing the layout of the ICIF, a relay functional diagram, relaying AC and DC schematic wiring diagrams and relay settings for all facilities associated with the Interconnection Customer's step-up transformers, the facilities connecting the Generating Facility to the step-up transformers and the ICIF, and the impedances (determined by factory tests) for the associated step-up transformers and the Generating Facility. Interconnection Customer shall provide Transmission Provider and Transmission Owner with Interconnection Customer's specifications for the excitation system, automatic voltage regulator, Generating Facility control and protection settings, transformer tap settings, and communications, if applicable.

5.11 Transmission Owner's Interconnection Facilities Construction. The Transmission Owner's Interconnection Facilities shall be designed and constructed in accordance with Good Utility Practice. Upon request, within one hundred twenty (120) Calendar Days after the Commercial Operation Date, unless the Parties agree on another mutually acceptable deadline, Transmission Owner shall deliver to Transmission Provider (if requested) and Interconnection Customer the "as-built" drawings, information and documents for the Transmission Owner's Interconnection Facilities specified in Appendix C to this GIA.

Such drawings, information and documents shall be deemed Confidential Information.

Upon completion, the Transmission Owner's Interconnection Facilities and Stand Alone Network Upgrades shall be under the control of Transmission Provider or its designated representative.

5.12 Access Rights. Upon reasonable notice by a Party, and subject to any required or necessary regulatory approvals, a Party ("Granting Party") shall furnish *at no cost* to the other Party ("Access Party") any rights of use, licenses, rights of way and easements with respect to lands owned or controlled by the Granting Party, its agents (if allowed under the applicable agency agreement), or any Affiliate, that are necessary to enable the Access Party to obtain ingress and egress to construct, operate, maintain, repair, test (or witness testing), inspect, replace or remove facilities and equipment to: (i) interconnect the Generating Facility with the Transmission System; (ii) operate and maintain the Generating Facility, the Interconnection Facilities and the Transmission System; and (iii) disconnect or remove the Access Party's facilities and equipment upon termination of this GIA. In exercising such licenses, rights of way and easements, the Access Party shall not unreasonably disrupt or interfere with normal operation of the Granting Party's business and shall adhere to the safety rules and procedures established in advance, as

may be changed from time to time, by the Granting Party and provided to the Access Party.

5.13 Lands of Other Property Owners. If any part of the Transmission Owner's Interconnection Facilities, Network Upgrades, and/or Distribution Upgrades is to be installed on property owned by persons other than Interconnection Customer or Transmission Owner, Transmission Owner shall at Interconnection Customer's expense use efforts, similar in nature and extent to those that it typically undertakes on its own behalf or on behalf of its Affiliates, including use of its eminent domain authority to the extent permitted and consistent with Applicable Laws and Regulations and, to the extent consistent with such Applicable Laws and Regulations, to procure from such persons any rights of use, licenses, rights of way and easements that are necessary to construct, operate, maintain, test, inspect, replace or remove the Transmission Owner's Interconnection Facilities, Network Upgrades and/or Distribution Upgrades upon such property.

5.14 Permits. Transmission Provider or Transmission Owner and Interconnection Customer shall cooperate with each other in good faith in obtaining all permits, licenses and authorizations that are necessary to accomplish the interconnection in compliance with Applicable Laws and Regulations. With respect to this paragraph, Transmission Owner shall provide permitting assistance to Interconnection Customer comparable to that provided to the Transmission Owner's own, or an Affiliate's, generation to the extent that Transmission Owner or its Affiliate owns generation.

5.15 Early Construction of Base Case Facilities. (Includes facilities required for all queued projects with interconnection agreements).Interconnection Customer may request Transmission Owner to construct, and Transmission Owner shall construct, using Reasonable Efforts to accommodate Interconnection Customer's In-Service Date, all or any portion of any Network Upgrades, Transmission Owner's System Protection Facilities or Distribution Upgrades required for Interconnection Customer to be interconnected to the Transmission or Distribution System, as applicable, which are included in the Base Case of the Interconnection Facilities Study for Interconnection Customer, and which also are required to be constructed for another Interconnection Customer with a prior GIA, but where such construction is not scheduled to be completed in time to achieve Interconnection Customer's In-Service Date. Any such Network Upgrades, System Protection Facilities or Distribution Upgrades are included in the facilities to be constructed and as set forth in Appendix A to this GIA to the extent they are reasonably known.

5.16 Suspension.

5.16.1 Interconnection Customer's Right to Suspend for Force Majeure Event; Obligations. Provided that such suspension is permissible under the authorizations, permits or approvals granted for the construction of such Interconnection Facilities, Network Upgrades or Stand Alone Network Upgrades, Interconnection Customer will not suspend unless a Force Majeure event occurs.

Interconnection Customer must provide written notice of its request for suspension to Transmission Provider and Transmission Owner, and provide a description of the Force Majeure event that is acceptable to Transmission Provider. Suspension will only apply to Interconnection Customer milestones and Interconnection Facilities described in the Appendices of this GIA. Prior to suspension, Interconnection Customer must also provide security acceptable to Transmission Owner, equivalent to the higher of $5 million or the total cost of all Network Upgrades, Transmission Owner's System Protection Facilities, and Distribution Upgrades listed in Appendix A of this GIA. Network Upgrades and Transmission Owner's Interconnection Facilities will be constructed on the schedule described in the Appendices of this GIA unless: (1) construction is prevented by the order of a Governmental Authority; (2) the Network Upgrades are not needed by any other project; or (3) Transmission Owner or Transmission Provider determines that a Force Majeure event prevents construction. In the event of (1), (2), or (3) security shall be released upon the determination that the Network Upgrades will no longer be constructed.

If suspension occurs, the Transmission or Distribution System, as applicable, shall be left in a safe and reliable condition in accordance with Good Utility Practice and the Transmission Provider's and Transmission Owner's safety and reliability criteria. In such event, Interconnection Customer shall be responsible for all reasonable and necessary costs which Transmission Provider and Transmission Owner (i) have incurred pursuant to this GIA prior to the suspension and (ii) incur in suspending such work, including any costs incurred to perform such work as may be necessary to ensure the safety of persons and property and the integrity of the Transmission or Distribution System, as applicable, during such suspension and, if applicable, any costs incurred in connection with the cancellation or suspension of material, equipment and labor contracts which Transmission Provider and Transmission Owner cannot reasonably avoid; provided, however, that prior to canceling or suspending any such material, equipment or labor contract, Transmission Provider and Transmission Owner shall obtain Interconnection Customer's authorization to do so.

Transmission Provider and Transmission Owner shall each invoice Interconnection Customer for such costs pursuant to Article 12 and shall use Reasonable Efforts to minimize its costs. In the event Interconnection Customer suspends work by Transmission Owner required under this GIA pursuant to this Article 5.16, and has not requested Transmission Owner to recommence the work required under this GIA on or before the expiration of three (3) years following commencement of such suspension, this GIA shall be deemed terminated. The three-year period shall begin on the date the suspension is requested, or the date of the written notice to Transmission Provider, if no effective date is specified.

5.16.2 Effect of Missed Interconnection Customer Milestones. If Interconnection Customer fails to provide notice of suspension pursuant to Article 5.16, and

Interconnection Customer fails to fulfill or complete any Interconnection Customer Milestone provided in Appendix B ("Milestone"), this constitutes a Breach under this GIA. Depending upon the consequences of the Breach and effectiveness of the cure pursuant to Article 17, the Transmission Owners' Milestones may be revised, following consultation with Interconnection Customer, consistent with Reasonable Efforts, and in consideration of all relevant circumstances. Parties shall employ Reasonable Efforts to maintain their remaining respective Milestones.

5.16.3 Effect of Suspension; Parties Obligations. In the event that Interconnection Customer suspends work pursuant to this Article 5.16, no construction duration, timelines and schedules set forth in Appendix B shall be suspended during the period of suspension unless ordered by a Governmental Authority, with such order being the Force Majeure event causing the suspension. Should Interconnection Customer request that work be recommenced, Transmission Owner shall be obligated to proceed with Reasonable Efforts and in consideration of all relevant circumstances including regional outage schedules, construction availability and material procurement in performing the work as described in Appendix A and Appendix B. Transmission Owner will provide Interconnection Customer with a revised schedule for the design, procurement, construction, installation and testing of the Transmission Owner's Interconnection Facilities and Network Upgrades. Upon any suspension by Interconnection Customer pursuant to Article 5.16, Interconnection Customer shall be responsible for only those costs specified in this Article 5.16.

5.17 Taxes.

5.17.1 Interconnection Customer Payments Not Taxable. The Parties intend that all payments or property transfers made by Interconnection Customer to Transmission Owner for the installation of the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, Distribution Upgrades and Generator Upgrades shall be non-taxable, either as contributions to capital, or as an advance, in accordance with the Internal Revenue Code and any applicable state income tax laws and shall not be taxable as contributions in aid of construction or otherwise under the Internal Revenue Code and any applicable state income tax laws. To the extent that Transmission Owner is a limited liability company and not a corporation, and has elected to be taxed as a partnership, then the following shall apply: Transmission Owner represents, and the Parties acknowledge, that Transmission Owner is a limited liability company and is treated as a partnership for federal income tax purposes. Any payment made by Interconnection Customer to Transmission Owner for Network Upgrades is to be treated as an upfront payment in accordance with Rev Proc 2005-35. It is anticipated by the parties that any amounts paid by Interconnection Customer to Transmission Owner for Network Upgrades will be reimbursed to Interconnection Customer in accordance with the

terms of this GIA, provided Interconnection Customer fulfills its obligations under this GIA.

5.17.2 Representations and Covenants. In accordance with IRS Notice 2001-82 and IRS Notice 88-129, Interconnection Customer represents and covenants that (i) ownership of the electricity generated at the Generating Facility will pass to another party prior to the transmission of the electricity on the Transmission System, (ii) for income tax purposes, the amount of any payments and the cost of any property transferred to Transmission Owner for the Transmission Owner's Interconnection Facilities will be capitalized by Interconnection Customer as an intangible asset and recovered using the straight-line method over a useful life of twenty (20) years, and (iii) any portion of the Transmission Owner's Interconnection Facilities that is a "dual-use intertie," within the meaning of IRS Notice 88-129, is reasonably expected to carry only a de minimis amount of electricity in the direction of the Generating Facility. For this purpose, "de minimis amount" means no more than 5 percent of the total power flows in both directions, calculated in accordance with the "5 percent test" set forth in IRS Notice 88-129. This is not intended to be an exclusive list of the relevant conditions that must be met to conform to IRS requirements for non-taxable treatment.

At Transmission Owner's request, Interconnection Customer shall provide Transmission Owner with a report from an independent engineer confirming its representation in clause (iii), above, with a copy to Transmission Provider. Transmission Owner represents and covenants that the cost of the Transmission Owner's Interconnection Facilities paid for by Interconnection Customer will have no net effect on the base upon which rates are determined.

5.17.3 Indemnification for the Cost Consequences of Current Tax Liability Upon Transmission Owner. Notwithstanding Article 5.17.1 and to the extent permitted by law, Interconnection Customer shall protect, indemnify and hold harmless Transmission Owner from the cost consequences of any tax liability imposed against Transmission Owner as the result of payments or property transfers made by Interconnection Customer to Transmission Owner under this GIA for Interconnection Facilities, as well as any interest and penalties, other than interest and penalties attributable to any delay caused by Transmission Owner.

Transmission Owner shall not include a gross-up for the cost consequences of any current tax liability in the amounts it charges Interconnection Customer under this GIA unless (i) Transmission Owner has determined, in good faith, that the payments or property transfers made by Interconnection Customer to Transmission Owner should be reported as income subject to taxation or (ii) any Governmental Authority directs Transmission Owner to report payments or property as income subject to taxation; provided, however, that Transmission Owner may require Interconnection Customer to provide security for

Interconnection Facilities, in a form reasonably acceptable to Transmission Owner (such as a parental guarantee or a letter of credit), in an amount equal to the cost consequences or any current tax liability under this Article 5.17. Interconnection Customer shall reimburse Transmission Owner for such costs on a fully grossed-up basis, in accordance with Article 5.17.4, within thirty (30) Calendar Days of receiving written notification from Transmission Owner of the amount due, including detail about how the amount was calculated.

The indemnification obligation shall terminate at the earlier of (1) the expiration of the ten-year testing period and the applicable statute of limitation, as it may be extended by Transmission Owner upon request of the IRS, to keep these years open for audit or adjustment, or (2) the occurrence of a subsequent taxable event and the payment of any related indemnification obligations as contemplated by this Article 5.17.

5.17.4 Tax Gross-Up Amount. Interconnection Customer's liability for the cost consequences of any current tax liability under this Article 5.17 shall be calculated on a fully grossed-up basis. Except as may otherwise be agreed to by the parties, this means that Interconnection Customer will pay Transmission Owner, in addition to the amount paid for the Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, and/or Distribution Upgrades, an amount equal to (1) the current taxes imposed on Transmission Owner ("Current Taxes") on the excess of (a) the gross income realized by Transmission Owner as a result of payments or property transfers made by Interconnection Customer to Transmission Owner under this GIA (without regard to any payments under this Article 5.17) (the "Gross Income Amount") over (b) the present value of future tax deductions for depreciation that will be available as a result of such payments or property transfers (the "Present Value Depreciation Amount"), plus (2) an additional amount sufficient to permit Transmission Owner to receive and retain, after the payment of all Current Taxes, an amount equal to the net amount described in clause (1).

For this purpose, (i) Current Taxes shall be computed based on Transmission Owner's composite federal and state tax rates at the time the payments or property transfers are received and Transmission Owner will be treated as being subject to tax at the highest marginal rates in effect at that time (the "Current Tax Rate"), and (ii) the Present Value Depreciation Amount shall be computed by discounting Transmission Owner's anticipated tax depreciation deductions as a result of such payments or property transfers by Transmission Owner's current weighted average cost of capital. Thus, the formula for calculating Interconnection Customer's liability to Transmission Owner pursuant to this Article 5.17.4 can be expressed as follows: (Current Tax Rate x (Gross Income Amount – Present Value of Tax Depreciation))/(1-Current Tax Rate). Interconnection Customer's estimated tax liability in the event taxes are imposed shall be stated in Appendix A, Interconnection Facilities, Network Upgrades and Distribution Upgrades.

5.17.5 Private Letter Ruling or Change or Clarification of Law. At Interconnection Customer's request and expense, Transmission Owner shall file with the IRS a request for a private letter ruling as to whether any property transferred or sums paid, or to be paid, by Interconnection Customer to Transmission Owner under this GIA are subject to federal income taxation. Interconnection Customer will prepare the initial draft of the request for a private letter ruling, and will certify under penalties of perjury that all facts represented in such request are true and accurate to the best of Interconnection Customer's knowledge. Transmission Owner and Interconnection Customer shall cooperate in good faith with respect to the submission of such request.

Transmission Owner shall keep Interconnection Customer fully informed of the status of such request for a private letter ruling and shall execute either a privacy act waiver or a limited power of attorney, in a form acceptable to the IRS, that authorizes Interconnection Customer to participate in all discussions with the IRS regarding such request for a private letter ruling. Transmission Owner shall allow Interconnection Customer to attend all meetings with IRS officials about the request and shall permit Interconnection Customer to prepare the initial drafts of any follow-up letters in connection with the request.

5.17.6 Subsequent Taxable Events. If, within 10 years from the date on which the relevant Transmission Owner's Interconnection Facilities are placed in service, (i) Interconnection Customer breaches the covenant contained in Article 5.17.2, (ii) a "disqualification event" occurs within the meaning of IRS Notice 88-129, or (iii) this GIA terminates and Transmission Owner retains ownership of the Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, and/or Distribution Upgrades, Interconnection Customer shall pay a tax gross-up for the cost consequences of any current tax liability imposed on Transmission Owner, calculated using the methodology described in Article 5.17.4 and in accordance with IRS Notice 90-60.

5.17.7 Contests. In the event any Governmental Authority determines that Transmission Owner's receipt of payments or property constitutes income that is subject to taxation, Transmission Owner shall notify Interconnection Customer, in writing, within thirty (30) Calendar Days of receiving notification of such determination by a Governmental Authority. Upon the timely written request by Interconnection Customer and at Interconnection Customer's sole expense, Transmission Owner may appeal, protest, seek abatement of, or otherwise oppose such determination. Upon Interconnection Customer's written request and sole expense, Transmission Owner shall file a claim for refund with respect to any taxes paid under this Article 5.17, whether or not it has received such a determination. Transmission Owner reserves the right to make all decisions with regard to the prosecution of such appeal, protest, abatement or other contest, including the selection of counsel and compromise or settlement of the claim, but Transmission Owner shall keep Interconnection Customer

informed, shall consider in good faith suggestions from Interconnection Customer about the conduct of the contest, and shall reasonably permit Interconnection Customer or an Interconnection Customer representative to attend contest proceedings.

Interconnection Customer shall pay to Transmission Owner on a periodic basis, as invoiced by Transmission Owner, Transmission Owner's documented reasonable costs of prosecuting such appeal, protest, abatement or other contest. At any time during the contest, Transmission Owner may agree to a settlement either with Interconnection Customer's consent or after obtaining written advice from nationally-recognized tax counsel, selected by Transmission Owner, but reasonably acceptable to Interconnection Customer, that the proposed settlement represents a reasonable settlement given the hazards of litigation. Interconnection Customer's obligation shall be based on the amount of the settlement agreed to by Interconnection Customer, or if a higher amount, so much of the settlement that is supported by the written advice from nationally-recognized tax counsel selected under the terms of the preceding sentence. The settlement amount shall be calculated on a fully grossed-up basis to cover any related cost consequences of the current tax liability. Any settlement without Interconnection Customer's consent or such written advice will relieve Interconnection Customer from any obligation to indemnify Transmission Owner for the tax at issue in the contest.

5.17.8 Refund. In the event that (a) a private letter ruling is issued to Transmission Owner which holds that any amount paid or the value of any property transferred by Interconnection Customer to Transmission Owner under the terms of this GIA is not subject to federal income taxation, (b) any legislative change or administrative announcement, notice, ruling or other determination makes it reasonably clear to Transmission Owner in good faith that any amount paid or the value of any property transferred by Interconnection Customer to Transmission Owner under the terms of this GIA is not taxable to Transmission Owner, (c) any abatement, appeal, protest, or other contest results in a determination that any payments or transfers made by Interconnection Customer to Transmission Owner are not subject to federal income tax, or (d) if Transmission Owner receives a refund from any taxing authority for any overpayment of tax attributable to any payment or property transfer made by Interconnection Customer to Transmission Owner pursuant to this GIA, Transmission Owner shall promptly refund to Interconnection Customer the following:

(i) any payment made by Interconnection Customer under this Article 5.17 for taxes that is attributable to the amount determined to be non-taxable, together with interest thereon,

(ii) interest on any amounts paid by Interconnection Customer to Transmission Owner for such taxes which Transmission Owner did not

submit to the taxing authority, calculated in accordance with the methodology set forth in 18 C.F.R. Section 35.19a(a)(2)(iii) from the date payment was made by Interconnection Customer to the date Transmission Owner refunds such payment to Interconnection Customer, and

(iii) with respect to any such taxes paid by Transmission Owner, any refund or credit Transmission Owner receives or to which it may be entitled from any Governmental Authority, interest (or that portion thereof attributable to the payment described in clause (i), above) owed to Transmission Owner for such overpayment of taxes (including any reduction in interest otherwise payable by Transmission Owner to any Governmental Authority resulting from an offset or credit); provided, however, that Transmission Owner will remit such amount promptly to Interconnection Customer only after and to the extent that Transmission Owner has received a tax refund, credit or offset from any Governmental Authority for any applicable overpayment of income tax related to the Transmission Owner's Interconnection Facilities.

The intent of this provision is to leave both parties, to the extent practicable, in the event that no taxes are due with respect to any payment for Interconnection Facilities and Network Upgrades hereunder, in the same position they would have been in had no such tax payments been made.

5.17.9 Taxes Other Than Income Taxes. Upon the timely request by Interconnection Customer, and at Interconnection Customer's sole expense, Transmission Owner shall appeal, protest, seek abatement of, or otherwise contest any tax (other than federal or state income tax) asserted or assessed against Transmission Owner for which Interconnection Customer may be required to reimburse Transmission Owner under the terms of this GIA. Interconnection Customer shall pay to Transmission Owner on a periodic basis, as invoiced by Transmission Owner, Transmission Owner's documented reasonable costs of prosecuting such appeal, protest, abatement, or other contest. Interconnection Customer and Transmission Owner shall cooperate in good faith with respect to any such contest. Unless the payment of such taxes is a prerequisite to an appeal or abatement or cannot be deferred, no amount shall be payable by Interconnection Customer to Transmission Owner for such taxes until they are assessed by a final, non-appealable order by any court or agency of competent jurisdiction. In the event that a tax payment is withheld and ultimately due and payable after appeal, Interconnection Customer will be responsible for all taxes, interest and penalties, other than penalties attributable to any delay caused by Transmission Owner.

5.18 Tax Status. Each Party shall cooperate with the other Parties to maintain each Party's tax status. Nothing in this GIA is intended to adversely affect any Party's tax-exempt

status with respect to the issuance of bonds including, but not limited to, Local Furnishing Bonds.

5.19 Modification.

5.19.1 General. Either Party may undertake modifications to its facilities. If a Party plans to undertake a modification that reasonably may be expected to affect another Party's facilities, that Party shall provide to the other Parties sufficient information regarding such modification so that the other Parties may evaluate the potential impact of such modification prior to commencement of the work. Such information shall be deemed to be Confidential Information hereunder and shall include information concerning the timing of such modifications and whether such modifications are expected to interrupt the flow of electricity from the Generating Facility. The Party desiring to perform such work shall provide the relevant drawings, plans, and specifications to the other Parties at least ninety (90) Calendar Days in advance of the commencement of the work or such shorter period upon which the Parties may agree, which agreement shall not unreasonably be withheld, conditioned or delayed.

In the case of Generating Facility modifications that do not require Interconnection Customer to submit an Interconnection Request, Transmission Provider shall provide, within thirty (30) Calendar Days (or such other time as the Parties may agree), an estimate of any additional modifications to the Transmission or Distribution System as applicable, Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, and/or Distribution Upgrades necessitated by such Interconnection Customer modification and a good faith estimate of the costs thereof which shall be the responsibility of Interconnection Customer.

5.19.2 Standards. Any additions, modifications, or replacements made to a Party's facilities shall be designed, constructed and operated in accordance with this GIA and Good Utility Practice.

5.19.3 Modification Costs. Interconnection Customer shall not be directly assigned the costs of any additions, modifications, or replacements that Transmission Owner makes to the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, Distribution Upgrades, or the Transmission or Distribution System, as applicable, to facilitate the interconnection of a third party to the Transmission Owner's Interconnection Facilities or the Transmission or Distribution System, as applicable, or to provide transmission service to a third party under the Tariff. Interconnection Customer shall be responsible for the costs of any additions, modifications, or replacements to the Interconnection Customer's Interconnection Facilities that may be necessary to maintain or upgrade such Interconnection Customer's Interconnection Facilities consistent with

Applicable Laws and Regulations, Applicable Reliability Standards or Good Utility Practice.

ARTICLE 6. TESTING AND INSPECTION

6.1 Pre-Commercial Operation Date Testing and Modifications. Prior to the Commercial Operation Date, Transmission Owner shall test the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities and Distribution Upgrades, and Interconnection Customer shall test each electric production device at the Generating Facility, Interconnection Customer's System Protection Facilities and the Interconnection Customer's Interconnection Facilities to ensure their safe and reliable operation. Similar testing may be required after initial operation. Transmission Owner and Interconnection Customer shall make any modifications to their respective facilities that are found to be necessary as a result of such testing. Interconnection Customer shall bear the cost of all such testing and modifications. Interconnection Customer shall generate test energy at the Generating Facility only if it has arranged for the delivery of such test energy.

6.2 Post-Commercial Operation Date Testing and Modifications. Each Party shall at its own expense perform routine inspection and testing of its facilities and equipment in accordance with Good Utility Practice as may be necessary to ensure the continued interconnection of the Generating Facility with the Transmission or Distribution System, as applicable, in a safe and reliable manner. Each Party shall have the right, upon advance written notice, to require reasonable additional testing of the Interconnection Facilities, at the requesting Party's expense, as may be in accordance with Good Utility Practice.

6.3 Right to Observe Testing. Each Party shall notify the other Parties in advance of its performance of tests of its Interconnection Facilities. The other Parties shall each have the right, at its own expense, to observe such testing.

6.4 Right to Inspect. Each Party shall have the right, but shall have no obligation to: (i) observe Transmission Owner's and Interconnection Customer's tests and/or inspection of any of their respective System Protection Facilities and other protective equipment, including power system stabilizers; (ii) review the settings of the System Protection Facilities and other protective equipment; and (iii) review the maintenance records relative to the Interconnection Facilities, the System Protection Facilities and other protective equipment. A Party may exercise these rights from time to time as it deems necessary upon reasonable notice to the other Parties. The exercise or non-exercise by a Party of any such rights shall not be construed as an endorsement or confirmation of any element or condition of the Interconnection Facilities or the System Protection Facilities or other protective equipment or the operation thereof, or as a warranty as to the fitness, safety, desirability, or reliability of same. Any information that a Party obtains through the exercise of any of its rights under this Article 6.4 shall be deemed to be Confidential Information and treated pursuant to Article 22 of this GIA.

ARTICLE 7. METERING

7.1 General. Each Party shall comply with the Applicable Reliability Council requirements. Unless otherwise agreed by the Parties, Transmission Owner, at its election, or otherwise Interconnection Customer, shall install Metering Equipment (the "Metering Party") at the Point of Interconnection prior to any operation of the Generating Facility and Transmission Owner, at its election, or otherwise Interconnection Customer shall own, operate, test and maintain such Metering Equipment. Power flows to and from the Generating Facility shall be measured at or, at the Metering Party's option, compensated to, the Point of Interconnection. The Metering Party shall provide metering quantities, in analog and/or digital form, to the other Parties upon request. Interconnection Customer shall bear all reasonable documented costs associated with the purchase, installation, operation, testing and maintenance of the Metering Equipment.

7.2 Check Meters. Interconnection Customer, at its option and expense, may install and operate, on its premises and on its side of the Point of Interconnection, one or more check meters to check the Metering Equipment owned by the Metering Party. Such check meters shall be for check purposes only and shall not be used for the measurement of power flows for purposes of this GIA, except as provided in Article 7.4 below. The check meters shall be subject at all reasonable times to inspection and examination by Transmission Provider, Transmission Owner or their designees. The installation, operation and maintenance thereof shall be performed entirely by Interconnection Customer in accordance with Good Utility Practice.

7.3 Standards. The Metering Party shall install, calibrate, and test revenue quality Metering Equipment in accordance with applicable ANSI standards.

7.4 Testing of Metering Equipment. The Metering Party shall inspect and test Metering Equipment upon installation and at least once every two (2) years thereafter. If requested to do so by a Party, the Metering Party shall, at the requesting Party's expense, inspect or test Metering Equipment more frequently than every two (2) years. The Metering Party shall give reasonable notice to the other Parties of the time when any inspection or test shall take place, and the other Parties may have representatives present at the test or inspection. If at any time Metering Equipment is found to be inaccurate or defective, it shall be adjusted, repaired or replaced at Interconnection Customer's expense, in order to provide accurate metering, unless the inaccuracy or defect is due to the Metering Party's failure to maintain, then the Metering Party shall pay. If Metering Equipment fails to register, or if the measurement made by Metering Equipment during a test varies by more than two percent (2%) from the measurement made by the standard meter used in the test, the Metering Party shall adjust the measurements by correcting all measurements for the period during which Metering Equipment was in error by using Interconnection Customer's check meters, if installed. If no such check meters are installed or if the period cannot be reasonably ascertained, the adjustment shall be for the period immediately preceding the test of the Metering Equipment equal to one-half the time from the date of the previous test of the Metering Equipment.

7.5 Metering Data. At Interconnection Customer's expense, the metered data shall be telemetered to one or more locations designated by Transmission Provider and Transmission Owner and one or more locations designated by Interconnection Customer. Such telemetered data shall be used, under normal operating conditions, as the official measurement of the amount of energy delivered from the Generating Facility to the Point of Interconnection.

ARTICLE 8. COMMUNICATIONS

8.1 Interconnection Customer Obligations. Interconnection Customer shall maintain satisfactory operating communications with Transmission Provider's Transmission System dispatcher or representative designated by Transmission Provider. Interconnection Customer shall provide standard voice line, dedicated voice line and facsimile communications at its Generating Facility control room or central dispatch facility through use of either the public telephone system, or a voice communications system that does not rely on the public telephone system. Interconnection Customer shall also provide the dedicated data circuit(s) necessary to provide Interconnection Customer data to Transmission Provider as set forth in Appendix D, Security Arrangements Details. The data circuit(s) shall extend from the Generating Facility to the location(s) specified by Transmission Provider. Any required maintenance of such communications equipment shall be performed by and at the cost of Interconnection Customer. Operational communications shall be activated and maintained under, but not be limited to, the following events: system paralleling or separation, scheduled and unscheduled shutdowns, equipment clearances, and hourly and daily load data.

Unless the Generating Facility is an Intermittent Resource not relying on wind as a fuel source, Interconnection Customer shall install communication and control equipment such that the Generating Facility can receive and respond to the appropriate dispatch signals while operating under the Tariff. Where applicable, the requirements of the communication and control equipment will be enumerated in Appendix C to this GIA.

8.2 Remote Terminal Unit (RTU). Prior to the Initial Synchronization Date of the Generating Facility, a remote terminal unit, or equivalent data collection and transfer equipment acceptable to both Parties, shall be installed by Interconnection Customer, or by Transmission Owner at Interconnection Customer's expense, to gather accumulated and instantaneous data to be telemetered to the location(s) designated by Transmission Owner and Transmission Provider through use of a dedicated point-to-point data circuit(s) as indicated in Article 8.1. The communication protocol for the data circuit(s) shall be specified by Transmission Owner and Transmission Provider. Instantaneous bi-directional analog real power and reactive power flow information must be telemetered directly to the location(s) specified by Transmission Provider and Transmission Owner.

Each Party will promptly advise the other Parties if it detects or otherwise learns of any metering, telemetry or communications equipment errors or malfunctions that require the attention and/or correction. The Party owning such equipment shall correct such error or malfunction as soon as reasonably feasible.

8.3 No Annexation. Any and all equipment placed on the premises of a Party shall be and remain the property of the Party providing such equipment regardless of the mode and manner of annexation or attachment to real property, unless otherwise mutually agreed by the Parties.

8.4 Provision of Data from a Variable Energy Resource. The Interconnection Customer whose Generating Facility is a Variable Energy Resource shall provide meteorological and forced outage data to the Transmission Provider to the extent necessary for the Transmission Provider's development and deployment of power production forecasts for that class of Variable Energy Resources. The Interconnection Customer with a Variable Energy Resource having wind as the energy source will, upon request by the Transmission Provider, be required to provide the Transmission Provider with site-specific meteorological data including: temperature, wind speed, wind direction, and atmospheric pressure. The Interconnection Customer with a Variable Energy Resource having solar as the energy source will, upon request by the Transmission Provider, be required to provide the Transmission Provider with site-specific meteorological data including: temperature, atmospheric pressure, and irradiance. The Transmission Provider and Interconnection Customer whose Generating Facility is a Variable Energy Resource shall mutually agree to any additional meteorological data that are required for the development and deployment of a power production forecast. The Interconnection Customer whose Generating Facility is a Variable Energy Resource also shall submit data to the Transmission Provider regarding all forced outages to the extent necessary for the Transmission Provider's development and deployment of power production forecasts for that class of Variable Energy Resources. The exact specifications of the meteorological and forced outage data to be provided by the Interconnection Customer to the Transmission Provider, including the frequency and timing of data submittals, shall be made taking into account the size and configuration of the Variable Energy Resource, its characteristics, location, and its importance in maintaining generation resource adequacy and transmission system reliability in its area. All requirements for meteorological and forced outage data must be commensurate with the power production forecasting employed by the Transmission Provider. Data requirements for meteorological and forced outage data will be negotiated by the Transmission Provider and the Interconnection Customer, and will be set forth in Appendix C, Interconnection Details, of this GIA.

ARTICLE 9. OPERATIONS

9.1 General. Each Party shall comply with the Applicable Reliability Council requirements. Each Party shall provide to any Party all information that may reasonably be required by that Party to comply with Applicable Laws and Regulations and Applicable Reliability Standards.

9.2 Local Balancing Authority Notification. At least three (3) months before Initial Synchronization Date, Interconnection Customer shall notify Transmission Provider and Transmission Owner in writing of the Local Balancing Authority in which the Generating

Facility will be located. If Interconnection Customer elects to locate the Generating Facility through dynamic metering/scheduling in a Local Balancing Authority other than the Local Balancing Authority in which the Generating Facility is physically located, and if permitted to do so by the relevant transmission tariffs, all necessary arrangements, including but not limited to those set forth in Article 7 and Article 8 of this GIA, and remote Local Balancing Authority generator interchange agreements, if applicable, and the appropriate measures under such agreements, shall be executed and implemented prior to the placement of the Generating Facility in the other Local Balancing Authority.

9.3 Transmission Provider and Transmission Owner Obligations. Transmission Provider shall cause the Transmission System and the Transmission Owner's Interconnection Facilities to be operated, maintained and controlled in a safe and reliable manner in accordance with this GIA. Transmission Provider, or its designee, may provide operating instructions to Interconnection Customer consistent with this GIA and the Tariff and, if applicable, Transmission Owner's operating protocols and procedures as they may change from time to time. Transmission Provider will consider changes to its operating protocols and procedures proposed by Interconnection Customer.

9.4 Interconnection Customer Obligations. Interconnection Customer shall at its own expense operate, maintain and control the Generating Facility and the Interconnection Customer's Interconnection Facilities in a safe and reliable manner and in accordance with this GIA. The Generating Facility must be operated in accordance with the operating limits, if any, in the Interconnection Facilities Study and specified in Appendix C of this GIA. Interconnection Customer shall operate the Generating Facility and the Interconnection Customer's Interconnection Facilities in accordance with all applicable requirements of Transmission Provider or its designated Local Balancing Authority Operator of which the Generating Facility is part, as such requirements are set forth in Appendix C, Interconnection Details, of this GIA. Appendix C, Interconnection Details, will be modified to reflect changes to the requirements as they may change from time to time. Any Party may request that a Party provide copies of the requirements set forth in Appendix C, Interconnection Details, of this GIA.

9.5 Start-Up and Synchronization. Consistent with the Parties' mutually acceptable procedures, Interconnection Customer is responsible for the proper synchronization of the Generating Facility to the Transmission or Distribution System, as applicable.

9.6 Reactive Power.

9.6.1 Power Factor Design Criteria.

9.6.1.1 Synchronous Generation. Interconnection Customer shall design the Generating Facility to be capable of maintaining a composite power delivery at continuous rated power output at the Point of Interconnection at all power factors over 0.95 leading to 0.95 lagging, unless the Transmission Provider has established different requirements that apply to all synchronous generators in the Local Balancing Authority on a comparable basis. The

applicable Local Balancing Authority power factor requirements are listed on the Transmission Provider's website at

https://www.misoenergy.org/Library/Repository/Study/Generator%20Interconnection/Reactive%20Generator%20Requirements.pdf

and may be referenced in the Appendices to this GIA. The Generating Facility shall be capable of continuous dynamic operation throughout the power factor design range as measured at the Point of Interconnection. Such operation shall account for the net effect of all energy production devices on the Interconnection Customer's side of the Point of Interconnection.

9.6.1.2 Non-Synchronous Generation. Interconnection Customer shall design the Generating Facility to be capable of maintaining a composite power delivery at continuous rated power output at the high-side of the generator substation at all power factors over 0.95 leading to 0.95 lagging, unless the Transmission Provider has established different requirements that apply to all non-synchronous generators in the Local Balancing Authority on a comparable basis. The applicable Local Balancing Authority power factor requirements are listed on the Transmission Provider's website at

https://www.misoenergy.org/Library/Repository/Study/Generator%20Interconnection/Reactive%20Generator%20Requirements.pdf

and may be referenced in the Appendices to this GIA. This power factor range standard shall be dynamic and can be met using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors, or a combination of the two. This requirement shall only apply to newly interconnecting non-synchronous generators that have not yet completed a System Impact Study as of the effective date of the Final Rule establishing this requirement (Order No. 827). These requirements apply to existing non-synchronous generators making upgrades that require a new Generator Interconnection Agreement only where the Transmission Provider's System Impact Study shows the need for reactive power as a result of an upgrade. If applicable, these requirements will be memorialized in Appendix C to this GIA.

9.6.2 Voltage Schedules. Once Interconnection Customer has synchronized the Generating Facility with the Transmission System, Transmission Provider shall require Interconnection Customer to operate the Generating Facility to produce or absorb reactive power within the design limitations of the Generating Facility set forth in Article 9.6.1 (Power Factor Design Criteria), to maintain the output voltage or power factor at the Point of Interconnection as specified by Transmission Provider. Transmission Provider's voltage schedules shall treat all sources of reactive power in the Local Balancing

Authority in an equitable and not unduly discriminatory manner. Transmission Provider shall exercise Reasonable Efforts to provide Interconnection Customer with such schedules at least one (1) Calendar Day in advance, and may make changes to such schedules as necessary to maintain the reliability of the Transmission or Distribution System as applicable. Interconnection Customer shall operate the Generating Facility to maintain the specified output voltage or power factor at the Point of Interconnection within the design limitations of the Generating Facility set forth in Article 9.6.1 (Power Factor Design Criteria). If Interconnection Customer is unable to maintain the specified voltage or power factor, it shall promptly notify Transmission Provider's system operator, or its designated representative.

9.6.2.1 Governors and Regulators. Whenever the Generating Facility is operated in parallel with the Transmission or Distribution System as applicable and the speed governors (if installed on the generating unit pursuant to Good Utility Practice) and voltage regulators are capable of operation, Interconnection Customer shall operate the Generating Facility with its speed governors and voltage regulators in automatic operation. If the Generating Facility's speed governors and voltage regulators are not capable of such automatic operation, Interconnection Customer shall immediately notify Transmission Provider's system operator, or its designated representative, and ensure that such Generating Facility's reactive power production or absorption (measured in MVARs) are within the design capability of the Generating Facility's generating unit(s) and steady state stability limits. Interconnection Customer shall not cause its Generating Facility to disconnect automatically or instantaneously from the Transmission or Distribution System, as applicable, or trip any generating unit comprising the Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Local Balancing Authority on a comparable basis.

9.6.3 Payment for Reactive Power. Payments for reactive power shall be pursuant to any tariff or rate schedule filed by Transmission Provider and approved by the FERC.

9.7 Outages and Interruptions.

9.7.1 Outages.

9.7.1.1 Outage Authority and Coordination. Interconnection Customer and Transmission Owner may each in accordance with Good Utility Practice in coordination with the other Party and Transmission Provider remove from service any of its respective Interconnection Facilities, System Protection Facilities, Network Upgrades, System Protection Facilities or

Distribution Upgrades that may impact the other Party's facilities as necessary to perform maintenance or testing or to install or replace equipment. Absent an Emergency Condition, the Party scheduling a removal of such facility(ies) from service will use Reasonable Efforts to notify one another and schedule such removal on a date and time mutually acceptable to the Parties. In all circumstances, any Party planning to remove such facility(ies) from service shall use Reasonable Efforts to minimize the effect on the other Parties of such removal.

9.7.1.2 Outage Schedules. Transmission Provider shall post scheduled outages of transmission facilities on the OASIS. Interconnection Customer shall submit its planned maintenance schedules for the Generating Facility to Transmission Provider and Transmission Owner for a minimum of a rolling twenty-four (24) month period in accordance with the Transmission Provider's procedures. Interconnection Customer shall update its planned maintenance schedules as necessary. Transmission Provider may request Interconnection Customer to reschedule its maintenance as necessary to maintain the reliability of the Transmission System; provided, however, adequacy of generation supply shall not be a criterion in determining Transmission System reliability. Transmission Provider shall compensate, pursuant to applicable Transmission Provider tariff or rate schedule, Interconnection Customer for any additional direct costs that Interconnection Customer incurs as a result of having to reschedule maintenance, including any additional overtime, breaking of maintenance contracts or other costs above and beyond the cost Interconnection Customer would have incurred absent the Transmission Provider's request to reschedule maintenance. Interconnection Customer will not be eligible to receive compensation, if during the twelve (12) months prior to the date of the scheduled maintenance, Interconnection Customer had modified its schedule of maintenance activities.

Costs shall be determined by negotiation between Transmission Provider and Interconnection Customer prior to implementation of the voluntary change in outage schedules, or if such request is made by or on behalf of a Transmission Customer requesting firm service, costs and recovery of costs shall be determined through a bilateral agreement between the Transmission Customer and Interconnection Customer. Voluntary changes to outage schedules under this Article 9.7.1.2 are separate from actions and compensation required under Article 13 and for which costs are recovered in accordance with Transmission Provider's applicable tariff or rate schedule.

9.7.1.3 Outage Restoration. If an outage on either the Interconnection Customer's or Transmission Owner's Interconnection Facilities, Network Upgrades, System Protection Facilities or Distribution

Upgrades adversely affects a Party's operations or facilities, the Party that owns or controls the facility that is out of service shall use Reasonable Efforts to promptly restore such facility(ies) to a normal operating condition consistent with the nature of the outage. The Party that owns or controls the facility that is out of service shall provide the other Parties, to the extent such information is known, information on the nature of the Emergency Condition, an estimated time of restoration, and any corrective actions required. Initial verbal notice shall be followed up as soon as practicable with written notice to the other Parties explaining the nature of the outage.

9.7.2 Interruption of Service. If required by Good Utility Practice to do so, Transmission Provider may require Interconnection Customer to interrupt or reduce deliveries of electricity if such delivery of electricity could adversely affect Transmission Provider's ability to perform such activities as are necessary to safely and reliably operate and maintain the Transmission System. The following provisions shall apply to any interruption or reduction permitted under this Article 9.7.2:

9.7.2.1 The interruption or reduction shall continue only for so long as reasonably necessary under Good Utility Practice;

9.7.2.2 Any such interruption or reduction shall be made on an equitable, non-discriminatory basis with respect to all generating facilities directly connected to the Transmission or Distribution System, as applicable;

9.7.2.3 When the interruption or reduction must be made under circumstances which do not allow for advance notice, Transmission Provider shall notify Interconnection Customer by telephone as soon as practicable of the reasons for the curtailment, interruption, or reduction, and, if known, its expected duration. Telephone notification shall be followed by written notification as soon as practicable;

9.7.2.4 Except during the existence of an Emergency Condition, when the interruption or reduction can be scheduled without advance notice, Transmission Provider shall notify Interconnection Customer in advance regarding the timing of such scheduling and further notify Interconnection Customer of the expected duration. Transmission Provider shall coordinate with Interconnection Customer using Good Utility Practice to schedule the interruption or reduction during periods of least impact to Interconnection Customer, Transmission Owner and Transmission Provider;

9.7.2.5 The Parties shall cooperate and coordinate with each other to the extent necessary in order to restore the Generating Facility, Interconnection Facilities, and the Transmission or Distribution System, as applicable to

their normal operating state, consistent with system conditions and Good Utility Practice.

9.7.3 Under-Frequency, Over-Frequency, Under-Voltage, and Over-Voltage Conditions. The Transmission System is designed to automatically activate a load-shed program as required by the Applicable Reliability Council in the event of an under-frequency or under-voltage system disturbance. Interconnection Customer shall implement under-frequency, over-frequency, under-voltage, and over-voltage relay set points for the Generating Facility as required by the Applicable Reliability Council to ensure "ride through" capability of the Transmission System. Generating Facilities that are not required to implement under-frequency, over-frequency, under-voltage, and over-voltage relays as directed by the Applicable Reliability Council shall implement such relays with set points according to guidelines published by the Applicable Reliability Council. Generating Facility response to frequency and/or voltage deviations of pre-determined magnitudes, including under-frequency, over-frequency, under-voltage, and over-voltage, shall be studied and coordinated with Transmission Provider in accordance with Good Utility Practice. The term "ride through" as used herein shall mean the ability of a Generating Facility to stay connected to and synchronized with the Transmission System during system disturbances within a range of under-frequency, over-frequency, under-voltage, and over-voltage conditions, in accordance with Good Utility Practice.

9.7.4 System Protection and Other Control Requirements.

9.7.4.1 System Protection Facilities. Interconnection Customer shall, at its expense, install, operate and maintain its System Protection Facilities as a part of the Generating Facility or the Interconnection Customer's Interconnection Facilities. Transmission Owner shall install at Interconnection Customer's expense any Transmission Owner's System Protection Facilities that may be required on the Transmission Owner's Interconnection Facilities or the Transmission Owner's transmission or distribution facilities as a result of the interconnection of the Generating Facility and the Interconnection Customer's Interconnection Facilities.

9.7.4.2 Interconnection Customer's and Transmission Owner's System Protection Facilities shall be designed and coordinated with Affected Systems in accordance with Good Utility Practice.

9.7.4.3 Each Party shall be responsible for protection of its facilities consistent with Good Utility Practice.

9.7.4.4 Each Party's protective relay design shall incorporate the necessary test switches to perform the tests required in Article 6. The required test switches will be placed such that they allow operation of lockout relays while preventing breaker failure schemes from operating and causing

unnecessary breaker operations and/or the tripping of the Generating Facility.

9.7.4.5 Each Party will test, operate and maintain their respective System Protection Facilities in accordance with Good Utility Practice.

9.7.4.6 Prior to the In-Service Date, and again prior to the Commercial Operation Date, Interconnection Customer or Transmission Owner, or their respective agents, shall perform a complete calibration test and functional trip test of the System Protection Facilities. At intervals suggested by Good Utility Practice and following any apparent malfunction of the System Protection Facilities, Interconnection Customer or Transmission Owner shall each perform both calibration and functional trip tests of their respective System Protection Facilities. These tests do not require the tripping of any in-service generating unit. These tests do, however, require that all protective relays and lockout contacts be activated.

9.7.5 Requirements for Protection. In compliance with Good Utility Practice, Interconnection Customer shall provide, install, own, and maintain relays, circuit breakers and all other devices necessary to remove any fault contribution of the Generating Facility to any short circuit occurring on the Transmission or Distribution System, as applicable, not otherwise isolated by Transmission Owner's equipment, such that the removal of the fault contribution shall be coordinated with the protective requirements of the Transmission or Distribution System, as applicable. Such protective equipment shall include, without limitation, a disconnecting device or switch with load-interrupting capability located between the Generating Facility and the Transmission or Distribution System, as applicable, at a site selected upon mutual agreement (not to be unreasonably withheld, conditioned or delayed) of the Parties. Interconnection Customer shall be responsible for protection of the Generating Facility and Interconnection Customer's other equipment from such conditions as negative sequence currents, over- or under-frequency, sudden load rejection, over- or under-voltage, and generator loss-of-field. Interconnection Customer shall be solely responsible to disconnect the Generating Facility and Interconnection Customer's other equipment if conditions on the Transmission or Distribution System, as applicable, could adversely affect the Generating Facility.

9.7.6 Power Quality. Neither Party's facilities shall cause excessive voltage flicker nor introduce excessive distortion to the sinusoidal voltage or current waves as defined by ANSI Standard C84.1-1989, in accordance with IEEE Standard 519, or any applicable superseding electric industry standard. In the event of a conflict between ANSI Standard C84.1-1989, and any applicable superseding electric industry standard, the applicable superseding electric industry standard shall control.

9.8 Switching and Tagging Rules. Prior to the Initial Synchronization Date, each Party shall provide the other Parties a copy of its switching and tagging rules that are applicable to the other Parties' activities. Such switching and tagging rules shall be developed on a non-discriminatory basis. The Parties shall comply with applicable switching and tagging rules, as amended from time to time, in obtaining clearances for work or for switching operations on equipment.

9.9 Use of Interconnection Facilities by Other Parties.

9.9.1 Purpose of Interconnection Facilities. Except as may be required by Applicable Laws and Regulations, or as otherwise agreed to among the Parties, the Interconnection Facilities shall be constructed for the sole purpose of interconnecting the Generating Facility to the Transmission or Distribution System, as applicable, and shall be used for no other purpose.

9.9.2 Other Users. If required by Applicable Laws and Regulations or if the Parties mutually agree, such agreement not to be unreasonably withheld or delayed, to allow one or more Parties to use the Transmission Owner's Interconnection Facilities, or any part thereof, Interconnection Customer will be entitled to compensation for the capital expenses it incurred in connection with the Interconnection Facilities based upon the pro rata use of the Interconnection Facilities by Transmission Owner, all non-Party users, and Interconnection Customer, in accordance with Applicable Laws and Regulations or upon some other mutually-agreed upon methodology. In addition, cost responsibility for ongoing costs, including operation and maintenance costs associated with the Interconnection Facilities, will be allocated between Interconnection Customer and any non-Party users based upon the pro rata use of the Interconnection Facilities by Transmission Owner, all non-Party users, and Interconnection Customer, in accordance with Applicable Laws and Regulations or upon some other mutually agreed upon methodology. If the issue of such compensation or allocation cannot be resolved through such negotiations, it shall be submitted to Dispute Resolution pursuant to Section 12 of the Tariff.

9.10 Disturbance Analysis Data Exchange. The Parties will cooperate with one another in the analysis of disturbances to either the Generating Facility or the Transmission System by gathering and providing access to any information relating to any disturbance, including information from oscillography, protective relay targets, breaker operations and sequence of events records, and any disturbance information required by Good Utility Practice.

ARTICLE 10. MAINTENANCE

10.1 Transmission Owner Obligations. Transmission Owner shall maintain the Transmission Owner's Interconnection Facilities in a safe and reliable manner and in accordance with this GIA and all Applicable Laws and Regulations.

10.2 Interconnection Customer Obligations. Interconnection Customer shall maintain the Generating Facility and the Interconnection Customer's Interconnection Facilities in a safe and reliable manner and in accordance with this GIA and all Applicable Laws and Regulations.

10.3 Coordination. The Parties shall confer regularly to coordinate the planning, scheduling and performance of preventive and corrective maintenance on the Generating Facility and the Interconnection Facilities.

10.4 Secondary Systems. Each Party shall cooperate with the other in the inspection, maintenance, and testing of control or power circuits that operate below 600 volts, AC or DC, including, but not limited to, any hardware, control or protective devices, cables, conductors, electric raceways, secondary equipment panels, transducers, batteries, chargers, and voltage and current transformers that directly affect the operation of a Party's facilities and equipment which may reasonably be expected to impact another Party. Each Party shall provide advance notice to the other Parties before undertaking any work on such circuits, especially on electrical circuits involving circuit breaker trip and close contacts, current transformers, or potential transformers.

10.5 Operating and Maintenance Expenses. Subject to the provisions herein addressing the use of facilities by others, and except for operations and maintenance expenses associated with modifications made for providing Interconnection Service or Transmission Service to a non-Party and such non-Party pays for such expenses, Interconnection Customer shall be responsible for all reasonable expenses including overheads, associated with: (1) owning, operating, maintaining, repairing, and replacing Interconnection Customer's Interconnection Facilities; and (2) operation, maintenance, repair and replacement of Transmission Owner's Interconnection Facilities to the extent required by Transmission Owner on a comparable basis.

ARTICLE 11. PERFORMANCE OBLIGATION

11.1 Interconnection Customer's Interconnection Facilities. Interconnection Customer shall design, procure, construct, install, own and/or control the Interconnection Customer's Interconnection Facilities described in Appendix A at its sole expense.

11.2 Transmission Owner's Interconnection Facilities. Transmission Owner shall design, procure, construct, install, own and/or control the Transmission Owner's Interconnection Facilities described in Appendix A at the sole expense of Interconnection Customer.

11.3 Network Upgrades, System Protection Facilities and Distribution Upgrades. Transmission Owner shall design, procure, construct, install, and own the Network Upgrades, Transmission Owner's System Protection Facilities and Distribution Upgrades described in Appendix A. Interconnection Customer shall be responsible for all costs related to Distribution Upgrades and/or Generator Upgrades. Transmission Owner shall provide Transmission Provider and Interconnection Customer with written notice pursuant to Article 15 that Transmission Owner elects to fund the capital for the Network

Upgrades and Transmission Owner's System Protection Facilities, which election shall only be available upon mutual agreement of Interconnection Customer and Transmission Owner; otherwise, such facilities, if any, shall be solely funded by Interconnection Customer.

11.3.1 Contingencies Affecting Network Upgrades, System Protection Facilities and Distribution Upgrades**.** Network Upgrades, System Protection Facilities and Distribution Upgrades that are required to accommodate the Generating Facility may be modified because (1) a higher queued interconnection request withdrew or was deemed to have withdrawn, (2) the interconnection agreement associated with a higher queued interconnection request was terminated prior to the project's In-Service Date, (3) the Commercial Operation Date for a higher queued interconnection request is delayed, or the project itself is delayed (including due to suspension) such that facilities required to accommodate lower queued projects or the project itself may be altered, (4) the queue position is reinstated for a higher-queued interconnection request whose queue position was subject to dispute resolution, (5) changes occur in Transmission Provider or Transmission Owner equipment design standards or reliability criteria giving rise to the need for restudy, (6) the facilities required to accommodate a higher queued Interconnection Request were modified constituting a Material Modification pursuant to Section 4.4 of the GIP, (7) a GIA with an effective date prior to this GIA is terminated, or (8) when ordered to restudy by FERC. The higher queued Interconnection Requests that could impact the Network Upgrades, System Protection Facilities and Distribution Upgrades required to accommodate the Generating Facility, and possible Modifications that may result from the above listed events affecting the higher queued Interconnection Requests, to the extent such modifications are reasonably known and can be determined, and estimates of the costs associated with such required Network Upgrades, System Protection Facilities and Distribution Upgrades, are provided in Appendix A.

11.3.2 Agreement to Restudy and Cost Reallocation**.** At any time before the Network Upgrades, System Protection Facilities and/or Distribution Upgrades associated with higher queued Interconnection Requests with GIA in effect prior to this GIA are completed, Transmission Provider may determine restudy is required either: (i) in Transmission Provider's discretion or (ii) because one of the contingencies listed in Article 11.3.1 has occurred. If a restudy is required, Transmission Provider will provide notice to Interconnection Customer and Interconnection Customer agrees to enter into an Interconnection Study Agreement for such restudy. Transmission Provider will post on its OASIS if a restudy is declared for reasons other than the contingencies listed in Article 11.3.1. Transmission Provider will reevaluate the need for any Common Use Upgrade(s) and/or Shared Network Upgrade(s), and if still required, reallocate the cost and responsibility for any Common Use Upgrade and/or Shared Network Upgrade, without a restudy when possible, or with a restudy if the Transmission Provider deems it necessary in order to ensure reliability of the Transmission System. The Parties agree to

amend Appendix A to this GIA in accordance with Article 30.10 to reflect the results of any cost reallocation required under this Article 11.3.2.

11.3.3 Agreement to Fund Shared Network Upgrades. Interconnection Customer agrees to fund Shared Network Upgrades, as determined by Transmission Provider. Where applicable, payments to fund Shared Network Upgrade(s) that are made to Transmission Provider by Interconnection Customer will be disbursed by Transmission Provider to the appropriate entities that funded the Shared Network Upgrades in accordance with Attachment X and Attachment FF of the Tariff. In the event that Interconnection Customer fails to meet its obligation to fund Shared Network Upgrades, Transmission Owner and Transmission Provider shall not be responsible for the Interconnection Customer's funding obligation.

11.4 Transmission Credits.

11.4.1 Repayment of Amounts Advanced for Network Upgrades. Interconnection Customer shall be entitled to a cash repayment by Transmission Owner(s) and the Affected System Owner(s) that own the Network Upgrades, of the amount paid respectively to Transmission Owner and Affected System Operator, if any, for the Network Upgrades, as provided under Attachment FF of this Tariff and including any tax gross-up or other tax-related payments associated with the repayable portion of the Network Upgrades, and not repaid to Interconnection Customer pursuant to Article 5.17.8 or otherwise, to be paid to Interconnection Customer on a dollar-for-dollar basis for the non-usage sensitive portion of transmission charges, as payments are made under the Tariff and Affected System's Tariff for Transmission Services with respect to the Generating Facility. Any repayment shall include interest calculated in accordance with the methodology set forth in FERC's regulations at 18 C.F.R. § 35.19 (a)(2)(iii) from the date of any payment for Network Upgrades through the date on which Interconnection Customer receives a repayment of such payment pursuant to this subparagraph. Interest shall not accrue during periods in which Interconnection Customer has suspended construction pursuant to Article 11 or the Network Upgrades have been determined not to be needed pursuant to this Article 11.4.1. Interconnection Customer may assign such repayment rights to any person.

If the Generating Facility is designated a Network Resource under the Tariff, or if there are otherwise no incremental payments for Transmission Service resulting from the use of the Generating Facility by Transmission Customer, and in the absence of another mutually agreeable payment schedule any repayments provided under Attachment FF shall be established equal to the applicable rate for Firm Point-To-Point Transmission Service for the pricing zone where the Network Load is located multiplied by the portion of the demonstrated output of the Generating Facility designated as a Network Resource by the Network Customer(s) or in the absence of such designation, equal to the monthly firm single system-wide rate defined under Schedule 7 of the Tariff multiplied by the

portion of the demonstrated output of the Generating Facility under contract to Network Customer(s) and consistent with studies pursuant to Section 3.2.2.2 of the GIP.

Notwithstanding the foregoing, as applicable and consistent with the provisions of Attachment FF of this Tariff, Interconnection Customer, Transmission Provider, Transmission Owner, and Affected System Operator may adopt any alternative payment schedule that is mutually agreeable so long as Transmission Owner and Affected System Operator take one of the following actions no later than five (5) years from the Commercial Operation Date: (1) return to Interconnection Customer any amounts advanced for Network Upgrades not previously repaid, or (2) declare in writing that Transmission Owner or Affected System Operator will continue to provide payments to Interconnection Customer on a dollar-for-dollar basis for the non-usage sensitive portion of transmission charges, or develop an alternative schedule that is mutually agreeable and provides for the return of all amounts advanced for Network Upgrades not previously repaid; however, full reimbursement shall not extend beyond twenty (20) years from the Commercial Operation Date.

If the Generating Facility is installed in phases, the amount eligible for refund as each phase achieves Commercial Operation will be reduced by the proportional amount of generation capacity not yet installed. However, all facilities in Appendix A other than the Generating Facility shall be built without consideration for the phasing of the Generating Facility as though the entire Generating Facility will be placed in Commercial Operation for the full output or increased output of the Generating Facility constructed by Interconnection Customer under this GIA.

If the Generating Facility fails to achieve Commercial Operation, but it or another generating facility is later constructed and makes use of the Network Upgrades, Transmission Owner and Affected System Operator shall at that time reimburse Interconnection Customer for the remaining applicable amounts that may be refundable pursuant to Attachment FF of this Tariff that were advanced for the Network Upgrades on their respective systems as described above. Before any such reimbursement can occur, Interconnection Customer, or the entity that ultimately constructs the Generating Facility, if different, is responsible for identifying the entity to which the reimbursement must be made.

11.4.2 Special Provisions for Transmission Provider as an Affected System to be covered under Separate Agreements. When the Transmission Owner's Transmission or Distribution System (including for this Article 11.4.2 independent distribution systems connected to the Transmission System) is an Affected System for an interconnection in another electric system, Transmission Provider will coordinate the performance of Interconnection Studies with the other system. Transmission Provider will determine if any Network Upgrades or Distribution Upgrades, which may be required on the Transmission System

as a result of the interconnection, would not have been needed but for the interconnection. Unless Transmission Owner provides, under the interconnection agreement between Interconnection Customer and the other system, for the repayment of amounts advanced to Transmission Provider or an impacted Transmission Owner for Network Upgrades, Interconnection Customer, Transmission Provider, and the impacted Transmission Owner(s) shall enter into an agreement that provides for such repayment by Transmission Owner(s) as directed by Transmission Provider. The agreement shall specify the terms governing payments to be made by Interconnection Customer to the Affected System Operator as well as the payment of refunds by the Affected System Operator.

11.4.3 Notwithstanding any other provision of this GIA, nothing herein shall be construed as relinquishing or foreclosing any rights, including but not limited to firm transmission rights, capacity rights, transmission congestion rights, or transmission credits, that Interconnection Customer, shall be entitled to, now or in the future under any other agreement or tariff as a result of, or otherwise associated with, the transmission capacity, if any, created by the Network Upgrades, including the right to obtain cash reimbursement or transmission credits for transmission service that is not associated with the Generating Facility.

11.5 Initial Payment. Interconnection Customer shall elect (and provide its election to the Transmission Provider within five days of the commencement of negotiation of the GIA pursuant to Section 11.2 of the GIP) to make either 1) an initial payment equal to twenty (20) percent of the total cost of Network Upgrades, Transmission Owner Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and/or Generator Upgrades (if the In-Service Date is less than or equal to five (5) years of the initial payment date); or 2) an initial payment equal to ten (10) percent of the total cost of Network Upgrades, Transmission Owner Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and/or Generator Upgrades (if the In-Service Date exceeds the initial payment date by more than five (5) years); or 3) the total cost of Network Upgrades, Transmission Owner Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and/or Generator Upgrades in the form of security pursuant to Article 11.6. The initial payment shall be provided to Transmission Owner by Interconnection Customer pursuant to this Article 11.5 within the later of a) forty-five (45) Calendar Days of the execution of the GIA by all Parties, or b) forty-five (45) Calendar Days of acceptance by FERC if the GIA is filed unexecuted and the payment is being protested by Interconnection Customer, or c) forty-five (45) Calendar Days of the filing if the GIA is filed unexecuted and the initial payment is not being protested by Interconnection Customer. If the Interconnection Customer made its milestone payments in the form of cash and the Interconnection Customer elects a cash initial payment, then the Transmission Provider shall transfer those funds to the Transmission Owner on the Interconnection Customer's behalf.

11.6 Provision of Security. Unless otherwise provided in Appendix B, at least thirty (30) Calendar Days prior to the commencement of the design, procurement, installation, or construction of a discrete portion of an element, not otherwise funded under Article 11.5, of the Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Network Upgrades, Distribution Upgrades or Stand-Alone Network Upgrades, or at the request of Transmission Owner if regulatory approvals are required for the construction of such facilities, Interconnection Customer shall provide Transmission Owner, at Interconnection Customer's selection, a guarantee, a surety bond, letter of credit or other form of security that is reasonably acceptable to Transmission Owner and is consistent with the Uniform Commercial Code of the jurisdiction identified in Article 14.2.1. Such security for payment shall be in an amount sufficient to cover the applicable costs and cost commitments, in addition to those funded under Article 11.5, required of the Party responsible for building the facilities pursuant to the construction schedule developed in Appendix B for designing, engineering, seeking regulatory approval from any Governmental Authority, constructing, procuring and installing the applicable portion of the Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Network Upgrades, Distribution Upgrades or Stand-Alone Network Upgrades and shall be reduced on a dollar-for-dollar basis for payments made to Transmission Owner for these purposes.

In addition:

11.6.1 The guarantee must be made by an entity that meets the creditworthiness requirements of Transmission Owner, and contain terms and conditions that guarantee payment of any amount that may be due from Interconnection Customer, up to an agreed-to maximum amount.

11.6.2 The letter of credit must be issued by a financial institution reasonably acceptable to Transmission Owner and must specify a reasonable expiration date.

11.6.3 The surety bond must be issued by an insurer reasonably acceptable to Transmission Owner and must specify a reasonable expiration date.

11.6.4 If the Shared Network Upgrade is not in service, Interconnection Customer will provide, as applicable, an Irrevocable Letter of Credit to fund any Shared Network Upgrade pursuant to Attachment FF of the Tariff. The Irrevocable Letter of Credit shall be in an amount sufficient to cover the Interconnection Customer's share of the applicable costs and cost commitments associated with the Shared Network Upgrades. Transmission Provider may periodically adjust the Interconnection Customer's share of the applicable costs and cost commitment of Shared Network Upgrades and may require Interconnection Customer to adjust the amount of the Irrevocable Letter of Credit accordingly.

11.7 Interconnection Customer Compensation. If Transmission Provider requests or directs Interconnection Customer to provide a service pursuant to Article 13.4 of this GIA,

Transmission Provider shall compensate Interconnection Customer in accordance with any tariff or rate schedule filed by Transmission Provider and approved by the FERC.

ARTICLE 12. INVOICE

12.1 General. Each Party shall submit to the other Party, on a monthly basis, invoices of amounts due, if any, for the preceding month. Each invoice shall state the month to which the invoice applies and fully describe the services and equipment provided. The Parties may discharge mutual debts and payment obligations due and owing to each other on the same date through netting, in which case all amounts a Party owes to the other Party under this GIA, including interest payments or credits, shall be netted so that only the net amount remaining due shall be paid by the owing Party.

12.2 Final Invoice. Within six (6) months after completion of the construction of the Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and the Network Upgrades, Transmission Owner shall provide an invoice of the final cost of the construction of the Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and the Network Upgrades and shall set forth such costs in sufficient detail to enable Interconnection Customer to compare the actual costs with the estimates and to ascertain deviations, if any, from the cost estimates. Transmission Owner shall refund, with interest (calculated in accordance with 18 C.F.R. Section 35.19a(a)(2)(iii), to Interconnection Customer any amount by which the actual payment by Interconnection Customer for estimated costs exceeds the actual costs of construction within thirty (30) Calendar Days of the issuance of such final construction invoice.

12.3 Payment. Invoices shall be rendered to the paying Party at the address specified in Appendix F. The Party receiving the invoice shall pay the invoice within thirty (30) Calendar Days of receipt. All payments shall be made in immediately available funds payable to the other Party, or by wire transfer to a bank named and account designated by the invoicing Party. Payment of invoices by a Party will not constitute a waiver of any rights or claims that Party may have under this GIA.

12.4 Disputes. In the event of a billing dispute among the Parties, Transmission Provider shall continue to provide Interconnection Service under this GIA as long as Interconnection Customer: (i) continues to make all payments not in dispute; and (ii) pays to Transmission Provider or Transmission Owner or into an independent escrow account the portion of the invoice in dispute, pending resolution of such dispute. If Interconnection Customer fails to meet these two requirements for continuation of service, then Transmission Provider may or, at Transmission Owner's request upon Interconnection Customer's failure to pay, Transmission Owner, shall provide notice to Interconnection Customer of a Default pursuant to Article 17. Within thirty (30) Calendar Days after the resolution of the dispute, the Party that owes money to another Party shall pay the amount due with interest calculated in accord with the methodology set forth in 18 C.F.R. § 35.19a(a)(2)(iii).

ARTICLE 13. EMERGENCIES

13.1 Obligations. Each Party shall comply with the Emergency Condition procedures of Transmission Provider, NERC, the Applicable Reliability Council, and Applicable Laws and Regulations.

13.2 Notice. Transmission Provider or Transmission Owner shall notify the other Parties promptly when it becomes aware of an Emergency Condition that affects the Transmission Owner's Interconnection Facilities or the Transmission or Distribution System, as applicable, that may reasonably be expected to affect Interconnection Customer's operation of the Generating Facility or the Interconnection Customer's Interconnection Facilities.

Interconnection Customer shall notify Transmission Provider and Transmission Owner, which includes by definition if applicable, the operator of a Distribution System, promptly when it becomes aware of an Emergency Condition that affects the Generating Facility or the Interconnection Customer's Interconnection Facilities that may reasonably be expected to affect the Transmission or Distribution System, as applicable, or the Transmission Owner's Interconnection Facilities.

To the extent information is known, the notification shall describe the Emergency Condition, the extent of the damage or deficiency, the expected effect on the operation of Interconnection Customer's or Transmission Provider's or Transmission Owner's facilities and operations, its anticipated duration and the corrective action taken and/or to be taken. The initial notice shall be followed as soon as practicable with written notice.

13.3 Immediate Action. Unless, in a Party's reasonable judgment, immediate action is required, the Party exercising such judgment shall notify and obtain the consent of the other Parties, such consent to not be unreasonably withheld, prior to performing any manual switching operations at the Generating Facility or the Interconnection Customer's Interconnection Facilities in response to an Emergency Condition either declared by Transmission Provider or otherwise regarding the Transmission or Distribution System, as applicable.

13.4 Transmission Provider and Transmission Owner Authority.

13.4.1 General. Transmission Provider or Transmission Owner may take whatever actions or inactions with regard to the Transmission System or the Transmission Owner's Interconnection Facilities it deems necessary during an Emergency Condition in order to (i) preserve public health and safety, (ii) preserve the reliability of the Transmission System or the Transmission Owner's Interconnection Facilities, (iii) limit or prevent damage, and (iv) expedite restoration of service.

Transmission Provider or Transmission Owner shall use Reasonable Efforts to minimize the effect of such actions or inactions on the Generating Facility or the

Interconnection Customer's Interconnection Facilities. Transmission Provider or Transmission Owner may, on the basis of technical considerations, require the Generating Facility to mitigate an Emergency Condition by taking actions necessary and limited in scope to remedy the Emergency Condition, including, but not limited to, directing Interconnection Customer to shut-down, start-up, increase or decrease the real or reactive power output of the Generating Facility; implementing a reduction or disconnection pursuant to Article 13.4.2; directing Interconnection Customer to assist with blackstart (if available) or restoration efforts; or altering the outage schedules of the Generating Facility and the Interconnection Customer's Interconnection Facilities. Interconnection Customer shall comply with all of Transmission Provider's or Transmission Owner's operating instructions concerning Generating Facility real power and reactive power output within the manufacturer's design limitations of the Generating Facility's equipment that is in service and physically available for operation at the time, in compliance with Applicable Laws and Regulations.

13.4.2 Reduction and Disconnection. Transmission Provider or Transmission Owner may reduce Interconnection Service or disconnect the Generating Facility or the Interconnection Customer's Interconnection Facilities, when such reduction or disconnection is necessary under Good Utility Practice due to Emergency Conditions. These rights are separate and distinct from any right of curtailment of Transmission Provider pursuant to the Tariff. When Transmission Provider can schedule the reduction or disconnection in advance, Transmission Provider shall notify Interconnection Customer of the reasons, timing and expected duration of the reduction or disconnection. Transmission Provider shall coordinate with Interconnection Customer and Transmission Owner using Good Utility Practice to schedule the reduction or disconnection during periods of least impact to Interconnection Customer, Transmission Owner and Transmission Provider. Any reduction or disconnection shall continue only for so long as reasonably necessary pursuant to Good Utility Practice. The Parties shall cooperate with each other to restore the Generating Facility, the Interconnection Facilities, and the Transmission System to their normal operating state as soon as practicable consistent with Good Utility Practice.

13.5 Interconnection Customer Authority. Consistent with Good Utility Practice and this GIA and the GIP, Interconnection Customer may take whatever actions or inactions with regard to the Generating Facility or the Interconnection Customer's Interconnection Facilities during an Emergency Condition in order to (i) preserve public health and safety, (ii) preserve the reliability of the Generating Facility or the Interconnection Customer's Interconnection Facilities, (iii) limit or prevent damage, and (iv) expedite restoration of service. Interconnection Customer shall use Reasonable Efforts to minimize the effect of such actions or inactions on the Transmission System and the Transmission Owner's Interconnection Facilities. Transmission Provider and Transmission Owner shall use Reasonable Efforts to assist Interconnection Customer in such actions.

13.6 Limited Liability. Except as otherwise provided in Article 11.6 of this GIA, no Party shall be liable to any other for any action it takes in responding to an Emergency Condition so long as such action is made in good faith and is consistent with Good Utility Practice.

13.7 Audit. In accordance with Article 25.3, any Party may audit the performance of another Party when that Party declared an Emergency Condition.

ARTICLE 14. REGULATORY REQUIREMENTS AND GOVERNING LAW

14.1 Regulatory Requirements. Each Party's obligations under this GIA shall be subject to its receipt of any required approval or certificate from one or more Governmental Authorities in the form and substance satisfactory to the applying Party, or the Party making any required filings with, or providing notice to, such Governmental Authorities, and the expiration of any time period associated therewith. Each Party shall in good faith seek, and if necessary assist the other Party and use its Reasonable Efforts to obtain such other approvals. Nothing in this GIA shall require Interconnection Customer to take any action that could result in its inability to obtain, or its loss of, status or exemption under the Federal Power Act, the Public Utility Holding Company Act of 2005, as amended, or the Public Utility Regulatory Policies Act of 1978.

14.2 Governing Law.

14.2.1 The validity, interpretation and performance of this GIA and each of its provisions shall be governed by the laws of the state where the Point of Interconnection is located, without regard to its conflicts of law principles.

14.2.2 This GIA is subject to all Applicable Laws and Regulations.

14.2.3 Each Party expressly reserves the right to seek changes in, appeal, or otherwise contest any laws, orders, rules, or regulations of a Governmental Authority.

ARTICLE 15. NOTICES

15.1 General. Unless otherwise provided in this GIA, any notice, demand or request required or permitted to be given by any Party to the other Parties and any instrument required or permitted to be tendered or delivered by a Party in writing to the other Parties shall be effective when delivered and may be so given, tendered or delivered, by recognized national courier, or by depositing the same with the United States Postal Service with postage prepaid, for delivery by certified or registered mail, addressed to the Party, or personally delivered to the Party, at the address set out in Appendix F, Addresses for Delivery of Notices and Billings.

Either Party may change the notice information in this GIA by giving five (5) Business Days written notice prior to the effective date of the change.

15.2 Billings and Payments. Billings and payments shall be sent to the addresses set out in Appendix F.

15.3 Alternative Forms of Notice. Any notice or request required or permitted to be given by any Party to the other and not required by this GIA to be given in writing may be so given by telephone, facsimile or email to the telephone numbers and email addresses set out in Appendix F.

15.4 Operations and Maintenance Notice. Each Party shall notify the other Parties in writing of the identity of the person(s) that it designates as the point(s) of contact with respect to the implementation of Articles 9 and 10.

ARTICLE 16. FORCE MAJEURE

16.1 Force Majeure.

16.1.1 Economic hardship is not considered a Force Majeure event.

16.1.2 A Party shall not be considered to be in Default with respect to any obligation hereunder, (including obligations under Article 4 and 5), other than the obligation to pay money when due, if prevented from fulfilling such obligation by Force Majeure. A Party unable to fulfill any obligation hereunder (other than an obligation to pay money when due) by reason of Force Majeure shall give notice and the full particulars of such Force Majeure to the other Parties in writing or by telephone as soon as reasonably possible after the occurrence of the cause relied upon. Telephone, facsimile or email notices given pursuant to this Article shall be confirmed in writing as soon as reasonably possible and shall specifically state full particulars of the Force Majeure, the time and date when the Force Majeure occurred and when the Force Majeure is reasonably expected to cease. The Party affected shall exercise Reasonable Efforts to remove such disability with reasonable dispatch, but shall not be required to accede or agree to any provision not satisfactory to it in order to settle and terminate a strike or other labor disturbance.

ARTICLE 17. DEFAULT

17.1 Default

17.1.1 General. No Default shall exist where such failure to discharge an obligation (other than the payment of money) is the result of Force Majeure as defined in this GIA or the result of an act or omission of another Party. Upon a Breach, the non-Breaching Party or Parties shall give written notice of such Breach to the Breaching Party with a copy to the other Party if one Party gives notice of such Breach. Except as provided in Article 17.1.2, the Breaching Party shall have thirty (30) Calendar Days from receipt of the Breach notice within which to cure such Breach; provided however, if such Breach is not capable of cure within

thirty (30) Calendar Days, the Breaching Party shall commence such cure within thirty (30) Calendar Days after notice and continuously and diligently complete such cure within ninety (90) Calendar Days from receipt of the Breach notice; and, if cured within such time, the Breach specified in such notice shall cease to exist.

17.1.2 Termination. If a Breach is not cured as provided in this Article, or if a Breach is not capable of being cured within the period provided for herein, the non-Breaching Party or Parties shall terminate this GIA, subject to Article 2.3.2 of this GIA, by written notice to the Breaching Party, with a copy to the other Party if one Party gives notice of termination, and be relieved of any further obligation hereunder and, whether or not that Party(ies) terminates this GIA, to recover from the Breaching Party all amounts due hereunder, plus all other damages and remedies to which it is (they are) entitled at law or in equity. The provisions of this Article will survive termination of this GIA.

ARTICLE 18. LIMITATION OF LIABILITY, INDEMNITY, CONSEQUENTIAL DAMAGES AND INSURANCE

18.1 Limitation of Liability. A Party shall not be liable to another Party or to any third party or other person for any damages arising out of actions under this GIA, including, but not limited to, any act or omission that results in an interruption, deficiency or imperfection of Interconnection Service, except as provided in this Tariff. The provisions set forth in the Tariff shall be additionally applicable to any Party acting in good faith to implement or comply with its obligations under this GIA, regardless of whether the obligation is preceded by a specific directive.

18.2 Indemnity. To the extent permitted by law, an Indemnifying Party shall at all times indemnify, defend and hold the other Parties harmless from Loss.

18.2.1 Indemnified Party. If an Indemnified Party is entitled to indemnification under this Article 18 as a result of a claim by a non-Party, and the Indemnifying Party fails, after notice and reasonable opportunity to proceed under Article 18.2, to assume the defense of such claim, such Indemnified Party may at the expense of the Indemnifying Party contest, settle or consent to the entry of any judgment with respect to, or pay in full, such claim.

18.2.2 Indemnifying Party. If an Indemnifying Party is obligated to indemnify and hold any Indemnified Party harmless under this Article 18, the amount owing to the Indemnified Party shall be the amount of such Indemnified Party's actual Loss, net of any insurance or other recovery.

18.2.3 Indemnity Procedures. Promptly after receipt by an Indemnified Party of any claim or notice of the commencement of any action or administrative or legal proceeding or investigation as to which the indemnity provided for in Article 18.2 may apply, the Indemnified Party shall notify the Indemnifying

Party of such fact. Any failure of or delay in such notification shall not affect a Party's indemnification obligation unless such failure or delay is materially prejudicial to the Indemnifying Party.

The Indemnifying Party shall have the right to assume the defense thereof with counsel designated by such Indemnifying Party and reasonably satisfactory to the Indemnified Party. If the defendants in any such action include one or more Indemnified Parties and the Indemnifying Party and if the Indemnified Party reasonably concludes that there may be legal defenses available to it and/or other Indemnified Parties which are different from or additional to those available to the Indemnifying Party, the Indemnified Party shall have the right to select separate counsel to assert such legal defenses and to otherwise participate in the defense of such action on its own behalf. In such instances, the Indemnifying Party shall only be required to pay the fees and expenses of one additional attorney to represent an Indemnified Party or Indemnified Parties having such differing or additional legal defenses.

The Indemnified Party shall be entitled, at its expense, to participate in any such action, suit or proceeding, the defense of which has been assumed by the Indemnifying Party. Notwithstanding the foregoing, the Indemnifying Party (i) shall not be entitled to assume and control the defense of any such action, suit or proceedings if and to the extent that, in the opinion of the Indemnified Party and its counsel, such action, suit or proceeding involves the potential imposition of criminal liability on the Indemnified Party, or there exists a conflict or adversity of interest between the Indemnified Party and the Indemnifying Party, in such event the Indemnifying Party shall pay the reasonable expenses of the Indemnified Party, and (ii) shall not settle or consent to the entry of any judgment in any action, suit or proceeding without the consent of the Indemnified Party, which shall not be reasonably withheld, conditioned or delayed.

18.3 Consequential Damages. Other than the Liquidated Damages heretofore described, in no event shall either Party be liable under any provision of this GIA for any losses, damages, costs or expenses for any special, indirect, incidental, consequential, or punitive damages, including but not limited to loss of profit or revenue, loss of the use of equipment, cost of capital, cost of temporary equipment or services, whether based in whole or in part in contract, in tort, including negligence, strict liability, or any other theory of liability; provided; however, that damages for which a Party may be liable to the other Party under another agreement will not be considered to be special, indirect, incidental, or consequential damages hereunder.

18.4 Insurance. Transmission Owner and Interconnection Customer shall, at their own expense, maintain in force throughout the period of this GIA pursuant to 18.4.9, and until released by the other Party, the following minimum insurance coverages, with insurers authorized to do business or an approved surplus lines carrier in the state where the Point of Interconnection is located:

18.4.1 Employers' Liability and Workers' Compensation Insurance providing statutory benefits in accordance with the laws and regulations of the state in which the Point of Interconnection is located.

18.4.2 Commercial General Liability Insurance including premises and operations, personal injury, broad form property damage, broad form blanket contractual liability coverage (including coverage for the contractual indemnification) products and completed operations coverage, coverage for explosion, collapse and underground hazards, independent contractors coverage, coverage for pollution to the extent normally available and punitive damages to the extent normally available and a cross liability endorsement, with minimum limits of One Million Dollars ($1,000,000) per occurrence/One Million Dollars ($1,000,000) aggregate combined single limit for personal injury, bodily injury, including death and property damage.

18.4.3 Comprehensive Automobile Liability Insurance, for coverage of owned and non-owned and hired vehicles, trailers or semi-trailers licensed for travel on public roads, with a minimum combined single limit of One Million Dollars ($1,000,000) each occurrence for bodily injury, including death, and property damage.

18.4.4 Excess Public Liability Insurance over and above the Employer's Liability, Commercial General Liability and Comprehensive Automobile Liability Insurance coverage, with a minimum combined single limit of Twenty Million Dollars ($20,000,000) per occurrence/Twenty Million Dollars ($20,000,000) aggregate.

18.4.5 The Commercial General Liability Insurance, Comprehensive Automobile Insurance and Excess Public Liability Insurance policies shall name the other Parties, their parents, associated and Affiliate companies and their respective directors, officers, agents, servants and employees ("Other Party Group") as additional insured. All policies shall contain provisions whereby the insurers waive all rights of subrogation in accordance with the provisions of this GIA against the Other Party Groups and provide thirty (30) Calendar Days' advance written notice to the Other Party Groups prior to anniversary date of cancellation or any material change in coverage or condition.

18.4.6 The Commercial General Liability Insurance, Comprehensive Automobile Liability Insurance and Excess Public Liability Insurance policies shall contain provisions that specify that the policies are primary and shall apply to such extent without consideration for other policies separately carried and shall state that each insured is provided coverage as though a separate policy had been issued to each, except the insurer's liability shall not be increased beyond the amount for which the insurer would have been liable had only one insured been

covered. Each Party shall be responsible for its respective deductibles or retentions.

18.4.7 The Commercial General Liability Insurance, Comprehensive Automobile Liability Insurance and Excess Public Liability Insurance policies, if written on a Claims First Made Basis, shall be maintained in full force and effect for two (2) years after termination of this GIA, which coverage may be in the form of tail coverage or extended reporting period coverage if agreed by Transmission Owner and Interconnection Customer.

18.4.8 The requirements contained herein as to the types and limits of all insurance to be maintained by Transmission Owner and Interconnection Customer are not intended to and shall not in any manner, limit or qualify the liabilities and obligations assumed by Transmission Owner and Interconnection Customer under this GIA.

18.4.9 As of the date set forth in Appendix B, Milestones, and as soon as practicable after the end of each fiscal year or at the renewal of the insurance policy and in any event within ninety (90) Calendar Days thereafter, Interconnection Customer and Transmission Owner shall provide the other Party with certification of all insurance required in this GIA, executed by each insurer or by an authorized representative of each insurer.

18.4.10 Notwithstanding the foregoing, Transmission Owner or Interconnection Customer may self-insure to meet the minimum insurance requirements of Articles 18.4.1 through 18.4.8, to the extent it maintains a self-insurance program; provided that, Transmission Owner's or Interconnection Customer's senior secured debt is rated at investment grade, or better, by Standard & Poor's and that its self-insurance program meets minimum insurance requirements under Articles 18.4.1 through 18.4.8. For any period of time that a Transmission Owner's or Interconnection Customer's senior secured debt is unrated by Standard & Poor's or is rated at less than investment grade by Standard & Poor's, such Party shall comply with the insurance requirements applicable to it under Articles 18.4.1 through 18.4.9. In the event that Transmission Owner or Interconnection Customer is permitted to self-insure pursuant to this article, it shall notify the other Party that it meets the requirements to self-insure and that its self-insurance program meets the minimum insurance requirements in a manner consistent with that specified in Article 18.4.9.

18.4.11 Transmission Owner and Interconnection Customer agree to report to each other in writing as soon as practical all accidents or occurrences resulting in injuries to any person, including death, and any property damage arising out of this GIA.

ARTICLE 19. ASSIGNMENT

19.1 Assignment. This GIA may be assigned by any Party only with the written consent of the other Parties; provided that a Party may assign this GIA without the consent of the other Parties to any Affiliate of the assigning Party with an equal or greater credit rating and with the legal authority and operational ability to satisfy the obligations of the assigning Party under this GIA; and provided further that Interconnection Customer shall have the right to assign this GIA, without the consent of either Transmission Provider or Transmission Owner, for collateral security purposes to aid in providing financing for the Generating Facility, provided that Interconnection Customer will promptly notify Transmission Provider of any such assignment. Any financing arrangement entered into by Interconnection Customer pursuant to this Article will provide that prior to or upon the exercise of the secured party's, trustee's or mortgagee's assignment rights pursuant to said arrangement, the secured creditor, the trustee or mortgagee will notify Transmission Provider of the date and particulars of any such exercise of assignment right(s), including providing Transmission Provider and Transmission Owner with proof that it meets the requirements of Article 11.5 and 18.4. Any attempted assignment that violates this Article is void and ineffective. Any assignment under this GIA shall not relieve a Party of its obligations, nor shall a Party's obligations be enlarged, in whole or in part, by reason thereof. Where required, consent to assignment will not be unreasonably withheld, conditioned or delayed.

ARTICLE 20. SEVERABILITY

20.1 Severability. If any provision in this GIA is finally determined to be invalid, void or unenforceable by any court or other Governmental Authority having jurisdiction, such determination shall not invalidate, void or make unenforceable any other provision, agreement or covenant of this GIA; provided that if Interconnection Customer (or any non-Party, but only if such non-Party is not acting at the direction of either Transmission Provider or Transmission Owner) seeks and obtains such a final determination with respect to any provision of the Alternate Option (Article 5.1.2), or the Negotiated Option (Article 5.1.4), then none of these provisions shall thereafter have any force or effect and the Parties' rights and obligations shall be governed solely by the Standard Option (Article 5.1.1).

ARTICLE 21. COMPARABILITY

21.1 Comparability. The Parties will comply with all applicable comparability and code of conduct laws, rules and regulations including such laws, rules and regulations of Governmental Authorities establishing standards of conduct, as amended from time to time.

ARTICLE 22. CONFIDENTIALITY

22.1 Confidentiality. Confidential Information shall include, without limitation, all information relating to a Party's technology, research and development, business affairs,

and pricing, and any information supplied by a Party to another Party prior to the execution of this GIA.

Information is Confidential Information only if it is clearly designated or marked in writing as confidential on the face of the document, or, if the information is conveyed orally or by inspection, if the Party providing the information orally informs the Party receiving the information that the information is confidential. The Parties shall maintain as confidential any information that is provided and identified by a Party as Critical Energy Infrastructure Information (CEII), as that term is defined in 18 C.F.R. Section 388.113(c). Such confidentiality will be maintained in accordance with this Article 22.

If requested by the receiving Party, the disclosing Party shall provide in writing, the basis for asserting that the information referred to in this Article warrants confidential treatment, and the requesting Party may disclose such writing to the appropriate Governmental Authority. Each Party shall be responsible for the costs associated with affording confidential treatment to its information.

22.1.1 Term**.** During the term of this GIA, and for a period of three (3) years after the expiration or termination of this GIA, except as otherwise provided in this Article 22 or with regard to CEII, each Party shall hold in confidence and shall not disclose to any person Confidential Information. CEII shall be treated in accordance with Commission policy and regulations.

22.1.2 Scope. Confidential Information shall not include information that the receiving Party can demonstrate: (1) is generally available to the public other than as a result of a disclosure by the receiving Party; (2) was in the lawful possession of the receiving Party on a non-confidential basis before receiving it from the disclosing Party; (3) was supplied to the receiving Party without restriction by a non-Party, who, to the knowledge of the receiving Party after due inquiry, was under no obligation to the disclosing Party to keep such information confidential; (4) was independently developed by the receiving Party without reference to Confidential Information of the disclosing Party; (5) is, or becomes, publicly known, through no wrongful act or omission of the receiving Party or Breach of this GIA; or (6) is required, in accordance with Article 22.1.7 of this GIA, Order of Disclosure, to be disclosed by any Governmental Authority or is otherwise required to be disclosed by law or subpoena, or is necessary in any legal proceeding establishing rights and obligations under this GIA. Information designated as Confidential Information will no longer be deemed confidential if the Party that designated the information as confidential notifies the receiving Party that it no longer is confidential.

22.1.3 Release of Confidential Information. No Party shall release or disclose Confidential Information to any other person, except to its Affiliates (limited by the Standards of Conduct requirements), subcontractors, employees, agents, consultants, or to non-parties who may be or are considering providing

financing to or equity participation with Interconnection Customer, or to potential purchasers or assignees of Interconnection Customer, on a need-to-know basis in connection with this GIA, unless such person has first been advised of the confidentiality provisions of this Article 22 and has agreed to comply with such provisions. Notwithstanding the foregoing, a Party providing Confidential Information to any person shall remain primarily responsible for any release of Confidential Information in contravention of this Article 22.

22.1.4 Rights. Each Party retains all rights, title, and interest in the Confidential Information that it discloses to the receiving Party. The disclosure by a Party to the receiving Party of Confidential Information shall not be deemed a waiver by the disclosing Party or any other person or entity of the right to protect the Confidential Information from public disclosure.

22.1.5 No Warranties. By providing Confidential Information, no Party makes any warranties or representations as to its accuracy or completeness. In addition, by supplying Confidential Information, no Party obligates itself to provide any particular information or Confidential Information to another Party nor to enter into any further agreements or proceed with any other relationship or joint venture.

22.1.6 Standard of Care. Each Party shall use at least the same standard of care to protect Confidential Information it receives as it uses to protect its own Confidential Information from unauthorized disclosure, publication or dissemination. Each Party may use Confidential Information solely to fulfill its obligations to another Party under this GIA or its regulatory requirements.

22.1.7 Order of Disclosure. If a court or a Government Authority or entity with the right, power, and apparent authority to do so requests or requires any Party, by subpoena, oral deposition, interrogatories, requests for production of documents, administrative order, or otherwise, to disclose Confidential Information, that Party shall provide the disclosing Party with prompt notice of such request(s) or requirement(s) so that the disclosing Party may seek an appropriate protective order or waive compliance with the terms of this GIA. Notwithstanding the absence of a protective order or waiver, the Party may disclose such Confidential Information which, in the opinion of its counsel, the Party is legally compelled to disclose. Each Party will use Reasonable Efforts to obtain reliable assurance that confidential treatment will be accorded any Confidential Information so furnished.

22.1.8 Termination of Agreement. Upon termination of this GIA for any reason, each Party shall, within ten (10) Calendar Days of receipt of a written request from another Party, use Reasonable Efforts to destroy, erase, or delete (with such destruction, erasure, and deletion certified in writing to the requesting Party) or return to the requesting Party, without retaining copies thereof, any and all written or electronic Confidential Information received from the requesting

Party, except that each Party may keep one copy for archival purposes, provided that the obligation to treat it as Confidential Information in accordance with this Article 22 shall survive such termination.

22.1.9 Remedies**.** The Parties agree that monetary damages would be inadequate to compensate a Party for another Party's Breach of its obligations under this Article 22. Each Party accordingly agrees that the disclosing Party shall be entitled to equitable relief, by way of injunction or otherwise, if the receiving Party Breaches or threatens to Breach its obligations under this Article 22, which equitable relief shall be granted without bond or proof of damages, and the Breaching Party shall not plead in defense that there would be an adequate remedy at law. Such remedy shall not be deemed an exclusive remedy for the Breach of this Article 22, but shall be in addition to all other remedies available at law or in equity. The Parties further acknowledge and agree that the covenants contained herein are necessary for the protection of legitimate business interests and are reasonable in scope. No Party, however, shall be liable for indirect, incidental, or consequential or punitive damages of any nature or kind resulting from or arising in connection with this Article 22.

22.1.10 Disclosure to FERC, its Staff or a State**.** Notwithstanding anything in this Article 22 to the contrary, and pursuant to 18 CFR § 1b.20, if FERC or its staff, during the course of an investigation or otherwise, requests information from a Party that is otherwise required to be maintained in confidence pursuant to this GIA, the Party shall provide the requested information to FERC or its staff, within the time provided for in the request for information. In providing the information to FERC or its staff, the Party must, consistent with 18 CFR § 388.112, request that the information be treated as confidential and non-public by FERC and its staff and that the information be withheld from public disclosure. Parties are prohibited from notifying the other Parties to this GIA prior to the release of the Confidential Information to FERC or its staff. The Party shall notify the other Parties to this GIA when it is notified by FERC or its staff that a request to release Confidential Information has been received by FERC, at which time any of the Parties may respond before such information would be made public, pursuant to 18 CFR § 388.112. Requests from a state regulatory body conducting a confidential investigation shall be treated in a similar manner if consistent with the applicable state rules and regulations.

22.1.11 Subject to the exception in Article 22.1.10, any information that a disclosing Party claims is competitively sensitive, commercial or financial information under this GIA shall not be disclosed by the receiving Party to any person not employed or retained by the receiving Party, except to the extent disclosure is (i) required by law; (ii) reasonably deemed by the receiving Party to be required to be disclosed in connection with a dispute between or among the Parties, or the defense of litigation or dispute; (iii) otherwise permitted by consent of the disclosing Party, such consent not to be unreasonably withheld; or (iv) necessary to fulfill its obligations under this GIA or as the Regional

Transmission Organization or a Local Balancing Authority operator including disclosing the Confidential Information to a regional or national reliability organization. The Party asserting confidentiality shall notify the receiving Party in writing of the information that Party claims is confidential. Prior to any disclosures of that Party's Confidential Information under this subparagraph, or if any non-Party or Governmental Authority makes any request or demand for any of the information described in this subparagraph, the Party who received the Confidential Information from the disclosing Party agrees to promptly notify the disclosing Party in writing and agrees to assert confidentiality and cooperate with the disclosing Party in seeking to protect the Confidential Information from public disclosure by confidentiality agreement, protective order or other reasonable measures.

ARTICLE 23. ENVIRONMENTAL RELEASES

23.1 Each Party shall notify the other Parties, first orally and then in writing, of the release of any Hazardous Substances, any asbestos or lead abatement activities, or any type of remediation activities related to the Generating Facility or the Interconnection Facilities, each of which may reasonably be expected to affect another Party. The notifying Party shall: (i) provide the notice as soon as practicable, provided such Party makes a good faith effort to provide the notice no later than twenty-four hours after such Party becomes aware of the occurrence; and (ii) promptly furnish to the other Parties copies of any publicly available reports filed with any Governmental Authorities addressing such events.

ARTICLE 24. INFORMATION REQUIREMENTS

24.1 **Information Acquisition**. Transmission Provider, Transmission Owner and Interconnection Customer shall submit specific information regarding the electrical characteristics of their respective facilities to each other as described below and in accordance with Applicable Reliability Standards.

24.2 **Information Submission by Transmission Provider and Transmission Owner** The initial information submission by Transmission Provider to Interconnection Customer, with copy provided to Transmission Owner, shall occur no later than one hundred eighty (180) Calendar Days prior to Trial Operation and shall include Transmission or Distribution System information, as applicable and available, necessary to allow Interconnection Customer to select equipment and meet any system protection and stability requirements, unless otherwise mutually agreed to by the Parties. On a monthly basis, Transmission Owner shall provide Interconnection Customer a status report on the construction and installation of Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and Network Upgrades, including, but not limited to, the following information: (1) progress to date; (2) a description of the activities since the last report (3) a description of the action items for the next period; and (4) the delivery status of equipment ordered.

24.3 Updated Information Submission by Interconnection Customer. The updated information submission by Interconnection Customer to Transmission Provider, with copy to Transmission Owner, including manufacturer information, shall occur no later than one hundred eighty (180) Calendar Days prior to the Trial Operation. Interconnection Customer shall submit to Transmission Provider and Transmission Owner a completed copy of the Generating Facility data requirements contained in Appendix 1 to the GIP. It shall also include any additional information provided to Transmission Provider for the Interconnection Facilities Study. Information in this submission shall be the most current Generating Facility design or expected performance data. Information submitted for stability models shall be compatible with Transmission Provider standard models. If there is no compatible model, Interconnection Customer will work with a consultant mutually agreed to by Transmission Provider and Interconnection Customer to develop and supply a standard model and associated information.

If the Interconnection Customer's data is materially different from what was originally provided to Transmission Provider pursuant to the Interconnection Study Agreement between Transmission Provider and Interconnection Customer, then Transmission Provider will conduct appropriate studies to determine the impact on the Transmission System based on the actual data submitted pursuant to this Article 24.3. Interconnection Customer shall not begin Trial Operation until such studies are completed.

24.4 Information Supplementation. Prior to the Commercial Operation Date, the Parties shall supplement their information submissions described above in this Article 24 with any and all "as-built" Generating Facility information or "as-tested" performance information that differs from the initial submissions or, alternatively, written confirmation that no such differences exist. Interconnection Customer shall conduct tests on the Generating Facility as required by Good Utility Practice, such as an open circuit "step voltage" test on the Generating Facility to verify proper operation of the Generating Facility's automatic voltage regulator.

Unless otherwise agreed, the test conditions shall include: (1) Generating Facility at synchronous speed; (2) automatic voltage regulator on and in voltage control mode; and (3) a five percent (5 %) change in Generating Facility terminal voltage initiated by a change in the voltage regulators reference voltage. Interconnection Customer shall provide validated test recordings showing the responses in Generating Facility terminal and field voltages. In the event that direct recordings of these voltages is impractical, recordings of other voltages or currents that mirror the response of the Generating Facility's terminal or field voltage are acceptable if information necessary to translate these alternate quantities to actual Generating Facility terminal or field voltages is provided. Generating Facility testing shall be conducted and results provided to Transmission Provider and Transmission Owner for each individual generating unit in a station.

Subsequent to the Commercial Operation Date, Interconnection Customer shall provide Transmission Provider and Transmission Owner any information changes due to

equipment replacement, repair, or adjustment. Transmission Owner shall provide Interconnection Customer, with copy to Transmission Provider, any information changes due to equipment replacement, repair or adjustment in the directly connected substation or any adjacent Transmission Owner substation that may affect the Interconnection Customer's Interconnection Facilities equipment ratings, protection or operating requirements. The Parties shall provide such information no later than thirty (30) Calendar Days after the date of the equipment replacement, repair or adjustment.

ARTICLE 25. INFORMATION ACCESS AND AUDIT RIGHTS

25.1 Information Access. Each Party (the "disclosing Party") shall make available to the other Parties information that is in the possession of the disclosing Party and is necessary in order for the other Parties to: (i) verify the costs incurred by the disclosing Party for which another Party is responsible under this GIA; and (ii) carry out its obligations and responsibilities under this GIA. The Parties shall not use such information for purposes other than those set forth in this Article 25.1 and to enforce their rights under this GIA.

25.2 Reporting of Non-Force Majeure Events. A Party (the "notifying Party") shall notify the other Parties when the notifying Party becomes aware of its inability to comply with the provisions of this GIA for a reason other than a Force Majeure event. The Parties agree to cooperate with each other and provide necessary information regarding such inability to comply, including the date, duration, reason for the inability to comply, and corrective actions taken or planned to be taken with respect to such inability to comply. Notwithstanding the foregoing, notification, cooperation or information provided under this Article shall not entitle any Party receiving such notification to allege a cause for anticipatory breach of this GIA.

25.3 Audit Rights. Subject to the requirements of confidentiality under Article 22 of this GIA, each Party shall have the right, during normal business hours, and upon prior reasonable notice to the other Parties, to audit at its own expense the other Parties' accounts and records pertaining to the Parties' performance or the Parties' satisfaction of obligations under this GIA. Such audit rights shall include audits of the other Parties' costs, calculation of invoiced amounts, the Transmission Provider's efforts to allocate responsibility for the provision of reactive support to the Transmission or Distribution System, as applicable, the Transmission Provider's efforts to allocate responsibility for interruption or reduction of generation, and each Party's actions in an Emergency Condition. Any audit authorized by this Article shall be performed at the offices where such accounts and records are maintained and shall be limited to those portions of such accounts and records that relate to each Party's performance and satisfaction of obligations under this GIA. Each Party shall keep such accounts and records for a period equivalent to the audit rights periods described in Article 25.4.

25.4 Audit Rights Periods.

25.4.1 Audit Rights Period for Construction-Related Accounts and Records. Accounts and records related to the design, engineering, procurement, and

construction of the Transmission Owner's Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and Network Upgrades shall be subject to audit for a period of twenty-four months following Transmission Owner's issuance of a final invoice in accordance with Article 12.2.

25.4.2 **Audit Rights Period for All Other Accounts and Records**. Accounts and records related to a Party's performance or satisfaction of all obligations under this GIA other than those described in Article 25.4.1 shall be subject to audit as follows: (i) for an audit relating to cost obligations, the applicable audit rights period shall be twenty-four (24) months after the auditing Party's receipt of an invoice giving rise to such cost obligations; and (ii) for an audit relating to all other obligations, the applicable audit rights period shall be twenty-four (24) months after the event for which the audit is sought.

25.5 **Audit Results**. If an audit by a Party determines that an overpayment or an underpayment has occurred, a notice of such overpayment or underpayment shall be given to the Party or from whom the overpayment or underpayment is owed together with those records from the audit which support such determination.

ARTICLE 26. SUBCONTRACTORS

26.1 **General.** Nothing in this GIA shall prevent a Party from utilizing the services of any subcontractor as it deems appropriate to perform its obligations under this GIA; provided, however, that each Party shall require its subcontractors to comply with all applicable terms and conditions of this GIA in providing such services and each Party shall remain primarily liable to the other Parties for the performance of such subcontractor.

26.2 **Responsibility of Principal.** The creation of any subcontract relationship shall not relieve the hiring Party of any of its obligations under this GIA. The hiring Party shall be fully responsible to the other Parties for the acts or omissions of any subcontractor the hiring Party hires as if no subcontract had been made; provided, however, that in no event shall Transmission Provider or Transmission Owner be liable for the actions or inactions of Interconnection Customer or its subcontractors with respect to obligations of Interconnection Customer under Article 5 of this GIA. Any applicable obligation imposed by this GIA upon the hiring Party shall be equally binding upon, and shall be construed as having application to, any subcontractor of such Party.

26.3 **No Limitation by Insurance**. The obligations under this Article 26 will not be limited in any way by any limitation of subcontractor's insurance.

ARTICLE 27. DISPUTES

27.1 **Submission.** In the event any Party has a dispute, or asserts a claim, that arises out of or in connection with this GIA or its performance, such Party (the "disputing Party") shall provide the other Parties with written notice of the dispute or claim ("Notice of

Dispute"). Such dispute or claim shall be referred to a designated senior representative of each Party for resolution on an informal basis as promptly as practicable after receipt of the Notice of Dispute by the non-disputing Parties. In the event the designated representatives are unable to resolve the claim or dispute through unassisted or assisted negotiations within thirty (30) Calendar Days of the non-disputing Parties' receipt of the Notice of Dispute, such claim or dispute shall be submitted for resolution in accordance with the dispute resolution procedures of the Tariff.

ARTICLE 28. REPRESENTATIONS, WARRANTIES AND COVENANTS

28.1 General. Each Party makes the following representations, warranties and covenants:

28.1.1 Good Standing. Such Party is duly organized, validly existing and in good standing under the laws of the state in which it is organized, formed, or incorporated, as applicable; that it is qualified to do business in the state or states in which the Generating Facility, Interconnection Facilities and Network Upgrades owned by such Party, as applicable, are located; and that it has the corporate power and authority to own its properties, to carry on its business as now being conducted and to enter into this GIA and carry out the transactions contemplated hereby and perform and carry out all covenants and obligations on its part to be performed under and pursuant to this GIA.

28.1.2 Authority**.** Such Party has the right, power and authority to enter into this GIA, to become a Party hereto and to perform its obligations hereunder. This GIA is a legal, valid and binding obligation of such Party, enforceable against such Party in accordance with its terms, except as the enforceability thereof may be limited by applicable bankruptcy, insolvency, reorganization or other similar laws affecting creditors' rights generally and by general equitable principles (regardless of whether enforceability is sought in a proceeding in equity or at law).

28.1.3 No Conflict. The execution, delivery and performance of this GIA does not violate or conflict with the organizational or formation documents, or bylaws or operating agreement, of such Party, or any judgment, license, permit, order, material agreement or instrument applicable to or binding upon such Party or any of its assets.

28.1.4 Consent and Approval. Such Party has sought or obtained, or, in accordance with this GIA will seek or obtain, each consent, approval, authorization, order, or acceptance by any Governmental Authority in connection with the execution, delivery and performance of this GIA, and it will provide to any Governmental Authority notice of any actions under this GIA that are required by Applicable Laws and Regulations.

ARTICLE 29. {RESERVED}

ARTICLE 30. MISCELLANEOUS

30.1 Binding Effect. This GIA and the rights and obligations hereof, shall be binding upon and shall inure to the benefit of the successors and assigns of the Parties hereto.

30.1.1 Reversion. If offered pursuant to an Agency Agreement under which this GIA is executed by Transmission Provider as agent for the relevant Transmission Owner, in the event that the relevant Agency Agreement terminates, any HVDC Service offered by Transmission Provider under this GIA shall revert to the relevant Transmission Owner and Transmission Provider shall be released from all obligations and responsibilities under this GIA.

30.2 Conflicts. In the event of a conflict between the body of this GIA and any attachment, appendices or exhibits hereto, the terms and provisions of the body of this GIA shall prevail and be deemed the final intent of the Parties.

30.3 Rules of Interpretation. This GIA, unless a clear contrary intention appears, shall be construed and interpreted as follows: (1) the singular number includes the plural number and vice versa; (2) reference to any person includes such person's successors and assigns but, in the case of a Party, only if such successors and assigns are permitted by this GIA, and reference to a person in a particular capacity excludes such person in any other capacity or individually; (3) reference to any agreement (including this GIA), document, instrument or tariff means such agreement, document, instrument, or tariff as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof; (4) reference to any Applicable Laws and Regulations means such Applicable Laws and Regulations as amended, modified, codified, or reenacted, in whole or in part, and in effect from time to time, including, if applicable, rules and regulations promulgated thereunder; (5) unless expressly stated otherwise, reference to any Article, Section or Appendix means such Article of this GIA or such Appendix to this GIA, or such Section to the GIP or such Appendix to the GIP, as the case may be; (6) "hereunder", "hereof", "herein", "hereto" and words of similar import shall be deemed references to this GIA as a whole and not to any particular Article or other provision hereof or thereof; (7) "including" (and with correlative meaning "include") means including without limiting the generality of any description preceding such term; and (8) relative to the determination of any period of time, "from" means "from and including", "to" means "to but excluding" and "through" means "through and including."

30.4 Entire Agreement. This GIA, including all Appendices and attachments hereto, constitutes the entire agreement between the Parties with reference to the subject matter hereof, and supersedes all prior and contemporaneous understandings or agreements, oral or written, between the Parties with respect to the subject matter of this GIA. There are no other agreements, representations, warranties, or covenants, which constitute any part of the consideration for, or any condition to, any Party's compliance with its obligations under this GIA.

30.5 No Third Party Beneficiaries. This GIA is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the Parties, and the obligations herein assumed are solely for the use and benefit of the Parties, their successors in interest and, where permitted, their assigns.

30.6 Waiver. The failure of a Party to this GIA to insist, on any occasion, upon strict performance of any provision of this GIA will not be considered a waiver of any obligation, right, or duty of, or imposed upon, such Party.

Any waiver at any time by any Party of its rights with respect to this GIA shall not be deemed a continuing waiver or a waiver with respect to any other failure to comply with any other obligation, right, duty of this GIA. Termination or Default of this GIA for any reason by Interconnection Customer shall not constitute a waiver of the Interconnection Customer's legal rights to obtain Interconnection Service from Transmission Provider. Any waiver of this GIA shall, if requested, be provided in writing.

30.7 Headings. The descriptive headings of the various Articles of this GIA have been inserted for convenience of reference only and are of no significance in the interpretation or construction of this GIA.

30.8 Multiple Counterparts. This GIA may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

30.9 Amendment. The Parties may by mutual agreement amend this GIA by a written instrument duly executed by all of the Parties.

30.10 Modification by the Parties. The Parties may by mutual agreement amend the Appendices to this GIA by a written instrument duly executed by all of the Parties. Such amendment shall become effective and a part of this GIA upon satisfaction of all Applicable Laws and Regulations.

30.11 Reservation of Rights. Transmission Provider shall have the right to make a unilateral filing with FERC to modify this GIA with respect to any rates, terms and conditions, charges, classifications of service, rule or regulation under Section 205 or any other applicable provision of the Federal Power Act and FERC's rules and regulations thereunder, and Transmission Owner and Interconnection Customer shall have the right to make a unilateral filing with FERC to modify this GIA pursuant to Section 206 or any other applicable provision of the Federal Power Act and FERC's rules and regulations thereunder; provided that each Party shall have the right to protest any such filing and to participate fully in any proceeding before FERC in which such modifications may be considered. Nothing in this GIA shall limit the rights of the Parties or of FERC under Sections 205 or 206 of the Federal Power Act and FERC's rules and regulations thereunder, except to the extent that the Parties otherwise mutually agree as provided herein.

30.12 No Partnership. This GIA shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership among or between the Parties or to impose any partnership obligation or partnership liability upon any Party. No Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Parties.

IN WITNESS WHEREOF, the Parties have executed this GIA in multiple originals; each of which shall constitute and be an original GIA among the Parties.

Transmission Provider
Midcontinent Independent System Operator, Inc.

8/9/2019 kkh

By: _____
Name: _____
Title _____

Transmission Owner
Otter Tail Power Company

By: _____
Name: _____
Title: _____

Interconnection Customer
Crowned Ridge Wind, LLC

By: _____
Name: _____
Title: _____

APPENDICES TO GIA

Appendix A	Interconnection Facilities, Network Upgrades, System Protection Facilities, Generator Upgrades and Distribution Upgrades
Appendix B	Milestones
Appendix B-1	Pre-Certification Generation Test Notification Form
Appendix C	Interconnection Details
Appendix D	Security Arrangements Details
Appendix E	Commercial Operation Date
Appendix F	Addresses for Delivery of Notices and Billings
Appendix G	Interconnection Requirements for a Wind Generating Plant
Appendix H	Interconnection Requirements for Provisional GIA
Appendix I	Requirements Applicable to Net Zero Interconnection Service

Appendix A
To GIA

Interconnection Facilities, Network Upgrades, System Protection Facilities, Generator Upgrades and Distribution Upgrades.

1. Description of Generating Facility

Interconnection Customer shall install a wind Generating Facility in Codington, Duel, and Grant Counties in South Dakota and is interconnecting into the Transmission Owner's Big Stone South substation in Grant County, SD.

G736 Generating Facility is composed of eighty-seven (87) GE 2.3MW wind turbines. The J442 Generating Facility is composed of eighty-seven (87) GE 2.3 MW wind turbines.

Interconnection Service provided under this agreement is 400 MW gross of Conditional ERIS (200MW for G736 and 200MW for J442) that will become 400 MW gross of ERIS and/or NRIS (200MW for G736 and 200MW for J442), where NRIS cannot exceed 400 MW gross (200MW for G736 and 200MW for J442) upon completion of all Network Upgrades and transmission projects in Exhibit A10.

Interconnection Customer shall install appropriate protection equipment per Appendix C, Interconnection Details to this GIA. G736 Interconnection Customer's collector substation will include one transformer rated 135/180/225 MVA to increase voltage from 34.5 kV to 230 kV and a 230kV circuit breaker. The J442 switchyard shall contain a 34.5/230 kV generator step up transformer, rated at 135/180/225 MVA, and a high side breaker.

2. Interconnection Facilities:

(a) Point of Interconnection. Point of Interconnection is where the Interconnection Customer's 230 kV line interconnects to the 230 kV bus at Transmission Owner's Big Stone South substation as indicated on Exhibit A2-1. The Point of Change of Ownership of Interconnection Customer Interconnection Facilities is at the vangs of the first steel 230 kV dead-end tower outside of the Big Stone South Substation.

(b) Interconnection Facilities (including metering equipment) to be constructed by Interconnection Customer. The Interconnection Customer's Interconnection Facilities shall include the following (See Exhibit A-1-1)

1. a new 230 kV Interconnection Customer substation including one 230 kV breaker bay complete with breaker, isolating disconnect switches, dead-end, bus, steel, insulators and foundations located in Interconnection Customer's substation for its G736 Generating Facility.

2. a new 4.75 mile 230 kV using 1272 kcmil Bittern from G736's collector substation to J442's collector substation.

3. a new 230 kV Interconnection Owner's substation including one 230 kV breaker bay complete with breaker, isolating disconnect switches, dead-end, bus, steel, insulators and foundations located in Interconnection Customer's substation for its J442 Generating Facility.

4. a sole use 34 miles radial 230 kV transmission line using double conductor 1590 kcmil Lapwing from the Interconnection Customer substation to Interconnection Customer's Interconnection capacitor station outside of the Transmission Owner's Big Stone South Substation.

5. a capacitor station that contains two breakers, two 25 MVAR capacitor banks, line disconnect switches, and revenue metering.

6. a less than half-mile 230 kV transmission line that connects the Interconnection Customer's capacitor station to the Transmission Owner's Big Stone South Substation.

7. the design of the Interconnection Customer's sole use radial 230 kV lines and capacitor station will be subject to review by the Transmission Owner.

8. RTU/SCADA capability at the Generating Facility and data from Interconnection Customer Interconnection Facilities that includes, but is not limited to MW, MVAR, MWhr, MVARhr, volts, amps, breaker status, and station battery alarm, frequency, status indication and power factor setpoint control signals for any reactors or capacitors installed in Interconnection Customer's substations or capacitor station, and SCADA control of the 230 kV circuit breaker and reactive devices within the Interconnection Customer's capacitor station to Transmission Owner's primary and secondary Transmission Dispatch Center, Transmission Provider, and the Local Balancing Authority (Transmission Owner).

9. Interconnection Customer Interconnection Facilities include installation of revenue metering, three current transformers, three potential transformers, 3-phase switch, six arresters, metering and telemetry cabinets and phone protection panel.

   Metering will be at the Interconnection Customer's Generating Facilities in their capacity station and compensated to the Point of Interconnection. Interconnection Customer will be responsible for coordinating design, installation, and check-out of metering equipment with the Local Balancing Authority.

   The Interconnection Customer will provide revenue metering per Transmission Owner and Local Balancing Authority specification. The specifics of the revenue metering will be defined during detailed engineering phase of the project in coordination with the Local Balancing Authority. The Interconnection Customer

must coordinate and comply with the Local Balancing Authority and Transmission Provider to provide necessary metering data. Metering and communication requirements of the Market Participant must be identified by the Interconnection Customer and presented to the Transmission Owner prior to project construction.

10. A separate Service Agreement between the Interconnection Customer and Transmission Owner under Transmission Owner's CASOT is required for any interconnection occurring within the Transmission Owner's Local Balancing Area (formerly referred to as a control area). The CASOT is required in order to address certain control area operational details necessary for maintaining reliable operations of the Local Balancing Area.

11. The conductor from the Interconnection Customer's capacitor station shall terminate on the Interconnection Customer's structure, which is the first structure outside of the Big Stone South Substation (which includes insulators).

12. Interconnection Customer is responsible for installing all required communication equipment in the Interconnection Customer's capacitor station and substations. The Interconnection Customer is also responsible for arranging for the installation of the communication circuit per Transmission Owner specifications to both the Transmission Owner's primary and back-up Transmission Dispatch Centers.

13. Interconnection Customer is responsible for coordinating station service supply with the appropriate local service provider. The local service territory provider must be contacted to address normal and emergency back-up station power needs during project construction. Station Service power may be obtained per the Transmission Provider's Schedule 20.

14. Interconnection Customer is responsible for splicing OPGW communications circuit into theInterconnection Customer's splice box at theirfirst structure outside the Big Stone South Substation. Interconnection Customer will provide the splice box. In addition, the Interconnection Customer is responsible for installing a second underground fiber to the Transmission Owner's underground vault located outside the Big Stone South Substation fence. The Interconnection Customer is responsible for splicing the fiber.

(c) **Transmission Owner Interconnection Facilities** (including metering equipment) to be constructed by Transmission Owner.

i) **SCADA and Metering Communication** (This work will occur in Fergus Falls, MN and potentially the area around the Big Stone South substation.)

Metering and SCADA communication systems are necessary to communicate to Transmission Owner's primary and backup Control Center in Fergus Falls. Transmission Owner will make available a connection point at it Fergus Falls facilities to receive the SCADA

information. Transmission Owner will install the necessary communication from each of the primary and secondary communication terminal blocks to its Energy Management System for both of its primary and backup Control Centers. Upon start-up, the generator may be required to perform studies or testing to prove it meets the necessary interconnection requirements called out in Appendix G of this GIA and section XI of the Transmission Owner's Guidelines for Generation, Tie-Line, and Substation Interconnections. These tests and studies are interconnection requirements, which may require Transmission Owner's support or review.

Demarcation of the Transmission Owner's Communication Facilities is shown in Exhibit A2-2.

ii) **Big Stone South Substation - Transmission Owner Interconnection Facilities**

The Transmission Owner purchased and installed one 230 kV dead-end structure, one 230 kV 2000 amp 3-pole motor operated line switch, three 152 kV MCOV line arrestors, control house equipment and grounding materials. Control House Equipment modifications and Grounding Grid modifications were modified.

Protection and Control Overview - One new panel was constructed for line protection and motor operated line switch. This panel included motor operated controls, an SEL 421, and an SEL 311C relays.

iii Big Stone South Relay Settings:

The Interconnection Customer will construct a capacitor station on the property adjacent to the Transmission Owner's Big Stone South Substation. As a result of the Interconnection Customer's capacitor station, the Transmission Owner will to replace the protection and controls system with new protection and controls equipment in the Big Stone South Substation.

Protection and Control Overview:

Existing protection and control systems will be removed to allow for the addition of the new systems.

New protection and control systems will be designed to provide adequate protection to the Interconnection Customer's 230 kV tie line as well as control for Transmission Owners new 230 kV motor operated switch on the Interconnection Customer's 230 kV tie line. The Transmission Owner will construct one new relay panel in the Big Stone South Substation for

line protection and the motor operated line switch. This relay panel will include the motor operated controls and associated relaying communications equipment to assist in protecting the Interconnection Customer's 230 kV tie-line.

This protection and control overview is assuming the generator tie line length is less than 1/2 mile to the Interconnection Customer's new capacitor station, which requires redundant communication paths. Differing lengths of the tie line could require different preferred relaying communications and different relay design.

The design of the protection and controls for the Interconnection Customer's 230 kV tie line must provide adequate protection to the Interconnection Customer's tie line from the Transmission Owner's station.

3. Network Upgrades:

(a) Stand-Alone Network Upgrades to be installed by Transmission Owner None

(b) Network Upgrades to be installed by Transmission Owner.

i. Big Stone South Substation - To interconnect the Generating Facility to the Transmission Owner's Big Stone South Substation, the Transmission Owner expanded the Big Stone South substation 230 kV section. The expansion included the installation of new bus work, breakers, switches, along with the necessary protection and controls.

Major Equipment and Materials:

- Four (4) 230kv, 2000 A, 40 kA gas circuit breakers
- Five (5) 230kv single phase CCVTs
- Seven (7) 230kv, 2000 A, 3-pole vertical break disconnects
- 4" IPS aluminum pipe bus & jumpers
- Material to existing grid relay panels
- Protective equipment in the control house.
- Control Cable: 4 & 12 conductor direct buried and installed in cable trench system

SCADA and Metering Communication:
The existing RTU is sufficient for this addition. Minor modifications were made to the RTU during installation of the new protective devices.

Other Major Items Include

- **Foundations -** New foundations were required for new 230kV breakers, switches, CCVT's, and new buswork.

- **Structures –** New steel support structures for bus, switches, and CCVT stands were installed
- **Control House** - Existing Control House had adequate room for additional breaker relay panels. Minor work was required to make room for new panels.
- **Cables and Cable Trenches –** new cables and extension of cable trenches for new bay addition
- **Metering – Not Applicable**

ii. Wahpeton Substation:

This sub-project entails upgrading the Wahpeton substation to achieve a rating of 369 MVA. To achieve this rating, the terminal equipment within the Wahpeton substation will be upgraded, which includes the **r**eplace wave trap on the Wahpeton to Hankinson 230 kV line with a 2000 amp rated wave trap.

iii. Wahpeton to Hankinson 230 kV Transmission Line

This sub-project upgrades the Wahpeton to Hankinson 230 kV line from a rating of 369 MVA by replacing several structures.

iv. Hankinson Substation:

This sub-project upgrades the Hankinson substation to a rating of 369 MVA. To achieve this some of the terminal equipment within the Hankinson substation will be upgraded, which includes the replace wave trap on the Hankinson to Wahpeton 230 kV line with a 2000 amp rated wave trap.

(c) Shared Network Upgrade(s) to be funded by Interconnection Customer.
None

4. System Protection Facilities

None

5. Distribution Upgrades:

None

6. Contingency List See Exhibit A10

7. Affected System Upgrades List Interconnection Customer to enter into a Facilities Construction Agreement with Transmission Provider and host transmission owner for these upgrades:

- +/- 200 MVAR statcom on the ATC transmission system
- +50 MVAR switched capacitor at MidPort substation on MidAmerican Energy Company's transmission system
- +50 MVAR switched capacitor at Electrifarm substation on MidAmerican Energy

Company's transmission system
- +50 MVAR switched capacitor at Washburn substation on MidAmerican Energy Company's transmission system
- +50 MVAR switched capacitor at Shaulis road substation on MidAmerican Energy Company's transmission system

8. Cost Responsibility and Transmission Owner Election to Fund the Capital:

As provided under Section 11.3 of this GIA, the Transmission Owner elects to fund the capital for the Network Upgrades constructed under this GIA, subject to the Transmission Owner's self-fund guidelines, as such a Facilities Service Agreement ("FSA") for the Network Upgrades is required.

9. Common Use Upgrades List:

Interconnection Customer is responsible for the Basin Electric Power Cooperative upgrade on Big Stone – Blair 230kV line to achieve a minimum rating of 595.9 MVA. Any cost sharing or reimbursement will be governed by the applicable tariff.

Interconnection Customer is responsible to delay interconnection service until SPP redefines the Cooper_South flowgate. Interconnection Customer can request a limited operation study from SPP to conditionally go in service before this.

Interconnection Customer is responsible to delay interconnection service until SPP has the in service date of the Gentleman Generating Station – Thedford – Holt 345kV Project ("R-Plan"). This project is approved and scheduled for 10/1/2018. Interconnection Customer can request a limited operation study from SPP to conditionally go in service before this.
Interconnection Customer is required to mitigate NRIS thermal constraints on Grand Island – Holt County 345kV to update current transformers for single contingency outage. The $60,000 cost is currently assigned to J411 interconnection customer.

10. Exhibits – The following exhibits are included:

A1. Interconnection Customer One-Line and Site Map
A1-1: Interconnection Customer Generating Facility One-Line Diagram
A1-2: Interconnection Customer Generating Facility Site Map

A2. Transmission Owner One-Line
A2-1: Transmission Owner One Line
A2-2: Communications Block Diagram

A3. {Reserved}

A4. Transmission Line Plan and Profile {Reserved}

A5. Facilities to be Constructed by Transmission Owner

A6. Detailed Costs of Facilities to be Constructed by Transmission Owner
A6-1: Transmission Owner Interconnection Facilities
A6-2: Transmission Owner Network Upgrades

A7. Facilities to be Constructed by Interconnection Customer

A8. Detailed Cost of Transmission Owner's Facilities to be Constructed by Interconnection Customer

A9. Facilities Subject to Attachment FF {Reserved}

A10. Contingent Facilities

A11. Interconnection Customer Milestones

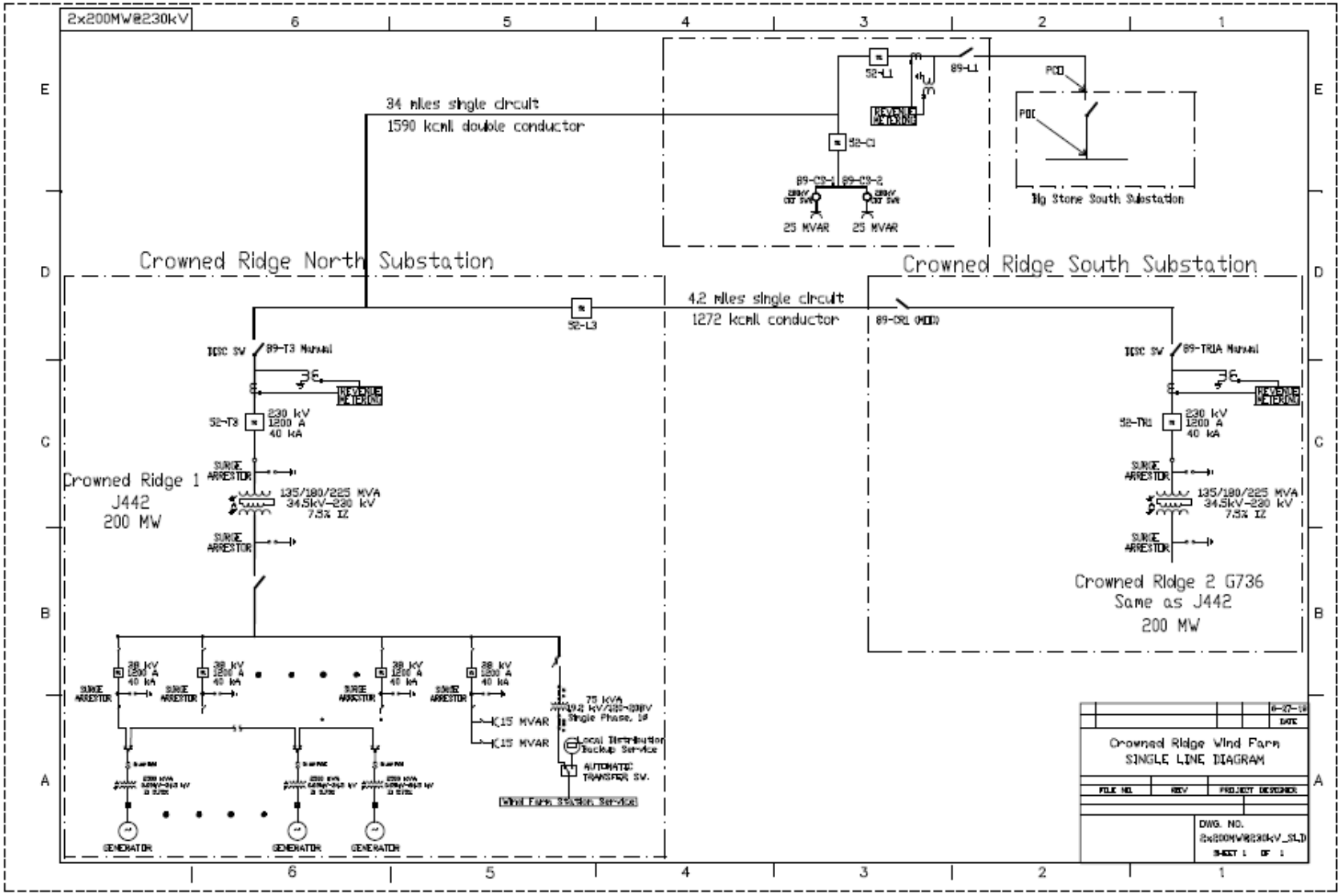
A12. Construction and Coordination Schedules

A13. Permits, Licenses, Regulatory Approvals and Authorization

A14. Interconnection and Operating Guidelines

Exhibit A1 Interconnection Customer One Line and Site Map

Exhibit A1-1 Interconnection Customer One Line



008530

Exhibit A1-2: Interconnection Customer Site Map



Exhibit A2 - Transmission Owner One Line

Exhibit A2-1 - Transmission Owner One Line

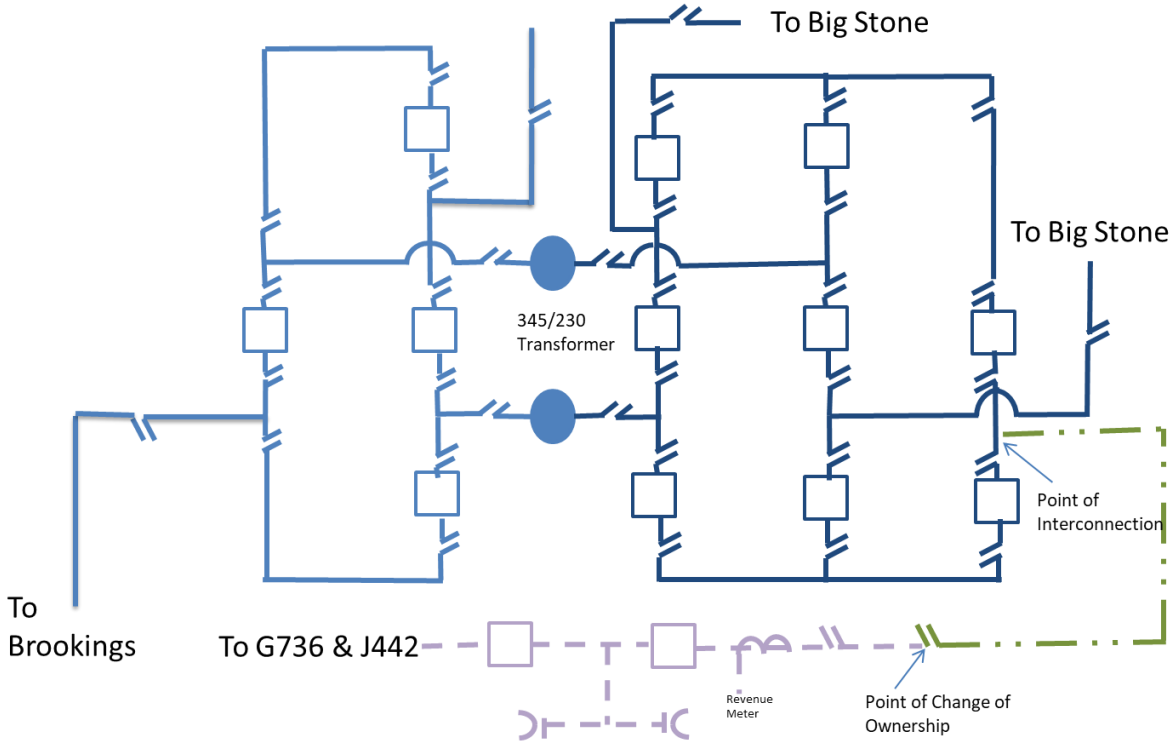


Exhibit A2–2 Communications Block Diagram – circuits to primary and backup Control Center are required

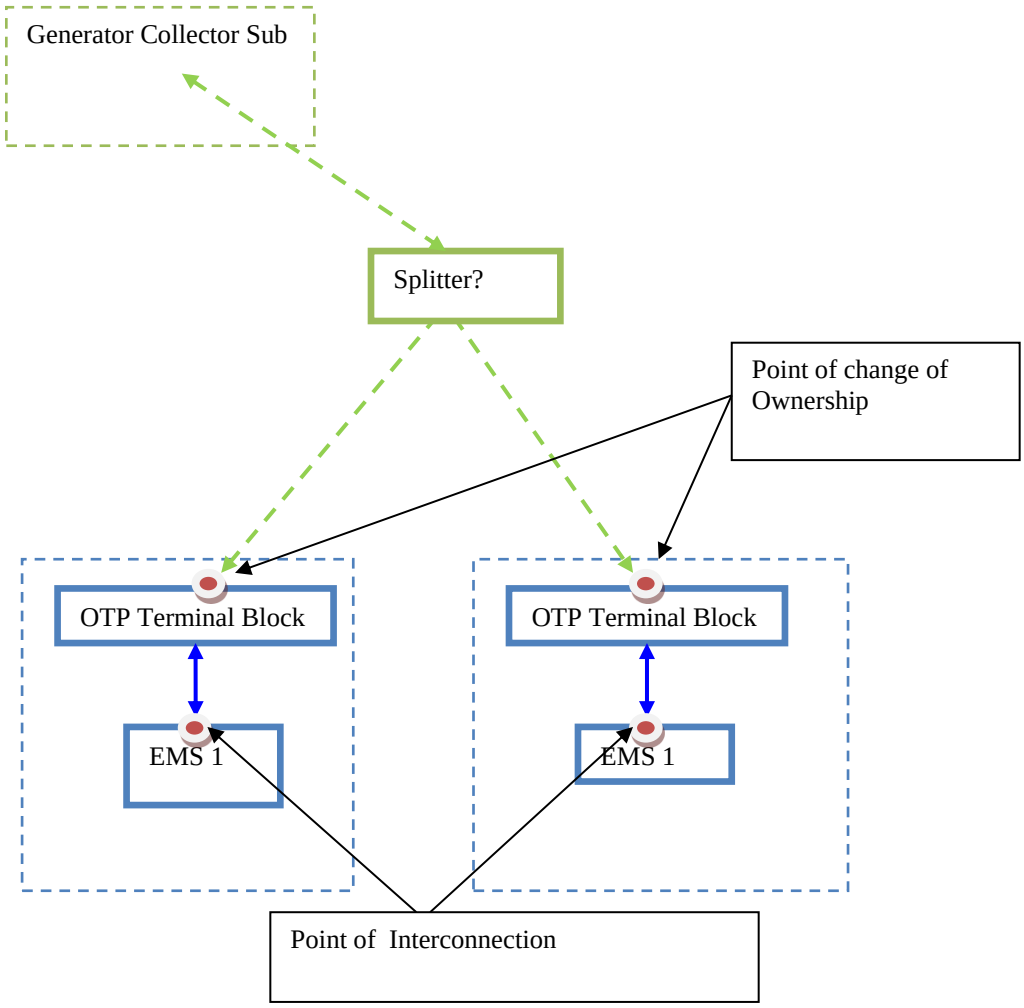


Exhibit A3 - Typical Transmission Owner Structures

{Reserved}

Exhibit A4 - Transmission Line Plan and Profile

{Reserved}

Exhibit A5-1 - Facilities to be Constructed by Transmission Owner

	Upgrade Type	Facilities to be Constructed by Transmission Owner	Estimate in 2017 & 2019 Dollars
1	**Transmission Owner Interconnection Facility**	SCADA, Metering Communication, and Startup	**PRIVILEGED**
2	**Transmission Owner Interconnection Facility**	Big Stone South Relaying	**PRIVILEGED**
3	**Transmission Owner Interconnection Facility**	230 kV Dead-end	**PRIVILEGED**
4	**Network Upgrade**	Big Stone South Substation	**PRIVILEGED**
	Network Upgrade	Wahpeton Substation	**PRIVILEGED**
	Network Upgrade	Hankinson to Wahpeton	**PRIVILEGED**
5	**Network Upgrade**	Hankinson Substation	**PRIVILEGED**
6	**Transmission Owner Interconnection Facility**	BSS Protection and Controls	**PRIVILEGED**
		Total Estimated Project Costs	**PRIVILEGED**

Exhibit A6: Detailed Cost of Facilities to be Constructed by Transmission Owner

See Facility Studies

Exhibit A7 - Facilities to be Constructed by Interconnection Customer

	Upgrade Type	Facilities to be Constructed by Interconnection Customer	Estimate in 2019 Dollars
	Interconnection Facilities	Install CT/VT metering unit, metering, and SCADA system at the Customer Interconnect switching station and get data to the Local Balancing Area's control center in Fergus Falls, MN	Not require
	Stand Alone Network Upgrade	There are no Stand Alone Network Upgrades to be constructed by the interconnect customer	None
	Direct Interconnection Facilities	There are no interconnection facilities to be constructed by the Interconnection Customer	None

Exhibit A8 - Detailed Cost of Transmission Owner Facilities to be Constructed by Interconnection Customer

There are no Transmission Owner Network Upgrades or Transmission Owner Interconnection Facilities that are currently proposed to be constructed by the Interconnection Customer; no estimates are required.

Exhibit A9 - Facilities Subject to Attachment FF

	Upgrade Type	Facilities to be Constructed by Transmission Owner	Estimate in 2017 & 2019 Dollars
1	Network Upgrade	Big Stone South Substation	$1,854,806
2	Network Upgrade	Wahpeton Substation	$56,902
3	Network Upgrade	Hankinson to Wahpeton	$178,900
4	Network Upgrade	Hankinson Substation	$56,902
		Total Estimated Project Costs	$2,147,510

Exhibit A10 - Contingent Facilities

Higher queue and/or same DPP group study Interconnection Requests that may create Contingencies pursuant to Article 11.3.1 are listed in Table below. Table 1 describes transmission assumptions modeled in the studies that were deemed necessary to allow for the interconnection service as described in Appendix A of this GIA and is not related to Article 11.3.1, i.e., does not describe projects associated with a higher queued and/or same DPP group study Interconnection Request. Nevertheless, if the transmission assumptions are not completed or significantly modified the interconnection service granted under this GIA may be restricted until such time as the Interconnection Customer funds a study to determine the applicable ERIS and NRIS level that results due to the changes in Table 1.

The list of higher-queued and/or same DPP group study projects in Tables 2 and 3, not yet in service, were included in the interconnection study for queue projects J442. However, a project's inclusion in the System Impact Study does not necessarily mean that these facilities would be contingencies for the Interconnection Customer's Generating Facility. In the event that any of the higher queued and/or same DPP group study generators were to drop out, then the Interconnection Customer may be subject to restudy pursuant to Article 11.3.2.

Table 1 Transmission Assumptions for G736

MTEP ID	Facility	Description	Expected Completion Date	Status
8404	OTP_BSS_XFMR_BSP-BSS230	OTP_BSS_XFMR_BSP-BSS230	12/30/2017	Completed
3127	Proposed MVP Portfolio 1: N LaCrosse-N Madison-Cardinal-Eden-Hickory Creek 345 kV (Only North Lacrosse – North Madison Required)	Construct N LaCrosse-N Madison-Cardinal 345 kV & Hickory Creek-Eden-Cardinal 345 kV line. Install Eden transformer	12/31/2018	Under Construction
SPP	Nebraska – Sibley 345 kV line	Construct Nebraska – Sibley 345 kV line	12/31/2016	Complete
SPP	Gentleman Generating Station– Thedford–Holt 345kV Project ("R-Plan")	Gentleman Generating Station– Thedford–Holt 345kV Project ("R-Plan")	2019	Approved Project scheduled for 2019

Table 2 Higher Queued Projects for G736

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
G549	NR	GRE	Pope, MN	Next to Williams Substation (69 kV)	20	Wind	Under Construction
G620	ER	XEL (NSP)	Goodhue, MN	Kenyon - Dodge 69 kV	19	Wind	Under Construction
G621	NR	XEL (NSP)	Pipestone, MN	Golf - Woodstock 34.5 kV	20	Wind	Under Construction
G667	ER	ITC Midwest	Jackson, MN	Round Lake Tap 69 kV Substation	13	Wind	Under Construction
G830	NR	GRE	McHenry, ND	McHenry Substation	99	Wind	Under Construction
G858	NR	XEL (NSP)	Stearns, MN	Black Oak 69 kV Substation	38	Wind	In Service
H071	NR	XEL (NSP)	Stearns, MN	Black Oak 69 kV Substation	40	Wind	In Service
H081	ER	XEL (NSP)	Lyon, MN	Brookings – Lyon County 345 kV	201	Wind	Under Construction
J233	NR	ITCM	Marshall, IA	Marshalltown 161 kV Substation	635	Gas	In Service
J238	NR	IPL	Morgan, IN	138kV at existing Eagle Valley Power Plant	725	Gas	Under Construction
J227	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction
J228	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction
J230	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
J231	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction
J262	NR	OTP	Stutsman, ND	Jamestown 115/345 kV Substation	100	Wind	In Service
J263	NR	OTP	Stutsman, ND	Jamestown 115/345 kV Substation	100	Wind	In Service
J327	NR	ITC	Huron, MI	Rapson 120 kV Substation	150	Wind	Under Construction
J340	NR	ITC	Huron, MI	Grassmere 345 kV Substation	100	Wind	Under Construction
J354	NR	ITC	Huron, MI	Grassmere, 345 kV Substation	52	Wind	Under Construction
J316	NR	MDU	Dickey, ND	Tatanka – Ellendale 230kV	150	Wind	Active / DPP-2014-AUG-West
J285	NR	MEC	O'Brien	O'Brien County 345 kV sub	250	Wind	Under Construction
J329	NR	CFU	Marion, IA	Pella West sub	55	Hydro	Under Construction
J344	NR	ITC-M	Mahaska, IA	Poweshiek – Oskaloosa 161kV	169	Wind	Under Construction

Table 3 Similar Queued Projects for G736

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
J299	ER	Xcel	Blue Earth, MN	Wilmarth sub	73	CC	DPP-2015-FEB-West
J385	NR	Xcel	Chisago, MN	Chisago 115 kV sub	100	Solar	In Service
J391	NR	MRES	Lyon, MN	MMU's N 7th Street sub	50	CT	DPP-2015-FEB-West
J400	NR	Xcel	Lyon, MN	Lyon County 115kV sub	62.5	Solar	DPP-2015-FEB-West
J405	NR	MDIU	Richland, MT	Lewis & Clark Jct sub	40	CT	In Service
J407	NR	ITCM	Freeborn, MN	Glenworth 161 kV Sub	200	Wind	DPP-2015-FEB-West
J411	NR	MEC	Ida, IA	Lehigh-Raun 345 kV Line	300	Wind	In Service
J416	NR	ITCM	Franklin, IA	Emery-Blackhawk 345 kV Line	200	Wind	DPP-2015-FEB-West
J426	NR	Xcel	Pipestone, MN	Chanarambie 34.5 sub	100	Wind	DPP-2015-FEB-West

Table 1 Transmission Assumptions for J442

MTEP ID	Facility	Description	Expected Completion Date	Status
8160	ITCM Morgan Valley-Beverly 345kV	A new 6.5 mile 345 kV line from a 345 kV addition to the existing Beverly substation to a new Morgan Valley 345 kV switching station.	5/1/2021	Under Construction

MTEP ID	Facility	Description	Expected Completion Date	Status
3127	Proposed MVP Portfolio 1: N LaCrosse-N Madison-Cardinal-Eden-Hickory Creek 345 kV (Only North LaCrosse – North Madison section required)	Construct N LaCrosse-N Madison-Cardinal 345 kV & Hickory Creek-Eden-Cardinal 345 kV line. Install Eden transformer.	12/31/2018	Under Construction
SPP	Grand Island – Holt County 345kV line	Update current transformers to increase rating, currently responsibility of J411		Under Construction

Table 2 Higher Queued Projects for J442

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
G549	NR	GRE	Pope, MN	Next to Williams Substation (69 kV)	20	Wind	Under Construction
G620	ER	XEL (NSP)	Goodhue, MN	Kenyon - Dodge 69 kV	19	Wind	Under Construction
G621	NR	XEL (NSP)	Pipestone, MN	Golf - Woodstock 34.5 kV	20	Wind	Under Construction
G830	NR	GRE	McHenry, ND	McHenry Substation	99	Wind	Under Construction
H081	ER	XEL (NSP)	Lyon, MN	Brookings – Lyon County 345 kV	201	Wind	Under Construction
J238	NR	IPL	Morgan, IN	138kV at existing Eagle Valley Power Plant	725	Gas	Under Construction
J228	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
J230	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction
J231	NR	METC	Mason, MI	Ludington Substation	70	Hydro	Under Construction
J340	NR	ITC	Huron, MI	Grassmere 345 kV Substation	100	Wind	Under Construction
J316	NR	MDU	Dickey, ND	Tatanka – Ellendale 230kV	150	Wind	Active / DPP-2014-AUG-West
J329	NR	CFU	Marion, IA	Pella West sub	55	Hydro	Under Construction
J344	NR	ITC-M	Mahaska, IA	Poweshiek – Oskaloosa 161kV	169	Wind	Under Construction
J299	ER	Xcel	Blue Earth, MN	Wilmarth sub	73	CC	DPP-2015-FEB-West
J391	NR	MRES	Lyon, MN	MMU's N 7th Street sub	50	CT	DPP-2015-FEB-West
J407	NR	ITCM	Freeborn, MN	Glenworth 161 kV Sub	200	Wind	DPP-2015-FEB-West
J416	NR	ITCM	Franklin, IA	Emery-Blackhawk 345 kV Line	200	Wind	DPP-2015-FEB-West
J426	NR	Xcel	Pipestone, MN	Chanarambie 34.5 sub	100	Wind	DPP-2015-FEB-West

Table 3 Similar Queued Projects for J442

MISO Higher Queued Project #	Service Type	TO	County, State	Point Of Interconnection	Pmax (MW)	Fuel Type	Status
J041	NR	ITCM	Grundy, IA	Wellsburg 161kV sub	90	Wind	DPP-2015-Aug-West

J298	NR	ITCM	Tama, IA	Dysart 161kV sub	300	Wind	DPP-2015-Aug-West
J399	NR	Xcel	Dakota, MN	Black Dog 115kV sub	200	CT	DPP-2015-Aug-West
J412	NR	MEC	Ida, IA	Lehigh-Raun 345kV	200	Wind	DPP-2015-Aug-West
J436	ER	OTP	Codington Grant SD	Big Stone South – Ellendale 345kV line	150	Wind	DPP-2015-Aug-West
J437	ER	OTP	Codington Grant SD	Big Stone South – Ellendale 345kV line	150	Wind	DPP-2015-Aug-West
J438	NR	MEC	Poweshiek, IA	Poweshiek-Parnell 161kV	170	Wind	DPP-2015-Aug-West
J443	NR	ITCM	Delaware County, IA	Greely Tap	41	Wind	DPP-2015-Aug-West
J449	NR	ITCM	Mitchell County - IA	Pioneer Prairie I substation	202	Wind	DPP-2015-Aug-West
J455	ER	MEC	Clay, IA	Kossuth-Obrien 345kV	300	Wind	DPP-2015-Aug-West

Exhibit A11 - Interconnection Customer Milestones

This Exhibit A11 is provided for reference only and is not binding. Governing milestone dates are listed in Appendix B.

The Interconnection Customer Generator Interconnection Agreements contained the following dates:

G736

- Sept. 31, 2017 is the Customer's proposed substation backfeed date.
- Dec. 31, 2017 is the Customer's proposed Commercial Operation Date.

The Interconnection Customer has not yet met these dates and indicated during the Facility Study kick-off call a desired backfeed date of October 1, 2019 with a Commercial operation date of December 31, 2019.

J442

- Oct. 1, 2019 is the Customer's proposed substation backfeed date.
- Dec. 31, 2019 is the Customer's proposed Commercial Operation Date

Transmission owner proposed schedule dates may not match or align with the customer requested in service date.

Exhibit A12 - Construction and Coordination Schedules

Exhibit A13 - Permits, Licenses, Regulatory Approvals and Authorization

Permits that may be required:
See Facility Studies

Exhibit A14 - Interconnection and Operating Guidelines

The interconnection and operating guidelines can be found in the document titled, "Guidelines for Generation, Tie-Line, and Substation Interconnection," which can be found at the following website address:

https://www.otpco.com/media/1243/otptechguidecasot.pdf

The Interconnection Customer will need to sign a Control Area Services Operating Tariff Service Agreement (CASOT) prior to energizing the facilities. The CASOT defines the operating requirements of a generator and can be found at the following website address:

https://www.otpco.com/media/1242/otp_casot.pdf

General Interconnection and Operating Guidelines

1. **Synchronizing Requirements.** The Interconnection Customer's Interconnection Facilities will be backfed from the Transmission Owner's Big Stone South substation utilizing the Transmission Owner's energization procedure. The Transmission Owner shall approve a synchronizing plan.

2. **Operating Studies.** It is the Interconnection Customer's responsibility to resolve reliability issues on both the Transmission Owner's Transmission System and any affected Transmission Owner's Transmission Systems (Affected System Upgrades). In-Service Date maybe delayed until all required Network Upgrades, Common Use Upgrades and/or Affected System Upgrades are completed or Generating Facility output maybe limited until such time operating studies would determine reliable operating limits. The Interconnection Customer also shall have operating study conducted with the Transmission Owner involvement to determine any operating limits prior to the In-Service Date of the Generating Facility.

The Interconnection Customer may need to sign additional agreement to allow the proper transfer of data to the Transmission Provider, Local Balancing Area, and Purchaser of the Power.

Appendix B
To GIA

Milestones

1. Selected Option pursuant to Article 5.1: Interconnection Customer selects the Standard Option as described in Article 5.1.

2. Milestones: The description and date entries listed in the following tables are provided solely for the convenience of the Parties in establishing their applicable Milestones consistent with the provisions of this GIA and the GIP.

A1. Interconnection Customer Milestones

(All references in the Milestones to "days" shall mean "Calendar Days" under the GIA).

Interconnection Customer's desired In Service Date is September 30, 2017 and Commercial Operation Date is December 31, 2017.

Table 1 - Interconnection Customer Milestones Under G736 amended and restated GIA

No.	Description	Date
1.	Signed GIA	January 8, 2016
2.	Interconnection Customer to provide Transmission Owner cash payment of **PRIVILEGED** to the Transmission Owner at the initial 20% payment for TOIFs and NUs pursuant to Article 11.5 Option 1.	N/A
3.	Interconnection Customer to provide Transmission Owner Letter of Credit of **PRIVILEGED** in a form acceptable to Transmission Owner (GIA 11.5 Option 3) ; The security is to be provided in the form of a letter of credit in a form acceptable to Transmission Owner, or a guarantee from an investment grade guarantor in a form acceptable to Transmission Owner. (GIA Article 11.6) The security will be reduced by drawing from the Letter of Credit by the Transmission Owner the amount of subsequent progress payments (including initial payment in Milestone 5a, 5b,and 5c) for the Transmission Owner's Interconnection Facilities and Network Upgrades at the time the progress payments are due. The remaining security, if any, will be released	30 days of Effective Date - Complete

	upon the Transmission Owner having been paid in full. To the extent the Transmission Owner's actual costs exceed the amount of the Letter of Credit, it shall notify the Interconnection Customer once it is aware of such anticipated shortfall and advise regarding additional funding. The Interconnection Customer shall increase the balance of the Letter of Credit accordingly within 10 days of such notice.	
4.	Interconnection Customer to provide Transmission Owner with a cash payment of **PRIVILEGED** to start engineering, permitting, procurement and construction of the TOIF's.	30 days after Effective Date - Complete
5.a	Interconnection Customer to provide Transmission Owner with a cash payment of **PRIVILEGED** to start engineering, permitting, and controls work of the TO Network Upgrades at BSS.	No later than December 15, 2016 - Complete
5.b	Interconnection Customer to provide Transmission Owner with a cash payment of **PRIVILEGED** to start procurement of the TO Network Upgrades.	On December 12, 2016* - Complete
5.c	Interconnection Customer to provide Transmission Owner with a cash payment of **PRIVILEGED** to start construction of the TO Network Upgrades.	On April 3, 2017* - Complete
6.	Interconnection Customer to get a transmission line crossing agreement with the Big Stone South to Brookings line Owners	180 days prior to TO's In Service Date
7.	Provide Certificate of Insurance (GIA 18.4.9)	Earlier of the construction work commencement date or milestone construction date; within 90 days of end of fiscal year or insurance renewal date
8.	Provide to Transmission Provider (a) reasonable evidence of continued site control at the substation or (b) post $250,000 non-refundable additional security (GIP 11.3)	Within 15 Business days of the Effective Date of this GIA
9.	Interconnection Customer to provide to Transmission Provider evidence of one or more of the following milestones being achieved: (a) execution of contract for fuel supply transport, (b) execution of contract for cooling water supply, (c) execution of contract for engineering procurement of major equipment or construction, (d) execution of contract for sale of electric energy or capacity; or (e) documentation of application for	Within 180 Calendar Days of the Effective Date of the GIA.

	air, water or conditional use permit from concerned authority. (GIP 11.3)	
10.	Provide preliminary design and specifications for Interconnection Customer's Interconnection Facilities, including bus generator tie line location, conductor type, protection and control information referenced to surveyed coordinates and bus phasing, to Transmission Owner and Transmission Provider for comment (GIA 5.10.1)	180 days prior TO In Service Date in Table B
11.	Pre-construction meeting	As may be agreed to by the Parties
12.	Updated Generating Facility information submittal (Article 24.3).	180 days prior TO In Service Date in Table B.
13.	Reserved	Reserved
14.	Provide final design and specifications for Interconnection Customer's Interconnection Facilities to Transmission Owner and Transmission Provider for comment (GIA 5.10.1)	90 days prior to TO In Service Date in Table B, if requested
15.	Provide Transmission Owner with a station service plan and/or copy of approved Schedule 20 application	30 days prior to TO In Service Date in Table B
16.	Provide Local Balancing Area with a signed CASOT Service Agreement.	60 days prior to TO In Service Date in Table B.
17.	Deliver to Transmission Owner and Transmission Provider "as built" drawings, information and documents regarding Interconnection Customer's Interconnection Facilities (GIA 5.10.3)	Not later than 120 days following the Commercial Operation Date, if requested.
18.	Supply a written synchronization plan to Transmission Owner	Not later than 90 days prior to TO In Service Date in Table B
19a.	Interconnection Customer shall provide the Parties with notice on the status of the Generating Facility, including COD, under Article 15 of this GIA and shall also send such notice by email to ResourceIntegration@misoenergy.org. Notification shall include Interconnection Customer's name, and as applicable Market Participant(s) name(s), and project number.	At least six (6) months before the earlier of either the Generating Facility COD or commencement of testing.
19b.	Interconnection Customer shall provide notice to the Parties of a test plan in advance of conducting tests for the Generating Facility. The notice shall be in the form of Appendix B-1 below pursuant to Article 15 of this GIA, and a copy of such notice should be emailed to ResourceIntegration@misoenergy.org	At least five (5) Business Days prior to the first testing date.

20.	Pre-energization meeting	As may be agreed to by the Parties
21.	Commercial Operation Date	December 31, 2019.**
22.	Pay final invoice	30 days after invoice sent

* The Transmission Owner may delay this payment with a 30 day notice due to a change in schedule. If the Transmission Owner delays the payment of this milestone, the TO will provide the IC with a 30 day notice of when the funds would be required to be paid.

** As of the Effective Date of this GIA, Commercial Operation for G736 has not be commenced and the Transmission Owner is not required to meet this schedule due to the change in scope of work contained within this Third Amended and Restated GIA.

Table 2 - Interconnection Customer Milestones for J442

No.	Description	Date
1a.	Provide initial payment of **PRIVILEGED** (20% of all Network Upgrades and Transmission Owner Interconnection Facilities) to Transmission Owner (GIA 11.5)	30 Calendar Days from Effective Date - Complete
1b.	Provide 100% security, i.e., a guarantee, surety bond, letter of credit or other reasonably acceptable form of security to Transmission Owner, in the amount of **PRIVILEGED** (GIA 11.6).	N/A
2a	Interconnection Customer to submit required powerflow modeling data, pursuant to NERC standard MOD-032, to Transmission Provider's model on demand database and MOD-032 required dynamic modeling data to **TAMmodeling@misoenergy.org** Interconnection Customer will coordinate with Transmission Owner to obtain model bus numbers prior to submitting model data	45 Calendar Days from Effective Date
2b.	Provide Certificate of Insurance (GIA 18.4.9).	The earlier of the construction work commencement date or the milestone date; thereafter, within 90 Calendar Days of end of fiscal year or insurance renewal date.

3a.	i) Provide to Transmission Provider reasonable evidence of continued Site Control. i) Provide evidence of one or more of the following milestones being achieved: (1) execution of contract for (a) fuel supply or transport; (b) cooling water supply; (c) engineering procurement of major equipment or construction; (d) execution of a contract for the sale of electric energy or capacity from the Generating Facility, or a statement signed by an officer or authorized agent of Interconnection Customer attesting that the Generating Facility is included in an applicable state resource adequacy plan; or other information that Transmission Provider deems to be reasonable evidence that the Generating Facility will qualify as a designated network resource; or (2) documentation of application for state or local air, water, land, or federal nuclear or hydroelectric permits and that the application is proceeding per regulations (GIP 11.3).	Within 15 Business Days of Effective Date. Within 180 Calendar Days of Effective Date.
3b.	G736 GIA amended, executed and filed with the FERC to reflect similar one-line diagram of J442 Exhibit A1.	Within 30 Calendar Days of Effective Date
4	Provide 1 payment in the amount of **PRIVILEGED** to Transmission Owner to commence design and property/equipment procurement for the Network Upgrades Interconnection Facilities, and System Protection Facilities	4/1/2019 - Complete
5.	Pre-construction meeting.	As may be agreed to by the Parties.
6.	Provide initial design and specifications for Interconnection Customer's Interconnection Facilities to Transmission Owner and Transmission Provider for comment (GIA 5.10.1).	180 Calendar Days prior to initial synchronization date.
7.	Update Generating Facility Information submittal (Article 24.3)	180 Calendar Days prior to Initial Synchronization Date.

8.	Provide final design and specifications for Interconnection Customer's Interconnection Facilities to Transmission Owner and Transmission Provider for comment (GIA 5.10.1).	90 Calendar Days prior to initial synchronization date.
9.	Deliver to Transmission Owner and Transmission Provider "as-built" drawings, information and documents regarding Interconnection Customer's Interconnection Facilities (GIA 5.10.3).	Within 120 Calendar Days of Commercial Operation Date.
10.	Reserved	
11.	Pre-energization meeting.	As may be agreed to by the Parties.
12.	Supply a written synchronization plan to the Transmission Owner	90 days prior to Initial Synchronization Date
13.	Reserved	
14.	Reserved	
15.	Initial Synchronization Date.	10/15/2019.*
16.	Commercial Operation Date.	12/31/2019*
17.	Interconnection Customer shall provide the Parties with notice on the status of the Generating Facility, including COD, under Article 15 of this GIA and shall also send such notice by email to ResourceIntegration@misoenergy.org. Notification shall include Interconnection Customer's name, and as applicable Market Participant(s) name(s), and project number.	6 months prior to Initial Synchronization Date..
18.	Interconnection Customer shall provide notice to the Parties of a test plan in advance of conducting tests for the Generating Facility. The notice shall be in the form below and should be provided under Article 15 of this GIA, and a copy of such notice should be emailed to ResourceIntegration@misoenergy.org**.**	5 Business Days prior to testing.
19.	If MOD-032 required modeling data has changed after Generating Facility and Interconnection Facilities have been constructed, updates to modeling data for "as built" facilities shall be submitted to Transmission Provider's model on demand database for powerflow and/or TAMmodeling@misoenergy.org for dynamic stability modeling data.	Within 120 days of Commercial Operation Date

*This is the Interconnection Customer's desired Backfeed date which the Transmission Owner is not required to meet this date due to the change in scope of work contained within this Third Amended and Restated GIA.

Table 3 - Interconnection Milestones for Second Amended and Restated Agreement

No.	Description	Date
1.	Provide security, i.e., a letter of credit or other reasonably acceptable form of security to the Transmission Owner in the amount of **PRIVILEGED**.	Within 45 days of the FERC acceptance of this second and amended GIA
2..	Return a signed Facility Service Agreement to the Transmission Owner	Within 30 days of Table 5, Milestone 10

Table 4 - Transmission Owner Milestones for G736

No.	Description	Date
1.	Provide Certificate of Insurance if requested (GIA 18.4.9)	Earlier of the construction work commencement date or milestone construction date; within 90 days of end of fiscal year or insurance renewal date, if requested
2a.	Commence design, permitting, procurement and construction of TOIFs (GIA 5.5 et seq.)**	Upon completion by Interconnection Customer of Milestone 4 in Table 1 of Appendix B
2b.	Commence engineering, permitting, and controls work of TO Network Upgrades (GIA 5.5 et seq.) **	Upon completion by Interconnection Customer of Milestone 5a in Table 1 of Appendix B
2c	Commence procurement of TO Network Upgrades (GIA 5.5 et seq.) **	Upon completion by Interconnection Customer of Milestone 5b in Table 1 of Appendix B
2d	Commence construction of TO Network Upgrades (GIA 5.5 et seq.) **	Upon completion by Interconnection Customer of Milestone 5c in Table 1 of Appendix B
3.	Comment on Interconnection Customer's preliminary design and specifications for Interconnection Facilities, SCADA and communication	Within 30 days of Interconnection Customer's submission of preliminary design and specifications.
4.	Comment on Interconnection Customer's final design and specifications for Interconnection Facilities, SCADA and communication	Within 30 days of Interconnection Customer's submission of final design and specifications.
5.	Deliver to Interconnection Customer and Transmission Provider "as built" drawings, information and documents regarding Transmission Owner's Interconnection Facilities if requested (GIA 5.11)	Not later than 120 days following Commercial Operation Date, if requested.

6	Transmission Owner Interconnection Facilities ready for Backfeed (i.e. In Service Date)	Six months after Table 3 Milestone 1
7	Provide Interconnection Customer final cost statements on invoice (GIA 12.2 et seq.)	Within six months after final completion of construction activities
8	Cancel existing Interconnection Customer's Letter of Credit that Interconnection Customer provided as initial and subsequent payment	30 days from the completion of milestone 1 of Table 3

*Assumes Transmission Owner has obtained all necessary final authorizations ("FA") including all necessary permits to commence construction of facilities needed to interconnect the Generating Facility

** The schedule above also assumes that there are no other major projects going on the transmission system in the region that would not allow required facilities to be taken out of service. Some of this scheduled is also weather and seasonally–dependent and dependent on available contractors.

Table 5 - Transmission Owner Milestones for J442

No.	Description	Date
1.	Provide Certificate of Insurance (GIA 18.4.9).	N/A
2.	• Commence design, procurement and construction of Interconnection Facilities (GIA 5.5 et seq.). • Commence equipment procurement.	Upon completion by Interconnection Customer of Milestone 4 in Table 1 of Appendix B
3.	Commence construction of Interconnection Facilities (GIA 5.6 et seq.).	N/A
4.	Comment on Interconnection Customer's final design and specifications.	Within 30 Calendar Days of Interconnection Customer's submission of final design and specifications.
5.	Deliver to Interconnection Customer and Transmission Provider "as-built" drawings, information and documents regarding Transmission Owner's Interconnection Facilities (GIA 5.11).	Within 120 Calendar Days of Commercial Operation Date.
6.	Provide Interconnection Customer final cost invoices (GIA 12.2 *et seq.*).	Within 6 (six) months of completion.
7.	Reserved	

8.	In-Service Date/Backfeed Date.	Six months after Table 3, Milestone 1
9.	If MOD-032 required modeling data has changed after Network Upgrade facilities have been constructed, updates to modeling data for "as built" facilities shall be submitted to MISO Model On Demand database.	120 Calendar Days after Commercial Operation Date
10.	Tender a Facility Service Agreement to the Interconnection Customer	Six months prior to Table 5 Milestone 8 or Table 4, Milestone 6
11.	Start engineering, procurement, and construction of the Wahpeton Substation, Wahpeton to Hankinson, and Hankinson Network Upgrades	Upon completion of Table 3, Milestone 1
12.	Complete the Wahpeton Substation, Wahpeton to Hankinson, and Hankinson Network Upgrades	300 Calendar Days after Table 5, Milestone 11
13.	Refund **PRIVILEGED** for prior funded Network Upgrade Transmission Owner self-funds	30 Calendar Days after Table 3, Milestone 1 is completed.

C. Affected System Owner Milestones

Interconnection Customer to enter into a Facilities Construction Agreement with Transmission Provider and host transmission owner for these upgrades:

- +/- 200 MVAR statcom on the ATC transmission system
- +50 MVAR switched capacitor at MidPort substation on MidAmerican Energy Company's transmission system
- +50 MVAR switched capacitor at Electrifarm substation on MidAmerican Energy Company's transmission system
- +50 MVAR switched capacitor at Washburn substation on MidAmerican Energy Company's transmission system
- +50 MVAR switched capacitor at Shaulis road substation on MidAmerican Energy Company's transmission system
- Upgrades on the Big Stone – Blair 230 kV line on Otter Tail Power, Montana Dakota Utilities, Co., and NorthWestern Public Service Energy's transmission system.

Interconnection Customer is responsible for the Basin Electric Power Cooperative upgrade on Big Stone – Blair 230kV line to achieve a minimum rating of 595.9 MVA. Any cost sharing or reimbursement will be governed by the applicable tariff.

Interconnection Customer is responsible to delay interconnection service until SPP redefines the Cooper_South flowgate. Interconnection Customer can request a limited operation study from SPP to conditionally go in service before this.

Interconnection Customer is responsible to delay interconnection service until SPP has the in service date of the Gentleman Generating Station – Thedford – Holt 345kV Project ("R-Plan"). This project is approved and scheduled for 10/1/2018. Interconnection Customer can request a limited operation study from SPP to conditionally go in service before this.
Interconnection Customer is required to mitigate NRIS thermal constraints on Grand Island – Holt County 345kV to update current transformers for single contingency outage. The $60,000 cost of NU is currently assigned to J411 interconnection customer.

D. Transmission Provider Milestones

No.	Description	Date
1	Transmission Provider to determine conditional limit for interconnection service.	Prior to Commercial Operation
2	Transmission Provider to provide Notice to the Parties when unconditional interconnection service is achieved	Within 30 Calendar days of unconditional service being achieved.

Appendix B-1
To GIA
Pre-Certification Generation Test Notification Form

The following form would need to be submitted to MISO Real Time Operations at least five (5) Business Days prior to the first date of testing.

Project Number:

Project Name:

Point of Interconnection:

Dispatcher Contact Information:

Date	Start Time (in EST)	End Time (in EST)	Expected MW Output	Expected MVAR Output (Only needed if beyond normal power factor)

Appendix C
To GIA
Interconnection Details

This Appendix C is a part of this GIA among Interconnection Customer, Transmission Owner and Transmission Provider.

1. Transmission Owner shall provide the following "as-built" drawings, information and documents regarding the Transmission Owner's Interconnection Facilities pursuant to Article 5.11 of this GIA:
1.2. The unique requirements of each generation interconnection will dictate the establishment of mutually agreeable Interconnection and/or Operating Guidelines that further define the requirements of this GIA. . The Interconnection Customer will comply with the Interconnection Guidelines for Generation, Tie Line and Substation Interconnections Version 3.3. dated November 15, 2013 available at http://www.otpco.com/NewsInformation/PDF/OTPtechGuideCASOT.pdf ("Interconnection and/or Operating Guidelines").

2. The Interconnection Customer will operate in the range of +/- 95% power factor at the Point of Interconnection with the Transmission Owner's Transmission System. This is required per the System Impact Study evaluation and Article 9.6.1 of this GIA shall apply.

3. In the event that the Interconnection and/or Operating Guidelines conflict with this GIA, this GIA will govern. These Interconnection and/or Operating Guidelines will address, but are not limited to, the following:

   (a) **System Protection Facilities:** Interconnection Customer will construct a protective relaying scheme to protect the Transmission System from faults on the Interconnection Customer's Interconnection Facilities. Interconnection Customer will be responsible for providing System Protection Facilities, along with SCADA control of its 230 kV circuit breaker and reactive compensation at the IC Substation. This scheme will be coordinated with and approved by Affected Control Area Operator prior to final design or implementation. The Local Balancing Authority also maintains the right to curtail the Interconnection Customer in order to maintain a safe and reliable Transmission System. Further information can be found in the Interconnection and Operating Guidelines.
   (b) **Communication requirements:** See Interconnection Guidelines
   (c) **Metering requirement:** Interconnection Customer will purchase and install CTs, VTs, and revenue metering per Transmission Owner specifications.
   (d) **Grounding requirements:** See Interconnection Guidelines.
   (e) **Transmission Line and Substation Connection configurations:** See Interconnection Guidelines
   (f) **Unit Stability requirements:** See Interconnection Guidelines
   (g) **Equipment ratings:** See Interconnection Guidelines
   (h) **Short Circuit requirements:** See Interconnection Guidelines

(i) **Synchronizing requirements:** The Interconnection Customer's Interconnection Facilities will be backfed from the Transmission Owner's 230 kV line utilizing the Transmission Owner's energization procedure. Further information can be found in the Interconnection and Operating Guidelines.

(j) **Generation Control requirements** Interconnection Customer will install all necessary potential devices on its system to allow voltage control override to prevent high voltage conditions from occurring. Voltage control will override power factor in order to maintain safe and proper operation of the Transmission Owner's Transmission System as required by the standards of Transmission Owner, the Applicable Reliability Council and NERC, and Good Utility Practice. Interconnection Customer will install sufficient reactive power equipment necessary for the Generating Facility to operate in the range of +/- 95% power factor at the Point of Interconnection. Operation of the Generating Facility shall prevent voltage swings during switching events in excess of 3% relative to actual voltage levels on the Transmission System at the time of the switching event as monitored at the 230kV metering point. The Transmission Owner/Balancing Area Operator will provide the Interconnection Customer with the proper settings for any reactive equipment and transformer taps located within the Interconnection Customer's facilities that may affect the operation of the Transmission System. The Interconnection Customer shall verify that the equipment settings have been made and that the reactive equipment is operating properly. The power factor equipment is to mitigate the effects on the Transmission System due to the VAR requirements of the IC Substation step-up transformer and Interconnection Customer's collection system. Further information can be found in the Interconnection and Operating Guidelines.

(k) **Data provisions:** See Interconnection Guidelines.

(l) **Energization inspection and testing requirements:** Interconnection Customer will provide Transmission Owner with checkout records to document that Interconnection Customer has tested all protection systems and equipment for correct operation. Further information can be found in the Interconnection and Operating Guidelines.

(m) **Switching and tagging:** See CASOT;

(n) **Data reporting requirements:** See Interconnection Guidelines;

(o) **Training:** See Interconnection Guidelines;

(p) **Capacity determination and verification (including ancillary services and certification):** See Interconnection Guidelines;

(q) **Emergency operations, including system restoration and black start arrangements:** See Interconnection Guidelines;

(r) **Identified must-run conditions:** See Interconnection Guidelines

(s) **Provision of ancillary services:** See CASOT;

(t) **Specific transmission requirements of nuclear units to abide by all NRC requirements and regulations:** See Interconnection Guidelines

(u) **Stability requirements, including generation short circuit ratio considerations:** See Interconnection Guidelines

(v) **Limitations of operations in support of emergency response:** See Interconnection Guidelines;

(w) **Maintenance and Testing:** See Interconnection Guidelines;

(x) Other: See Interconnection Guidelines.

(y) If applicable, the unique requirements, if any, of the Transmission Owner to which the Facility will be physically interconnected: See Interconnection Guidelines

(z) Transmission Provider has no additional requirements with respect to Section 8.4.

4. Information pursuant to 9.6.1.2: Since the interconnection facilities are being shared with G736, Interconnection Customer agrees to meet the entire 0.95 lead to 0.95 lag power factor range at the Point of Interconnection.

Appendix D To GIA

Security Arrangements Details

Infrastructure security of Transmission or Distribution System equipment and operations, as applicable, and control hardware and software is essential to ensure day-to-day Transmission and Distribution System reliability and operational security. The Commission will expect all Transmission Providers, market participants, and Interconnection Customers interconnected to the Transmission or Distribution System, as applicable, to comply with the recommendations provided by Governmental Authorities regarding Critical Energy Infrastructure Information ("CEII") as that term is defined in 18 C.F.R. Section 388.113(c) and best practice recommendations from the electric reliability authority. All public utilities will be expected to meet basic standards for system infrastructure and operational security, including physical, operational, and cyber-security practices.

Appendix E
To GIA

Commercial Operation Date

This Appendix E is a part of this GIA between Transmission Provider, Transmission Owner and Interconnection Customer.

[Date]

Midcontinent Independent System Operator, Inc.
Attn: Director, Transmission Access Planning
720 City Center Drive
Carmel, IN 46032

Re: _____ Generating Facility

Dear _____:

On **[Date] Crowned Ridge Wind, LLC (J442)** has completed Trial Operation of Unit No. ___. This letter confirms that **Crowned Ridge Wind, LLC** commenced commercial operation of Unit No. ___ at the Generating Facility, effective as of **[Date plus one Calendar Day]**.

Thank you.

John DiDonato
Vice President
Crowned Ridge Wind, LLC
c/o NextEra Energy Resources, LLC
700 Universe Boulevard
Juno Beach, FL 33408
Phone: (561)-691-7232
Email: john.didonato@nexteraenergy.com

cc: Transmission Owner

Appendix F
To GIA

Addresses for Delivery of Notices and Billings

Notices:

Transmission Provider:

MISO
Attn: Director, Transmission Access Planning
720 City Center Drive
Carmel, IN 46032

Transmission Owner:

Dean Pawlowski
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496

Jennifer Smestad
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496

Interconnection Customer:

Crown Ridge Wind, LLC
Midwest Business Manager
700 Universe Boulevard
Juno Beach, Florida 33408

Billings and Payments:

Transmission Provider:

MISO
Attn: Director, Transmission Access Planning
720 City Center Drive
Carmel, IN 46032

Transmission Owner:

Dean Pawlowski
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496

Interconnection Customer:

Crown Ridge Wind, LLC
Midwest Business Manager
700 Universe Boulevard
Juno Beach, Florida 33408

Alternative Forms of Delivery of Notices (telephone, facsimile or email):

Transmission Provider:

Phone: (317) 249-5700
Email: misotap@misoenergy.org or
MISOTransmissionAccessPlanning@misoenergy.org

Transmission Owner:

Dean Pawlowski
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496

Phone: (218) 739-8947
Email address: dpawlowski@otpco.com
Fax: (218) 739-8784

Jennifer Smestad
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496

Phone: (218) 739-8892
Email address: jsmestad@otpco.com
Fax: (218) 998-3165

Interconnection Customer:

Crown Ridge Wind, LLC
Midwest Business Manager
700 Universe Boulevard
Juno Beach, Florida 33408

Appendix G
Interconnection Requirements for a Wind Generating Plant

Appendix G sets forth requirements and provisions specific to a wind generating plant. All other requirements of this GIA continue to apply to wind generating plant interconnections.

A. Technical Standards Applicable to a Wind Generating Plant

i. Low Voltage Ride-Through (LVRT) Capability

A wind generating plant shall be able to remain online during voltage disturbances up to the time periods and associated voltage levels set forth in the standard below.

1. Wind generating plants are required to remain in-service during three-phase faults with normal clearing (which is a time period of approximately 4-9 cycles) and single line to ground faults with delayed clearing, and subsequent post-fault voltage recovery to prefault voltage unless clearing the fault effectively disconnects the generator from the system. The clearing time requirement for a three-phase fault will be specific to the wind generating plant substation location, as determined by and documented by the transmission provider. The maximum clearing time the wind generating plant shall be required to withstand for a three-phase fault shall be 9 cycles after which, if the fault remains following the location-specific normal clearing time for three-phase faults, the wind generating plant may disconnect from the transmission system. A wind generating plant shall remain interconnected during such a fault on the transmission system for a voltage level as low as zero volts, as measured at the high voltage side of the wind GSU.

2. This requirement does not apply to faults that would occur between the wind generator terminals and the high side of the GSU.

3. Wind generating plants may be tripped after the fault period if this action is intended as part of a special protection system.

4. Wind generating plants may meet the LVRT requirements of this standard by the performance of the generators or by installing additional equipment (*e.g.* Static VAr Compensator) within the wind generating plant or by a combination of generator performance and additional equipment.

5. Existing individual generator units that are, or have been, interconnected to the network at the same location at the effective date of the Appendix G LVRT Standard are exempt from meeting the Appendix G LVRT Standard for the remaining life of the existing generation equipment. Existing individual generator units that are replaced are required to meet the Appendix G LVRT Standard.

ii. Power Factor Design Criteria (Reactive Power)

The following reactive power requirements apply only to a newly interconnecting wind generating plant that has completed a System Impact Study as of the effective date of the Final

Rule establishing the reactive power requirements for non-synchronous generators in section 9.6.1 of this GIA (Order No. 827). A wind generating plant to which this provision applies shall maintain a factor within the range of 0.95 leading to 0.95 lagging, unless Transmission Provider has established different requirements that apply to all Generating Facilities in the Local Balancing Authority on a comparable basis, measured at the Point of Interconnection as defined in this GIA, if the Transmission Provider's System Impact Study shows that such a requirement is necessary to ensure safety or reliability. The power factor range standard can be met by using, for example, power electronics designed to supply this level of reactive capability (taking into account any limitations due to voltage level, real power output, etc.) or fixed and switched capacitors if agreed to by Transmission Provider, or a combination of the two. Interconnection Customer shall not disable power factor equipment while the wind plant is in operation. Wind plants shall also be able to provide sufficient dynamic voltage support in lieu of the power system stabilizer and automatic voltage regulation at the generator excitation system if the System Impact Study shows this to be required for system safety or reliability.

iii. Supervisory Control and Data Acquisition (SCADA) Capability

The wind plant shall provide SCADA capability to transmit data and receive instructions from Transmission Provider to protect system reliability. Transmission Provider and Interconnection Customer shall determine what SCADA information is essential for the proposed wind plant, taking into account the size of the plant and its characteristics, location, and importance in maintaining generation resource adequacy and transmission system reliability in its area.

Appendix H – Not Applicable
Interconnection Requirements for Provisional GIA

Provisional Agreement

This GIA is being provided in accordance with Section 11.5 of the Transmission Provider's GIP, which provides among other things, that an Interconnection Customer may request that Transmission Provider provide Interconnection Customer with a provisional GIA that limits the transfer of energy by Interconnection Customer commensurate with that allowed for Energy Resource Interconnection Service. Interconnection Customer requested Transmission Provider to provide a provisional GIA for limited operation at the discretion of Transmission Provider based upon the results of available studies (by Interconnection Customer and by Transmission Provider).

A Provisional Interconnection Study, the results of which are posted on the confidential portion of the Transmission Provider's internet website, was performed by Transmission Provider in order to confirm the facilities that are required for provisional Interconnection Service and to require them to be in place prior to commencement of service under the GIA.

Interconnection Customer represents that the Interconnection Customer facilities (including Network Upgrades, Interconnection Facilities, Distribution Upgrades, System Protection Upgrades and/or Generator Upgrades) that are necessary to commence provisional Interconnection Service and meet the requirements of NERC, or any applicable regional entity for the interconnection of a new generator are in place prior to the commencement of generation from the Generating Facility and will remain in place during the term of the service. The requisite Interconnection Studies were performed for the Generating Facility (under Optional Studies). Interconnection Customer shall meet any additional requirements (including reactive power requirements) pursuant to the results of applicable future Interconnection System Impact Studies. Until such time as the applicable Interconnection Studies and any identified facilities are completed, the output of the Generating Facility will operate within the output limit prescribed in a future, if applicable, operating guide.

The maximum permissible output of the Generating Facility under Appendix A will be updated by Transmission Provider on a quarterly basis, determined in accordance with Section 11.5 of the GIP, by finding the transfer limit of energy commensurate with the analysis for Energy Resource Interconnection Service ("ERIS"). This study shall be performed assuming the system topology represented by the base cases used to calculate Available Flowgate Capability, as described in Attachment C of the Tariff, with dispatch and optimization algorithms posted on the MISO internet site and operation above those limits will be deemed as unauthorized use of the Transmission System and subject to provisions in the Tariff surrounding that use.

Use of interim operating guide

Implementation of interim operating guide, if applicable, will constitute an interim solution that will permit Interconnection Customer to operate the Generating Facility under conditional Interconnection Service until planned Network Upgrades are constructed. Any interim operating

guide will be subject to the approval of Transmission Owner and Transmission Provider. Minimum requirements for an interim operating guide are as indicated below.

* Transmission Operator will have control of breaker(s) dedicated to the Generating Facility and will be able to trip the Interconnection Customer's Generating Facility
* Protection schemes must be tested and operative
* Interconnection Customer will provide continuous communication capability with the Generator Operator
* Interconnection Customer and the owner of the existing Generating Facility will enter into an operating agreement or similar agreement which designates, among other things, the responsibilities and authorities of each of the parties and shall be subject to the acceptance of Transmission Provider and Transmission Owner.
* A termination date consistent with completion of construction of Network Upgrades will be included as part of all operating guides accepted by Transmission Owner and Transmission Provider.

Interconnection Customer assumes all risks and liabilities with respect to changes, which may impact the Generator Interconnection Agreement including, but not limited to, change in output limits and responsibilities for future Network Upgrade and cost responsibilities that have not yet been identified on the direct connect Transmission System as well as all affected Transmission, Distribution or Generation System(s) including non-Transmission Provider Systems. Such upgrades will be determined pursuant to the Tariff and Policies in effect at the time of the Interconnection Studies.

Appendix I – Not Applicable
Requirements Applicable to Net Zero Interconnection Service

Where this GIA provides for Net Zero Interconnection Service, Interconnection Customer acknowledges, agrees to, and will be required to operate under the following conditions:

1) The combined Real-Time Offers, including Energy and Operating Reserves, of the Generating Facility and the existing generating facility with which Interconnection Customer has an executed Energy Displacement Agreement must be less than or equal to Interconnection Service limit (MW, MVAR, MVA output) provided in Exhibit I-1 (Monitoring and Consent Agreement) (hereinafter, "Interconnection Service limit"). In the event that the sum of the simultaneous energy output of the Generating Facility and the existing generating facility exceeds such Interconnection Service limit, MISO reserves the right to curtail and/or disconnect the Generating Facility immediately.

   In the event that the sum of the emergency and/or economic maximum offer limits of the Generating Facility and the existing generating facility exceeds the Interconnection Service limit, MISO reserves the right to curtail and/or disconnect the Generating Facility immediately.

2) The total MW, MVAR, MVA output at the Point of Interconnection resulting from the combined output of the Generating Facility and the existing generating facility with which Interconnection Customer has an executed Energy Displacement Agreement shall not at any time exceed the Interconnection Service limit.

3) The existing generating facility with which Interconnection Customer has an executed Energy Displacement Agreement is not relieved of any applicable requirements under the RAR of the Tariff.

4) The Interconnection Customer shall submit to the Transmission Provider a report by the seventh Calendar Day of each month showing the prior month's output, by 15 minute increment, the combined real-time offers and cleared energy injection. The existing generating facility and the Interconnection Customer shall cooperate consistent with other provisions in the Tariff to the extent necessary to ensure accuracy of the report. Transmission Provider shall provide a template for this report.

Exhibit I-1 (Completed Monitoring and Consent Agreement - Appendix 11 of the GIP)

Exhibit I-2 (Completed Energy Displacement Agreement - Appendix 12 of the GIP)

Exhibit AC-13

From:	Bruce, Brittany
To:	Jodi Deuel County
Cc:	Wilhelm, Tyler
Subject:	email
Date:	Tuesday, October 01, 2019 10:55:03 AM
Attachments:	Crowned Ridge 2 - 200 MW & 100 MW Deferral.pdf ATT00001.htm

Jodi,

Apologies for the delay. As requested, please see below information regarding the Crowned Ridge II project in Deuel County:

Due to MISO interconnection risks, Crowned Ridge Wind II is deferring the construction for 100 MWs of the planned 300 MW project. Specifically, the project will proceed as a 200 MW wind project until the MISO system supports a cost-effective interconnection for the last 100 MWs. Our team plans to inform landowners affected by the project size reduction at meetings that will take place on October 9 and 10.

Crowned Ridge Wind II is currently pending approval at the South Dakota Public Utilities Commission (PUC). On September 20, 2019, Crowned Ridge Wind II notified the South Dakota PUC of its plan to review the upcoming Q1 2020 MISO and SPP interconnection study and costs to determine whether to construct 100 MWs in 2020 or extend the time to begin construction. Crowned Ridge Wind II intends to construct 200 MWs, as the first 200 MWs have no interconnection concerns, provided it obtains a facilities permit from the South Dakota PUC.

It is our intent to build the additional 100 MWs for Crowned Ridge Wind II when the MISO system supports cost-effective interconnection to the transmission grid. If, at some point in the future, those costs are sufficiently reduced so that the project makes economic sense for our company, its participating landowners and customer, we will build the remainder of the project.

Our team will have additional information on the viability of the last 100 MWs in Q1 2020 when additional studies on the transmission are completed.

The attached maps help depict the 200 MW project we are currently proceeding with along with the 100 MWs that are currently deferred until further notice.

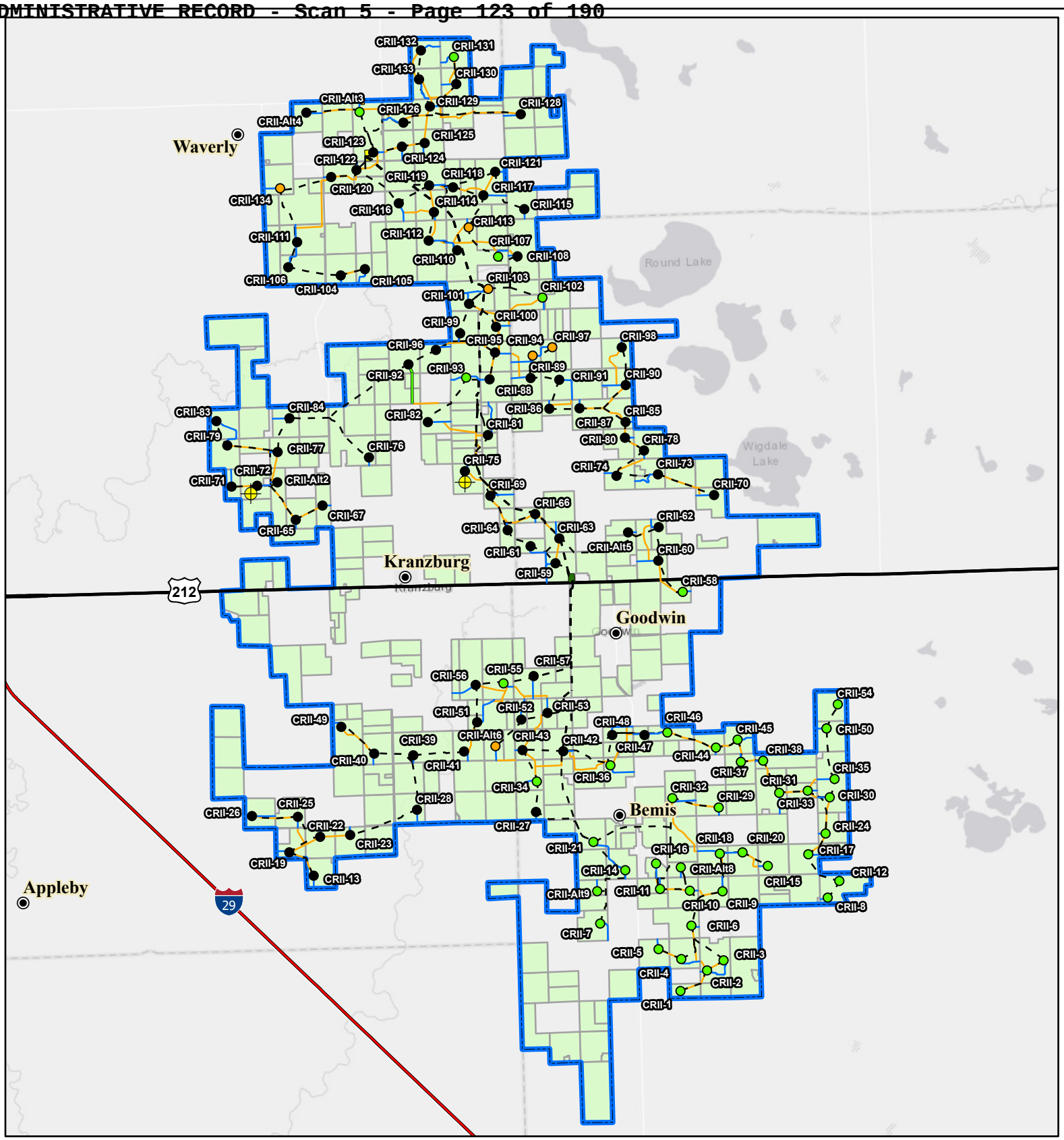
From: DC - Zoning <dczoning@itctel.com>
Date: October 1, 2019 at 8:45:50 AM CDT
To: "Bruce, Brittany" <Brittany.Bruce@nexteraenergy.com>
Subject: email

CAUTION - EXTERNAL EMAIL

Brittany you were going to send me an email about the wind farm in Deuel County and lowering MW of the project.

Sincerely

Jodi Theisen
Deuel County Zoning Officer



PUC Supplemental

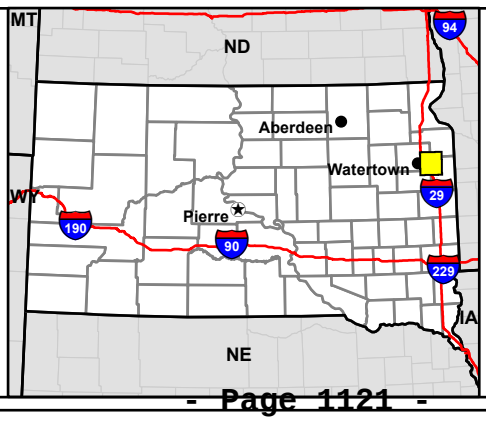
Crowned Ridge II Wind Farm

100 MW Array
- Primary Turbine

200 MW Array
- Primary Turbine
- Alternate Turbine

- MET Tower
- City
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- Substation
- O&M Facility
- Batch Plant
- Project Boundary

Land Status
- Leased, Signed



Kilometers
0 2.5 5

Miles
0 2.5 5

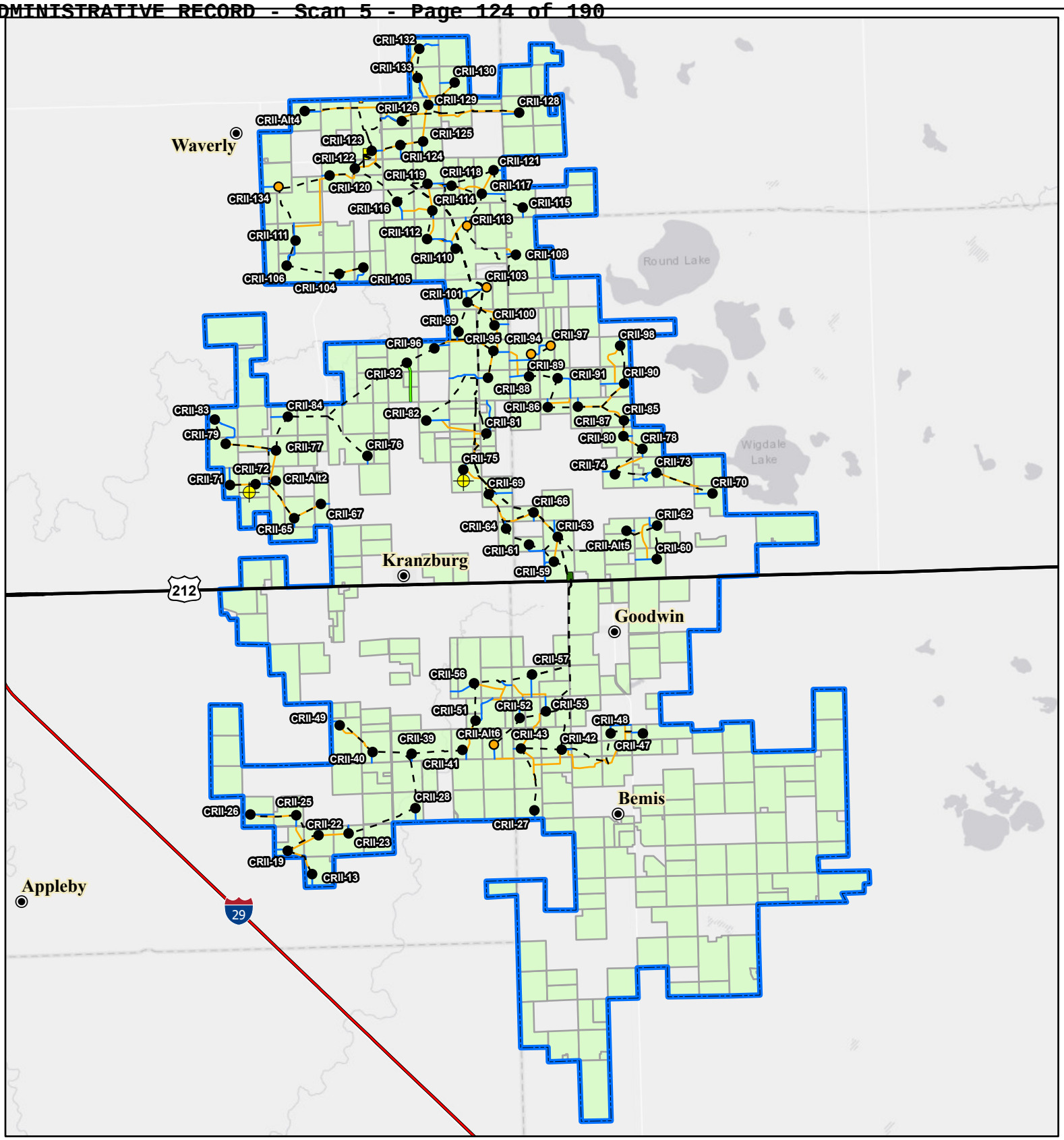
N W E S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Codington, Deuel, and Grant Counties, South Dakota

Projection: NAD 1983 UTM Zone 14N

008578

SWCA ENVIRONMENTAL CONSULTANTS



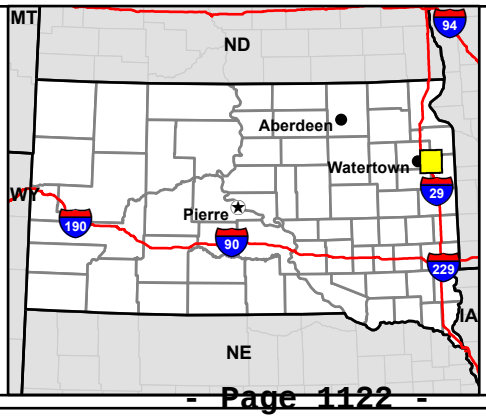
PUC Supplemental

Crowned Ridge II Wind Farm

- Primary Turbine
- Alternate Turbine
- MET Tower
- City
- Proposed Turbine Access Road
- Temporary Construction Easement (Needed for Construction)
- Collector Line
- Crane Path
- Interstate Highway
- U.S. Highway
- Substation
- O&M Facility
- Batch Plant
- Project Boundary

Land Status

- Leased, Signed



Kilometers
0 2.5 5

Miles
0 2.5 5

N
W E
S

Base Map: World Light Gray Canvas Base
Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
Codington, Deuel, and Grant Counties, South Dakota

Projection: NAD 1983 UTM Zone 14N

00857 SWCA ENVIRONMENTAL CONSULTANTS

From: Wilhelm, Tyler
To: "Luke Muller"
Cc: Bruce, Brittany
Subject: RE: Crowned Ridge / Crowned Ridge II - 200 MW Project Maps
Date: Wednesday, September 25, 2019 1:48:00 PM

Thanks Luke. We will definitely consider this venue moving forward as it is more centrally located in the project footprint.

Tyler Wilhelm
NextEra Energy Resources, LLC
Office (561) 694-3193
Cell (561) 602-3768

From: Luke Muller [mailto:luke@1stdistrict.org]
Sent: Wednesday, September 25, 2019 1:46 PM
To: Wilhelm, Tyler
Cc: Bruce, Brittany
Subject: RE: Crowned Ridge / Crowned Ridge II - 200 MW Project Maps

CAUTION - EXTERNAL EMAIL

The facility I mentioned was the "Country Road Barn" in Waverly/Watertown. They only have a facebook page, but I saw a youtube testimonial that mentioned seating for 300. Again, not advertising but it is closer to that core area.

Luke Muller
Zoning Officer
Codington County
Phone: (605) 882-6300
Zoning Officer Hours: 9:00 am to 11:00 am (Monday, Wednesday, Friday)
Email: luke@1stdistrict.org

From: Wilhelm, Tyler <Tyler.Wilhelm@nexteraenergy.com>
Sent: Wednesday, September 25, 2019 11:43 AM
To: Luke Muller <luke@1stdistrict.org>
Cc: Bruce, Brittany <Brittany.Bruce@nexteraenergy.com>
Subject: Crowned Ridge / Crowned Ridge II - 200 MW Project Maps

Luke,

As discussed on our call earlier today, please find attached the following to help visualize the current changes in play for the Crowned Ridge and Crowned Ridge 2 projects:

Crowned Ridge - 200 MW (first attachment)

- Visual representation of the 200 MW Crowned Ridge project that is under construction and to be completed December 2019

Crowned Ridge - 200 MW & 100 MW Deferral (second attachment)

- Visual representation of the 200 MW Crowned Ridge project that is under construction and to be completed December 2019; and
- Visual representation of the 100 MW that is currently being deferred and to be supplemented as future build
  - We hope to have a better line of site as to when we can supplement the 100 MW come Q1 2020

Crowned Ridge - 200 MW & 100 MW Deferral (third attachment)

- Visual representation of the 200 MW Crowned Ridge 2 project under permit application review by the South Dakota PUC;
- Visual representation of the 100 MW that is currently being deferred and to be supplemented as future build
  - We hope to have a better line of site as to when we can supplement the 100 MW come Q1 2020

For future reference you can always visit the Crowned Ridge and Crowned Ridge 2 dockets on the PUC website which includes everything filed with the PUC
Crowned Ridge 1 Wind Farm PUC Docket: https://puc.sd.gov/Dockets/Electric/2019/EL19-003.aspx
Crowned Ridge 2 Wind Farm PUC Docket: https://puc.sd.gov/Dockets/Electric/2019/EL19-027.aspx

Hope this helps paints a visual picture in the interim while we work to get you updated/fully solidified site plans for the 200 MW project scenarios.

Regards,

Tyler Wilhelm
Senior Project Manager
NextEra Energy Resources, LLC
700 Universe Boulevard
Juno Beach, FL. 33408
Office: (561) 694-3193
Tyler.Wilhelm@nee.com



From: Wilhelm, Tyler
To: "Ken Peterson"
Cc: Karen Layher; Krista Atyeo-Gortmaker; Pellman, Terence
Subject: RE: Crowned Ridge Deferred 100 MW
Date: Monday, September 23, 2019 12:55:00 PM

Ken,

Thank you for taking the time to reach out and ask the question. Landowner meetings are tentatively scheduled for October 9th and October 10th where the project team will present information and make themselves available to discuss how the 100 MW deferral impacts participating landowners on the Crowned Ridge and Crowned Ridge II projects. Project landowners will be receiving calls as well as mailed invites with the day, time, and location for the October meeting starting later this week. If you either cannot attend the October meetings or would like more information sooner than those meetings, please contact me on my cell number highlighted below.

Thanks again for reaching out and look forward to answering your questions.

Regards,

Tyler Wilhelm
NextEra Energy Resources, LLC
Office (561) 694-3193
Cell (561) 602-3768

From: Ken Peterson [mailto:ken.peterson@mcgough.com]
Sent: Saturday, September 21, 2019 5:16 PM
To: Pellman, Terence; Wilhelm, Tyler
Cc: Karen Layher; Krista Atyeo-Gortmaker
Subject: Crowned Ridge Deferred 100 MW

CAUTION - EXTERNAL EMAIL

Terry / Tyler,

I noticed this filing by Nextera with the SD PUC a couple weeks ago that you withdrew your MISO application back in August resulting in 100 MW within Grant County being dropped from the project. I'm disappointed that there has not been any communication from Nextera whatsoever regarding this change. When do you intend to notify landowners of this fairly significant change in events?

https://puc.sd.gov/commission/dockets/electric/2019/EL19-003/ltr091219.pdf

CONFIDENTIALITY NOTICE: This message is for the designated recipient only and may contain privileged, proprietary, or otherwise private information. If you have received it in error, please notify the sender immediately and delete the original. Any other use of the email by you is prohibited.

Exhibit AC-14

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	)))))	EL19-027 **APPLICANT'S RESPONSES TO STAFF'S FIRST SET OF DATA REQUESTS TO APPLICANT**

1-1) Provide copies of all data requests submitted by any intervenor to you in this proceeding and copies of all responses to those data requests. Provide this information to date and on an ongoing basis.

Response: Crowned Ridge Wind II, LLC will provide copies of all data requests submitted by any intervenor in this proceeding and provide copies of all responses to those data requests. To date, no data requests have been submitted by an intervenor.

Respondent: Miles Schumacher, Attorney

1-2) Provide copies of all pleadings in any civil appeal associated with the county permit(s) related to this project.

Response: Attachment 1 includes all pleadings in any civil appeal associated with the county permit(s) related to this project.

Respondent: Miles Schumacher, Attorney

1-3) See pages 73-76 of the Application. Did Applicant measure setback distances from property lines and rights-of-way of public roads using the height of the tower, rather than the tower and blade tip?

Response: Crowned Ridge Wind II measured setback distances from non-participating property lines and rights-of-way of public roads using the total turbine height (tower height + blade length) as required by the county setbacks. Setback distances from adjacent, participating property lines were measured using turbine blade length, given that the counties allow measurement of setback distances using turbine blade length when Crowned Ridge Wind II landowners with a turbine located on their land have entered into a wind easement.

Respondent: Tyler Wilhelm, Senior Project Manager

1-4) Confirm that the setbacks accounted for section line roads, which are defined as public highways pursuant to state law.

Response: Confirmed.

Respondent: Tyler Wilhelm, Senior Project Manager

1-5) Do the studies submitted with the Application, including but not limited to shadow and noise studies, account for the cumulative impact of both Crowned Ridge I and II and any other existing or planned project in the area?

Response: The shadow and noise studies account for the cumulative impact of both Crowned Ridge I and II as well as Deuel Harvest.

The environmental and culture studies are site specific to the project boundary for Crowned Ridge Wind II, and, therefore, do not include cumulative impacts.

Respondent: Jay Haley, Wind Engineer (sound and shadow flicker studies; Sarah Sappington, Consultant (environmental and culture studies)

1-6) Provide copies of agency communication concerning ADLS and confirmations of Determinations of No Hazard for the project.

Response: To date, there has been no communication with the Federal Aviation Administration ("FAA") concerning ADLS for the Crowned Ridge Wind II wind project. As explained in the Application at page 85, Crowned Ridge Wind II intends to apply for the use of an ADLS in the fourth quarter of 2019 once all Determinations of No Hazard have been received from the FAA.

Also, copies of the received Determinations of No Hazard are provided as Attachment 1. The remainder of the Determinations of No Hazard is expected to be received on or before December 10, 2019.

Respondent: Tyler Wilhelm, Senior Project Manager

1-7) Provide a copy of the contract/land use agreement signed by landowners, as well as any contracts that differ from the standard contract.

Response: Attachment 1 provides a public version and Attachment 2 provides confidential version of the standard wind easement agreement signed by landowners. There is no contract that differs from the standard agreement. There are, however, other types of standard agreements that pertain to collection easements, temporary construction easements, and participation agreements, which are provided in Confidential Attachment 3.

Respondent: Tyler Wilhelm, Senior Project Manager

1-8) Does Applicant offer a "good neighbor" contract? If so, provide a sample.

Response: The Applicant interprets the question to ask whether it is providing non-participants compensation through a written agreement. The Applicant has not been executing "good neighbor" agreements with non-participants. As the Project proceeds, if there a specific need to mitigate an identified impact with a non-participant, the Application may enter into an agreement related to the implementation of the mitigation.

Respondent: Tyler Wilhelm, Senior Project Manager

1-9) Provide an update on any pending easements in the project area. When will these easements be signed?

Response: There are no pending easements.

Respondent: Tyler Wilhelm, Senior Project Manager

1-10) Provide GIS shape files for the project and project facilities.

Response: Attachment 1 and Confidential Attachments 2 and 3 provide the GIS shape files for the project and project facilities.

Respondent: Sarah Sappington, Consultant

1-11) Provide the safety manuals for the 117 GE 2.3 MW and 15 GE 2.1 MW wind turbine generators.

Response: The safety manuals for the 117 GE 2.3 MW and 15 GE 2.1 MW wind turbine generators are attached as Confidential Attachment 1.

Respondent: Mark Thompson, Manager Wind Engineering

1-12) Provide a copy of the purchase and sale agreement referenced on page 1 of the Application.

Response: The purchase and sale agreement is provided as Confidential Attachment 1.

Respondent: Daryl Hart, Director Business Development

1-13) Did Applicant base its 30-hour per year shadow flicker limit on any factor other than county ordinance? If so, provide support.

Response: Yes, Crowned Ridge Wind II also based its 30-hour per year shadow flicker limit on the acceptance of this limit in the peer-reviewed scientific literature. Please see Attachment 1.

Respondent: Chris Ollson, Consultant

1-14) Has Applicant reached out to non-participating landowners with shadow flicker levels approaching the maximum to mitigate the shadow flicker? Explain.

Response: No. After the Project enters commercial operations, the Crowned Ridge Wind II operations team will conduct conversations with non-participating landowners who have concerns with shadow flicker levels, if any, and discuss possible mitigation actions.

Respondent: Tyler Wilhelm, Senior Project Manager

1-15) In the testimony of Wilhelm, he states that property rights have been obtained for 127 of the 132 turbine locations. Explain if the necessary property rights have been obtained for all other aspects of the project including but not limited to collector lines, O&M facility, and MET tower.

Response: Yes, the necessary property rights have been obtained for all proposed turbine locations and all other associated project facilities. Applicant will, however, need to obtain amendments for three existing easement agreements that will expire prior to Project's forecasted construction commencement date.

Respondent: Tyler Wilhelm, Senior Project Manager

1-16) What capacity factor was assumed when calculating the predicted tax revenue?

Response: The capacity factor is provided in Confidential Attachment 1.

Respondent: Daryl Hart, Director Business Development

1-17) Between the filing of docket EL19-016 and the current Crowned Ridge II filing, several (approximately 27) receptors depicted in the map provided with the sound study switched from participating to non-participating. Please explain the status change.

Response: The status change was due to the current Crowned Ridge Wind II facility permit application using a more current version of county parcel data, which showed a refined level of land ownership changes and parcel divisions.

Respondent: Tyler Wilhelm, Senior Project Manager

1-18) Again, refer to the map included with the sound study. The map legend identifies participating landowners in Codington County as purple and participating landowners as blue. Is there a difference in the status of the two, given there are numerous blue parcels in Codington County?

Response: The purple Codington County land parcels are those that have occupied structures on them. The blue parcels do not have occupied structures on them.

Respondent: Jay Haley, Wind Engineer

1-19) Provide a listing of receptors by number and landowner name.

Response: The list of receptors by number and landowner name is provided as Attachment 1.

Respondent: Jay Haley, Wind Engineer

1-20) Receptor CR1-C9-NP is listed in the sound study has having a sound level of 45.0. Staff research indicates the receptor is owned by a participating landowner. Has this landowner signed a waiver or confirmed to Applicant that they wish for the receptor to be treated as non-participating?

Response: No. The wind easement agreement entered into with the owner of receptor CR1-C9-NP encumbers the Northwest Quarter of Section 25, Township 118 North, Range 51 West, less and except for the approximate 7.75 acre addition which is the location of receptor CR1-C9-NP. Therefore, the wind easement area does not encumber the homestead addition where receptor CR1-C9-NP is located, which requires the receptor to be treated as a non-participating.

Respondent: Tyler Wilhelm, Senior Project Manager

1-21) Refer to pages 11 and 12 of the application. Page 11 states that the project will be up to 132 turbines. The total turbines mentioned on pages 11 and 12 are 134, including 1 alternate in Codington County. Explain what county has the other alternate turbine and why so few alternates are available for this project.

Response: As stated in the application, the project will consist of up to 132 turbine locations and one alternate turbine location located in Codington County. As explained in the application at page 20, Crowned Ridge Wind II was exploring 4-8 additional turbine locations. The supplemental testimony of Crowned Ridge Wind II due on September 20, 2019 will explain that 5 additional alternate turbine locations have passed the setback, sound, shadow flicker, environmental and culture reviews. Therefore, Crowned Ridge Wind II will have 6 alternate turbine locations, which is no longer a small number.

Respondent: Tyler Wilhelm, Senior Project Manager

1-22) Refer to page 20 of the application. Crowned Ridge says exploring the potential for 4-8 more alternates. Are the 4-8 turbines included in the sound and flicker shadow studies? When will the company determine if these turbines will be alternates for this project?

Response: The sound and shadow flicker studies filed with the application did not include the 4-8 additional alternate locations that were under consideration at that time. Crowned Ridge Wind II has completed the necessary reviews on these 4-8 additional alternate turbine locations and has decided to proceed with 5 additional alternate locations. The supplemental testimony of Crowned Ridge Wind II due on September 20, 2019 will explain which five additional alternate turbine locations were selected and the sound and shadow flicker results associated with adding the 5 additional turbine locations.

Respondent: Daryl Hart, Director Business Development

1-23) On Figure 3a, indicate which 34 turbine locations will use LNTE blades.

Response: Since the filing of the application, Crowned Ridge Wind II has decided to use LNTE blades on all wind turbines

Respondent: Tyler Wilhelm, Senior Project Manager

1-24) Refer to ARSD 20:10:22:12(2). Provide an evaluation of alternative site considered by the applicant. The application only discusses various site configurations within the project area.

Response: Crowned Ridge Wind II has been working for 10 years to evaluate alternative sites, and refine the Project Area. On page 27 of the application, there is an overview of alternative sites considered. More specifically, site evaluations were conducted on alternative locations to the north, south, east, and west of the current Project Area, and each alternative site was not pursued for the following reasons.

To the north of the Project Area, during the early development of the project, a site was considered north of the towns Kranzburg and Goodwin. At that time, the Project was comprised of a smaller Project Area to support a potential power purchase agreement of approximately 200 MW. In 2017, Crowned Ridge Wind II, however, entered into a purchase and sale agreement for 300 MW with Northern States Power, which required

Crowned Ridge Wind II to expand the Project Area to meet the increased name plate capacity. Alternate sites for 300 MWs to the north of the current Project Area were not viable due to the presence and proximity of competing wind projects and the Crowned Ridge Wind, LLC (CRW) wind project. For example, siting turbines too close to a competitor's project or CRW increases the cumulative impacts from sound and shadow flicker and hinders the turbines ability to operate without undue wake.

Alternative sites to the south of the current Project Area were also evaluated and it was determined that shifting further south would result in increased line losses. Line losses occur when turbines are sited greater distances from a project's collector substation, because it requires longer underground collector lines, and, therefore, energy is lost between the turbine and the collector substation. Shifting further south would also likely have required a longer generation tie line.

Evaluation of alternative sites to the east of the Project Area showed that the Project Area would be sited closer to constraints associated with undisturbed native grasslands, the Lake Park districts, identified eagle nests, as well as competitor wind farm easement agreements. Considerations of alternative sites to the west were rejected as being too close to interstate I-29 and the city of Watertown.

Respondent: Tyler Wilhelm, Senior Project Manager

1-25) Refer to page 29 of the application. The only project identified by the applicant was Dakota Range I. Are Crowned Ridge I and Deuel Harvest included in all models and analysis in this docket as well? If so, explain why only Dakota Range I is identified on page 29.

Response: The introductory language on page 29 of the application provided an overview of the project area, and mentioned Dakota Range I as an example. More specifically, the Sound Report, Appendix I at pages 1, 8-9 identified that the Crowned Ridge Wind I and Deuel Harvest turbines were included in the cumulative sound impact analysis, while Dakota Range turbines were not included because they are too far away to have any significant cumulative impacts on the Crowned Ridge II wind farm. Also, Shadow Flicker Report, Appendix J, at pages 1 and 8 explains that only Crowned Ridge Wind I was included in the cumulative impact analysis, because the Deuel Harvest and Dakota Range turbines are too far away to have any significant cumulative shadow flicker impacts on the Crowned Ridge Wind II project. Turbines that are more than 2 km (1.25 mi.) away from a receptor will have minimal (less than 30 dBA) noise impacts and no shadow flicker impacts.

The two figures below demonstrate the noise and shadow flicker levels as a function of distance from the wind turbine.

Figure 1 Noise levels as a function of distance from the source wind turbine

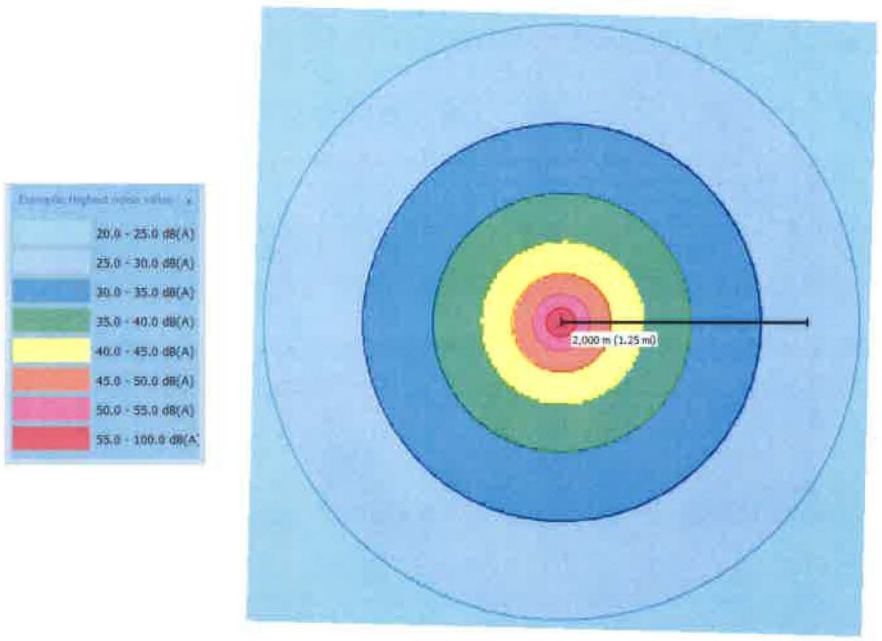
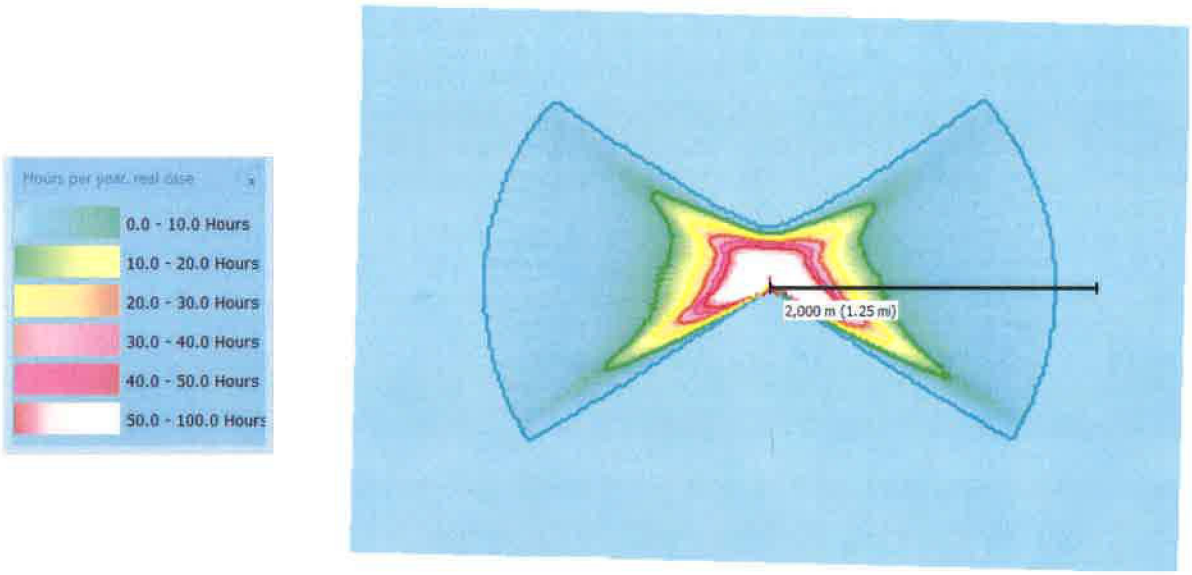


Figure 2 Shadow flicker levels as a function of distance from the source wind turbine.



Also see response to Data Request 1-5.

Respondent: Jay Haley, Wind Engineer

1-26) Refer to page 40 of the application and ARSD 20:10:22:15(4), since the applicant will drill for well water, provide the "specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water."

Response: Page 40 of the application states that Crowned Ridge Wind II may explore the need to drill for well water. Since the filing of the Application, Crowned Ridge Wind II has determined that it will not need to drill for well water. Therefore, there is no additional information to be provided on drilling for well water.

Respondent: Mark Thompson, Manager Wind Engineering

1-27) Were all the surveys in this docket, including but not limited to avian surveys, bat surveys, etc., completed throughout the entire project area?

Response: Yes, the surveys completed and study areas used for each natural resource (e.g., avian, bats) survey are representative of the entire Project Area. Surveys and study areas covered all potential areas of impact and are shown in the natural resources surveys reports in Appendices D (Bat Acoustic Survey Report); E (Bat Habitat Assessment Report); F (Dakota Skipper-Poweshiek Skipperling Survey Report); G (Raptor Nest Survey Report); and H (Avian Use Survey Report).

Respondent: Sarah Sappington, Consultant

1-28) Refer to page 50 of the application. Have all surveys been completed and all amendments/supplements necessary been filed?

Response: The aquatic resources surveys have been completed for all areas of potential impacts described in the application. As described in the application, page 50, Crowned Ridge Wind II is completing an amendment to the aquatic resources report provided as Appendix C to the application to incorporate survey results for efforts that have occurred since preparation of the final application, and the amended report will be submitted to the Commission once complete. Crowned Ridge Wind II expects to file the report with the Commission by November 15, 2019.

Respondent: Sarah Sappington, Consultant

1-29) Refer to page 60 of the application. Have all turbine foundations been located to avoid placement within the wetlands deemed suitable for whooping cranes? If not, which turbines are located in suitable wetlands.

Response: Yes. Turbines have been sited outside of all wetlands, including any wetlands that may provide potentially suitable whooping crane (*Grus americana*) stopover habitat.

Respondent: Sarah Sappington, Consultant

1-30) What is the distance of the closest turbine to each Lek in the project area?

Response: Turbine number CRII-102 is located approximately 0.33 miles southeast of the only documented prairie grouse lek within the Project Area.

Respondent: Sarah Sappington, Consultant

1-31) Have any Lek surveys been completed since 2016?

Response: No lek surveys have been completed since 2016. As described in the application, section 11.3.1.3.3, throughout agency coordination on the Project Area, the Applicant requested and received lek occurrence data from the South Dakota Game Fish & Parks (SDGFP) (see Appendix B). These locations were documented spatially in Crowned Ridge Wind II's project planning databases to ensure consideration during infrastructure siting. The data provided by SDGFP showed only one lek recorded in 2017 within the Project Area.

Respondent: Sarah Sappington, Consultant

1-32) Per ARSD 20:10:22:17, provide the information as required by this rule as it pertains to aquatic flora.

Response: Crowned Ridge Wind II provided an Aquatic Resources Summary Report as Appendix C of its application and identified the wetland vegetation and wetland hydrology on page 15-16. The application also addresses aquatic ecosystems in Section 12.0, including the impacts and mitigation to aquatic ecosystems in Section 12.2.

Respondent: Sarah Sappington, Consultant

1-33) Refer to ARSD 20:10:22:18(3) and (4), provide information specifically pertaining to those two sections of the South Dakota administrative rules.

Response:

Information and analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming is set forth in Sections 9, 11, and 13 of the application. As summarized in Table 11.1.1 and Figure 13 of the application, the predominant cover type within the Project Area is agricultural (67.21%) followed by grass/pasture (25.93 %), while the predominant land cover type in the Project Construction Easement is agricultural (73.79 %) followed by grass/pasture (21.82 %). Cropland provides minimal habitat for most terrestrial species, though it may provide a food source and cover for some. As summarized in Table 9.2.1.3, areas of prime farmland constitute 44,540.3 acres (66.5%) of the Project Area and 1,401.3 acres (72.3%) of the Project Construction Easement.

Permanent impacts to prime farmland areas after construction has been completed is anticipated to be approximately 56.9 acres (0.13%, Table 9.2) of the Project Area. These permanent impacts represent land that is permanently taken out of potential agricultural production, which is a low percentage, and, therefore, impacts to land use for rural life and farming are anticipated to be minimal. Mitigation measure related to land use are set forth in Sections 9.2.4, 11.1.2, and 13.1.2.

Respondent: Sarah Sappington, Consultant

1-34) Refer to ARSD 20:10:22:20, have any variances been permitted for this project, specifically water quality variances?

Response: No water quality variances have been permitted for the project nor are any expected to be needed for the project.

Respondent: Sarah Sappington, Consultant

1-35) Refer to ARSD 20:10:22:21, have any variances been permitted for this project, specifically air quality variances?

Response: No air quality variances have been permitted for the project nor are any expected to be needed for the project.

Respondent: Sarah Sappington, Consultant

1-36) Refer to Section 17 of the application. Provide an update on if any new leases have been signed or if any current leases have expired since the filing of this permit.

Response: Since the filing of the application five new easement agreements have been obtained and no existing easement agreements have expired. The new easement agreements obtained support three turbine locations, two collection corridors, and one temporary access road needed for construction.

Respondent: Tyler Wilhelm, Senior Project Manager

1-37) Does the applicant have an Unanticipated Discovery Plan in place in the event any cultural resources or human remains are discovered during construction? If not, will a plan be created prior to the start of construction if a permit is granted?

Response: An Unanticipated Discovery Plan has been drafted and will be put in place prior to construction commencing on the project in the event that any cultural resources or human remains are discovered during construction.

Respondent: Sarah Sappington, Consultant

1-38) Refer to ARSD 20:10:22:24, provide information pertaining to each portion of this rule including but not limited to estimated annual employment expenditures during construction, data related to the first 10 years of operation in one-year intervals, etc.

Response: In the application at page 105, Crowned Ridge Wind II explains that it expects to create 250 temporary construction jobs. The below table provides job

classifications and the approximate hour salary. Given that the duration of construction is less than a year, there is no annual estimate. However, during the 5-9 months of construction, the estimated employment expenditures are between $10 and $15 million.

In addition, on page 105 of the application, Crowned Ridge Wind II indicates that it expects to hire 7-12 permanent operation and maintenance workers. As elaborated on in witness Thompson's testimony at pages 9-10, these jobs will included wind technicians, wind technician leaders, and a wind site manager. The jobs are also included in the below table. The annual estimate of expenditures on the permanent operation and maintenance jobs over each of the first ten years of commercial operations is $655,000 annually.

To seek qualified local labor for construction and operation and maintenance, Crowned Ridge Wind II will conduct local job fairs. Based on the securing of local labor for the construction of Crowned Ridge Wind, the assessment on the use of local labor includes the likely hiring of 10 local construction workers to be employed as heavy equipment operators and general labors. It is not expected that any specialized training will be required prior to hiring these workers.

Project Phase	Job Title	Affiliation	Number On-Site	Approximate Hourly Salary
Construction	Site Superintendent	Crowned Ridge Wind II	1	$75
Construction	Civil Superintendent	Crowned Ridge Wind II	1	$50
Construction	Electrical Superintendent	Crowned Ridge Wind II	1	$50
Construction	Site Administrator	Crowned Ridge Wind II	1	$30
Construction	Tower Climbers	Crowned Ridge Wind II	2	$90
Construction	Concrete Crews	General Contractor	18 (6 per crew)	$15
Construction	Re-Bar Crews	General Contractor	18 (6 per crew)	$22
Construction	Crane Crews	General Contractor	15 (5 per crew)	$30
Construction	Main Erection Crane	General Contractor	15 (5 per crew)	$30
Construction	Laborers	General Contractor	100	$15
Construction	Office Staff	General Contractor	8	$20
Construction	Electricians	Subcontractor	20	$30
Construction	Heavy Equipment Operators	Subcontractor	20	$20

Construction	Laborers	Subcontractor	30	$15
Operation	Facility Manager	Xcel Operator	1	$100,000/year
Operation	Deputy Facility Manager	Xcel Operator	1	$90,000/year
Operation	Wind Turbine Technicians	Xcel Operator	8	$25/hour
Operation	Lead Technician	Xcel Operator	1	$34/hour
Operation	Site Admin	Xcel Operator	1	$12/hour

Respondent: Daryl Hart, Director Business Development

1-39) Refer to ARSD 20:10:22:33, provide the amount of land irretrievably committed for this project.

Response: In the application, Table 11.3 summarizes permanent impacts of the Project as a total of 76.2 acres.

Respondent: Sarah Sappington, Consultant

1-40) Will Crowned Ridge II commit to a decommissioning plan and condition similar to that as ordered in EL18-003? If not, explain in detail why. The decommissioning condition in docket EL18-003 states:

Response: Yes, Crowned Ridge Wind II is willing to commit to a decommissioning plan and condition similar to that as ordered in EL18-003.

Respondent: Daryl Hart, Director Business Development

1-41) Refer to the Appendix N. On page 13 it says that a decommissioning plan is required to be filed for Board approval in Grant County at least 30 days prior to construction.

a. Has the company filed this plan with Grant County? If not, when will the decommissioning plan be filed?
b. Will the decommissioning plan filed with Grant County vary in any way from the plan filed in this application?

Response:

a. Yes.

b. Yes, the decommissioning plan filed with Grant County also considers the decommissioning requirements for the Crowned Ridge Wind, LLC 230 kV transmission line, reactive compensation substation, and other associated transmission facilities located in Grant County and approved in Docket El-17-050. These transmission facilities are not under review in this docket, and, therefore, would not be part of the decommissioning plan filed as part of the application in this docket.

Respondent: Daryl Hart, Director Business Development and

Tyler Wilhelm, Senior Project Manager

1-42) Describe the technology that will be employed at each turbine to detect and assess ice buildup.

Response: The technology that will be employed at each turbine to detect and assess ice buildup is described on pages 7-8 of Mark Thompson's July 9, 2019 direct testimony.

Respondent: Mark Thompson, Manager Wind Engineering

1-43) Refer to the sound study in Appendix I and the flicker study in Appendix J, on the map in Appendix A of the studies, provide where each intervenor is located. In the results table in Appendix C of the studies, provide which receptor ID belongs to each intervenor.

Response: A map showing the locations of the intervenors is included as Attachment 1. The receptor ID for each intervenor is as follows:

Intervenors for Crowned Ridge II						Dist. To Nearest
			UTM NAD83 Z14	Noise	Shadow	Turbine
Receptor #	Name	Easting	Northing	(dBA)	(hr/yr)	(feet)
CR1-C29-NP	CHRISTENSON AMBER KAYE	666571.9	4988867.1	38.6	6:56	4,675
CR1-G70-NP *	ROBISH ALLEN E & SHIRLEY	677464.5	4991043.1	30.0	0:00	12,651
CR1-G600-NP *	MOGEN PETER & KRISTI	674300.7	5005772.8	28.7	0:00	13,166
CR2-D220-NP	EHLEBRACHT GARRY & CRYAN JODY	670260.3	4967728.0	43.6	3:14	2,211
CR2-D221-NP	GREBER STEVEN W & GREBER MARY C	670351.1	4973543.3	43.1	14:04	2,041
CR2-D222-NP	RALL RICHARD & RALL AMY	672080.5	4973212.3	42.0	15:12	2,264
CR2-D223-NP	KRANZ BRIAN & KRANZ LARETTA TRUST	670227.3	4967454.6	42.5	3:04	2,749

* Not included in the original appendix tables

Some of the data in the above table is outdated due to array changes that have been made since filing. The table below shows the more current information.

Intervenors for Crowned Ridge II						Dist. To Nearest
			UTM NAD83 Z14	Noise	Shadow	Turbine
Receptor #	Name	Easting	Northing	(dBA)	(hr/yr)	(feet)
CR1-C29-NP	CHRISTENSON AMBER KAYE	666571.9	4988867.1	41.2	6:56	2,451
CR1-G70-NP	ROBISH ALLEN E & SHIRLEY	677464.5	4991043.1	30.0	0:00	12,651
CR1-G600-NP	MOGEN PETER & KRISTI	674300.7	5005772.8	28.8	0:00	13,166
CR2-D220-NP	EHLEBRACHT GARRY & CRYAN JODY	670260.3	4967728.0	43.8	3:14	2,211
CR2-D221-NP	GREBER STEVEN W & GREBER MARY C	670351.1	4973543.3	44.5	14:04	2,041
CR2-D222-NP	RALL RICHARD & RALL AMY	672080.5	4973212.3	42.1	15:12	2,264
CR2-D223-NP	KRANZ BRIAN & KRANZ LARETTA TRUST	670227.3	4967454.6	42.9	3:04	2,749

Respondent: Jay Haley, Wind Engineer

1-44) Have all processes related to getting approval for interconnection to the MISO system been completed and costs determined? If no, when will interconnection costs and the interconnection approval process be completed?

Response: For the first 200 megawatts (MW) of Crowned Ridge Wind II, all MISO approvals, studies, and interconnect costs have been provided. Crowned Ridge Wind II has executed a Generation Interconnection Agreement for the first 200 MWs. The last 100 MWs is currently being studied by MISO and SPP in queue position J722. The preliminary studies and associated interconnection costs for queue position J722 will be released in the first quarter of 2020.

Respondent: Daryl Hart, Director Business Development

1-45) Has Crowned Ridge II withdrawn any of its interconnection queue positions as a result of the affected systems costs recently provided by MISO? If yes, please explain how much interconnection capacity is available for Crowned Ridge II and what impact the available capacity has on the proposed project.

Response: Crowned Ridge Wind II withdrew MISO queue position J721 in the MISO DPP-FEB-2017 West cycle, but it retained its queue position J722 in the MISO DPP-AUG-2017 West cycle for the last 100 MWs. Also, see response to Data Request 1-44.

Respondent: Daryl Hart, Director Business Development

1-46) How many of the 7-12 permanent jobs will be located within the state of South Dakota?

Response: All of the 7-12 permanent jobs will be located within the state of South Dakota.

Respondent: Mark Thompson, Manager Wind Engineering

Exhibit AC-15

Conditional Use Permit Application
Grant County, SD
Crowned Ridge Wind, LLC
Crowned Ridge Wind II, LLC

Conditional Use Permit Application
Grant County, SD
Crowned Ridge Wind, LLC
Crowned Ridge Wind II, LLC

GRANT COUNTY NOTICE OF APPEAL
CONDITIONAL USE PERMIT/VARIANCE APPLICATION

DATE: September 17th, 2018 PERMIT NUMBER _____

APPLICANT (PRINT): Crowned Ridge Wind, LLC and Crowned Ridge Wind II, LLC PHONE: 561-694-3913
ADDRESS (PRINT): 700 Universe Blvd., Juno Beach, Florida, 33408
OWNER (PRINT):_____PHONE :_____
IF DIFFERENT THAN APPLICANT
ADDRESS (PRINT):_____

I/WE, THE UNDER SIGNED, ~~DO HEREBY PETITION~~ THE BOARD OF ADJUSTMENT OF GRANT COUNTY, SOUTH DAKOTA, TO ISSUE A CONDITIONAL USE PERMIT OR VARIANCE FOR
(CIRCLE APPROPRIATE REQUEST)

THE PROPERTY DESCRIBED AS: LEGAL DESCRIPTION (PRINT) _____

Crowned Ridge Wind, LLC and Crowned Ridge Wind II, LLC

PARCEL NUMBER: 194 Participating Parcels

SITE STREET ADDRESS: N/A

EXISTING LAND USE: Agriculture EXISTING ZONING: (A)G C/I PD NR
(CIRCLE ONE)

SIZE OF PARCEL: ACRES 11,090.049 LOT DIMENSIONS: WIDTH (FRONTAGE)_____DEPTH _____

SURROUNDING LAND USE: NORTH: Shallow Aquifer
SOUTH: Stability
EAST: Stability
WEST: Stability

CONDITIONAL USE PERMIT:
PLEASE DESCRIBE WHAT YOU PROPOSE TO DO AND WHY YOU ARE SEEKING A CONDITIONAL USE PERMIT (ATTACH A SEPARATE SHEET OF PAPER IF NECESSARY). A Conditional Use Permit for a Wind Energy System is requested for construction and operation of the 72.8 MW Crowned Ridge Wind and Crowned Ridge II Wind Farms. Facilities will include approximately 32 turbines.

VARIANCE:
IF YOU ARE SEEKING A VARIANCE PLEASE PROVIDE A BRIEF STATEMENT OF THE VARIANCE DESIRED AND PLEASE STATE THE HARDSHIP REQUIRING RELIEF. (PROOF OF HARDSHIP IS ON THE APPLICANT – HARDSHIP EXAMPLES ARE ODD SIZE OR SHAPE OF THE LOT, UNUSUAL TOPOGRAPHY, ETC. ATTACH A SEPARATE SHEET OF PAPER IF NECESSARY).

SIGNATURE OF APPLICANT: Tyler Wilhelm
SIGNATURE OF OWNER (IF DIFFERENT THAN APPLICANT): _____

NOTE: A SKETCH OF PROPOSED PROPERTY SHALL ACCOMPANY THIS APPLICATION, SHOWING THE FOLLOWING:
1. NORTH DIRECTION
2. DIMENSIONS OF PROPOSED STRUCTURE
3. STREET NAMES
4. OTHER INFORMATION AS MAY BE REQUESTED
5. LOCATION OF PROPOSED STRUCTURE ON LOT
6. DIMENSIONS OF FRONT AND SIDE SETBACKS
7. LOCATION OF ADJACENT EXISTING BUILDINGS

THE BOARD OF ADJUSTMENT MAY REQUIRE THAT SUCH PLANS BE PREPARED BY A REGISTERED ENGINEER OR LAND SURVEYOR.

DATE FILED WITH ZONING OFFICER 9/17/2018 FEE PAID (NON-REFUNDABLE) (Y)N $200.00
HEARING DATE & TIME_____ACTION BY BOARD _____

Conditions of permit:

008607

THIS VOID IF PRINTED ON A GREEN BACKGROUND WITH AN ARTIFICIAL WATERMARK ON THE BACK - HOLD AT AN ANGLE TO VIEW
WARNING: Original document has a reflective watermark on reverse side. Hold at an angle to view.

64-1278
611

Crowned Ridge Wind II LLC
700 Universe Blvd
Juno Beach, FL 33408

BANK OF AMERICA, NA

Check Date: **08/13/2018**

Check No. **5000000100**

TWO HUNDRED DOLLARS

$200.00

Void after 180 days

Crowned Ridge Wind II LLC

PAY TO THE ORDER OF

GRANT COUNTY
210 E 5TH AVENUE
MILBANK SD 57252-2433

SIGNATURE HAS A COLORED BACKGROUND • BORDER CONTAINS MICROPRINTING

Form 617-G

Job No. 555948

⑈5000000100⑈ ⑆061112788⑆ 335 998 1282⑈

Crowned Ridge Wind II LLC (6403 000013)
Vendor Name: GRANT COUNTY

Check Date : 08/13/2018
Check Number: 5000000100

Invoice Number	Invoice Date	Document Header Text	SAP Document	Gross Amount	Discount	Net Amount
08/09/2018	08/09/2018	CROWNED RIDGE WIND II APP	1900000032	200.00	0.00	200.00
		Check Total.....				**$200.00**

008608

September 17, 2018

Krista Atyeo-Gortmaker
Grant County Planning & Zoning
210 East 5th Avenue
Milbank, SD 57252-2499

Re: Grant County – Conditional Use Permit Application for Crowned Ridge Wind, LLC and Crowned Ridge Wind II, LLC

Dear Mrs. Atyeo-Gortmaker,

Crowned Ridge Wind, LLC & Crowned Ridge Wind II, LLC respectfully requests your review and consideration of the enclosed application for a Conditional Use Permit Section (§)504 to construct and operate an Energy System (WES) in Grant County §1211.

Enclosed with this letter for the application is a participating property owner list, corresponding map, and a project overview. Also included are all maps, plans, studies, reports, and analyses required for submittal per §1211 Energy System (WES) Requirements of the Grant County Ordinance [Ord. 2004-1].

Please do not hesitate to contact me if you have any questions or concerns.

Sincerely,

Tyler Wilhelm
Project Manager, Renewable Development
Crowned Ridge Wind, LLC
Crowned Ridge Wind II, LLC
(561) 694-3193
Tyler.Wilhelm@NextEraEnergy.com

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Appendix J: Shadow Flicker & Sound Pressure Report
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Appendix L: Soil Erosion
Appendix M: Environmental Consultation

I. PROJECT INTRODUCTION | Grant County Conditional Land Use Permit Application

Crowned Ridge Wind, LLC and Crowned Ridge Wind II, LLC, (together "*Crowned Ridge*"), Delaware limited liability companies, wholly owned, indirect subsidiary of NextEra Energy Resources, LLC ("*NextEra Energy Resources*"), propose to construct the Crowned Ridge Wind and Crowned Ridge Wind II wind energy facilities, (the "Facility") in Grant, Deuel, and Codington Counties, South Dakota. The portion of the Facility located in Grant County will include approximately 32 wind turbines, totaling approximately 72.8 megawatts ("*MW*"), associated transmission and operation facilities.

NextEra Energy Resources is North America's largest producer of wind energy with 130 wind facilities in operation throughout 32 states and Canada, totaling more than 21,000 MW of wind power. NextEra Energy Resources added over 1,000 MW of new wind generation to its portfolio in 2017. Currently, NextEra Energy Resources portfolio of facilities totals 21,000 net megawatts of generating capacity from power plants operating in 32 states and Canada.

As shown in this Application, Crowned Ridge has been diligent in designing the Facility which meets or exceeds the requirements of the Grant County Wind Energy System Requirements §1211 Energy System (WES) Requirements.

This Application is in response to the Grant County Zoning Ordinance and is outlined accordingly. A section for "Additional Information" has also been included within this application.

Project Developer Contact:
Tyler Wilhelm
Crowned Ridge Wind, LLC
Crowned Ridge Wind II, LLC
561-694-3193
Tyler.Wilhelm@NextEraEnergy.com

II. WIND ENERGY SYSTEM | Conditional Land Use Permit Requirements

Crowned Ridge adheres to the following *Wind Energy System* requirements, as outlined in §1211. Energy System (WES) Requirements of the Grant County Zoning Ordinance.

1) APPLICANT IDENTIFICATION

Permittee:

Crowned Ridge Wind, LLC, and
Crowned Ridge Wind II, LLC
700 Universe Boulevard Juno Beach, Florida 33408
(561) 694 – 3193; (561) 694 – 3604
Tyler.Wilhelm@NextEraEnergy.com ;
Jamie.Gentile@NextEraEnergy.com

2) PROJECT DESCRIPTION

The facility will be located between 158th street to the north and 166th street to the south. The westernmost extent of the Facility is 461st street and 472nd avenue to the east. The portion of the facility proposed in Grant County will include approximately 32 turbine locations (including alternate turbines) and associated transmission and operation facilities. The Facility is located within the townships of Mazeppa, Stockholm, and Troy, and contains approximately 11,090.049 acres of leased land.

Approximately 450 construction workers will proudly be supported during the construction phase of the Facility. Local businesses, including those who participate in providing construction materials, housing, food, recreation, and day to day necessities, will benefit from this temporary increase in personnel.

Table 1.0 – Wind Turbine Specifications

Manufacturer	Turbine Name	Hub Height	Rotor Diameter	Tip Height	MW Rating	Turbines Installed
General Electric	GE 2.3 - 116	90 M (~295 FT)	116 M (~380 FT)	148 M (~485 FT)	2.3	30
General Electric	GE 2.1 - 116	80 M (~262 FT)	116 M (~380 FT)	138 M (~452 FT)	2.1	1
General Electric	GE 1.7 - 116	80 M (~262 FT)	103 M (~338 FT)	131.5 M (~432 FT)	1.7	1

Legal Description of Property
See Parcel Exhibit Map & Parcel List in **Appendix A & Appendix E.**

Construction Schedule
Assuming all permits are issued, the below table depicts an anticipated schedule outlining major Crowned Ridge milestones.

CROWNED RIDGE Energy Center Milestones	
Break Ground	Post Approval, 2019
Road Work & Collection	Spring, 2019
Turbine Delivery Commencement	Summer, 2019
Substation Energization	Fall, 2019
Commercial Operation Date	Winter, 2019

Crowned Ridge will continue to update the anticipated construction table as needed and submit a finalized construction schedule prior to construction.

3) SITE PLAN

The Facility site plan ("site plan") can be found in **Appendix F**.

The site plan, which includes maps showing the physical features and land uses of the project area, include the following:

a) The project area boundaries.
b) The locations and dimensions of all existing and proposed Wind Energy Systems.
c) Existing topography.
d) All new infrastructures above ground related to the Facility.
e) Existing occupied residential structures, businesses, churches, and buildings owned/maintained by a governmental entity.

4) SOUND PRESSURE LEVEL

A copy of the Sound Pressure Level Report can be found in **Appendix J.**

5) CERTIFICATIONS

Crowned Ridge will comply with all applicable federal, state, and local laws and regulations and will obtain all required federal, state, and local approvals, licenses, permits or variances for the proposed wind project prior to the date of construction. Crowned Ridge performs a systematic evaluation of its wind projects to ensure they are sited in an environmentally responsible manner and are in compliance with all applicable local, state and federal laws and regulations.

The following list represents permits and approvals being pursued, as part of this Facility, pertaining to Grant County:

Federal/State Permits:

1. Federal Aviation Administration (FAA) Determinations of No Hazard for turbine and permanent MET tower locations.
2. United States Army Corps of Engineers, Nationwide Permit under §404 of the Clean Water Act (subject to §401 state certification), if necessary.
3. Coordination with the United States Fish and Wildlife Service for federal coordination under the voluntary Land Based Wind Siting Guidelines and state permitting requirements.
4. South Dakota Public Utilities Commission (PUC) Permit for the construction and operation of a Wind Energy Facility.
5. South Dakota Public Utilities Commission (PUC) Permit for the construction and operation of a Transmission Facility.
6. Concurrence from the State Historic Preservation Office (SHPO) for state PUC permitting.
7. South Dakota Department of Environment and Natural Resources potential permits:
    a. Concrete Batch Plant Air Permit - if required.
    b. General Permit for Storm Water Discharges.
    c. §401 Water Quality Certification - if required separately.
8. South Dakota Department of Transportation, Highway Access/Approach Permit- if applicable.
9. South Dakota Department of Transportation, Utility Permit if applicable.
10. South Dakota Department of Transportation, Division of Highway Patrol – Oversized and/or Overweight Permit/Trip Permit/Fuel Permit.

Local Permits:

1. Land use or zoning regulations and permitting.
2. Conditional Use Permit.
3. Heavy Haul Road Agreement.
4. Road Crossing Agreement.
5. Right-of-Way Permit.
6. Road Use Agreement.
7. Pipeline Crossing Permit.
8. Utility Crossing Agreement.
9. Railroad Crossing Agreement.

10. Building Permit(s) (including, but not limited to, turbine foundation, substation and transmission line).
11. Turning and Radii Permits.
12. Operation and Maintenance ("*O&M*") Building Permits.
13. Any/all temporary laydown trailer building permits, as required.
14. Transportation plan/permit for contractor provided material and equipment, as required.

6) SHADOW FLICKER REPORT

A copy of the Shadow Flicker Report can be found in **Appendix J**.

7) DECOMMISSIONING SUMMARY

The Decommissioning summary can be found in **Appendix K.**

8) ECONOMIC BENEFITS

Construction of the Facility is expected to directly employ approximately 450 individuals on-site including construction workers, engineers, electricians, truck and tractor drivers, environmental consultants, and a number of other contractors and service providers. This estimate represents the number of people expected to work on-site during the construction phase.

Crowned Ridge continues to invest in the people of South Dakota, as evidenced by the Aberdeen manufacturing plant, which builds wind turbines and was due to close, and was kept open. This saved local jobs, displaying a positive form of economic investment in South Dakota's wind industry. Construction of the Facility is also expected to, in part, directly employ workers from Grant and neighboring Counties on-site during the construction period. On-site jobs will include those associated with site work, foundations, electrical, tower erection, and other associated labor needed to construct the Facility.

Construction of the Facility would also support economic activity elsewhere in Grant County and the State of South Dakota. Indirect supply-chain impacts would support several hundred jobs in South Dakota, with the majority of these jobs resulting from in-state expenditures on materials, specifically concrete, rebar, equipment, roads, and site preparation. Hotels, motels, restaurants, gas stations, pharmacies, grocery stores, hardware stores, machine shops, electrical supply companies, repair firms, equipment rental companies, and other local businesses would also potentially see an increase in demand for their goods and services.

Additionally, lease payments to landowners will generate annual benefits to the local economy over the life of the Facility. These payments represent a net increase in income for the landowner. Each turbine occupies a relatively small footprint when compared to the site as a whole, and landowners can continue farming and livestock operations on their property.

Direct employment, local O&M expenditures, lease payments would all support indirect and induced employment and income elsewhere in Grant County and the state as a whole. These benefits would be smaller than the construction-related benefits, but would occur each year and would likely gradually increase over time.

Overall, construction related benefits in Grant County would be smaller than the statewide impacts, reflecting the size of the local economy, but these jobs would make an important short-term contribution to the Grant County economy, generating a substantial positive impact to local businesses.

Operation

Once the construction phase is complete, operation and maintenance of the project will continue to contribute to the local economy. Crowned Ridge anticipates that operation of the Facility will provide direct employment for approximately seven to twelve (7-12) workers. In addition, project related O&M expenditures will generate economic benefits in the local economy. Typical local O&M related expenditures include vehicle related expenditures, such as fuel costs, site maintenance, replacement parts and equipment, and miscellaneous supplies.

9) LOCAL CONTRIBUTIONS

The goal of this proposed Community Outreach Plan is guided by Crowned Ridge to serve as the first and best source of information about this project, to give citizens and stakeholders an opportunity to both learn about and participate in its development. The Crowned Ridge Community Outreach Plan includes the following components:

- Conduct public open houses in the Project Area; and
- Create and distribute project fact sheets and updates that can be shared with citizens; and
- Conduct interviews and editorial board meeting(s) with local media; and
- Meet with stakeholders and community organizations in small-group settings, as needed, and
- Support local organizations through donations and sponsorships.

Public Open Houses

On November 16, 2017, Crowned Ridge hosted an open house at the Watertown Event Center in Watertown, South Dakota. Approximately 20 subject matter experts from Crowned Ridge were available to the local residents. The meeting featured poster displays on wind energy and the Facility. One-on-one and small group informational discussions took place throughout the duration of the open house, which provided opportunities for attendees to gain information about the Facility, have their questions addressed, and provide input to Crowned Ridge representatives.

Crowned Ridge notified landowners and stakeholders in the Facility area individually by mailing post cards announcing the open house and placed a notification of the open house in the Watertown Public Opinion.

Project fact sheet, brochures and mailings

Crowned Ridge has created a fact sheet detailing the location and specifications of the proposed Crowned Ridge Wind Energy Centers, including its positive economic impact on the local community. A brochure has been created that includes an explanation of how wind energy technology works to generate renewable energy. This information, as well as facility updates, were provided at the open house and other scheduled meetings with local stakeholders.

Conduct editorial board meeting(s) with local media

Crowned Ridge recognizes citizens look to a variety of sources, including local media, for information. As such, members of the Crowned Ridge development and communications team have made, and continue to make ourselves available for media interviews and, if available, an editorial board session with the local newspapers. This session would serve as a forum for reporters and editors to ask questions and for us to share information about the Crowned Ridge to help keep citizens informed throughout the development process.

Meet with stakeholders and organizations in small-group settings

Crowned Ridge has met with, and will continue to meet with community organizations and stakeholders in small-group settings, as needed. The purpose of these smaller meetings is to answer individual questions that may be of interest to civic groups and organizations. Our development team has shared Facility fact sheets and presentations about the proposed Crowned Ridge Wind Energy Centers.

Support local organizations through donations and sponsorships

Since 2016, Crowned Ridge has been a sponsor of the Crystal Springs Rodeo in Clear Lake, SD. In 2017 and 2018, we were the exclusive sponsor of the Xtreme Bulls competition and plan to continue this sponsorship for many years. Each year at the rodeo, members of our team were on hand to talk to guests, share information about our company, hand out bandanas to children and families who attended the event, and conduct interviews with a local radio station.

Crowned Ridge has partnered with a K-12 organization, Wind for Schools, that travels the state teaching students about wind energy. The donation given by Crowned Ridge, will be matched at the state level, further benefiting students in South Dakota. Renewable energy jobs are among the fastest growing jobs in America, according to the U.S. Bureau of Labor Statistics. By helping to integrate renewable energy into science curriculums, we are helping prepare students for potential careers in a growing industry.

10) CULTURAL RESOURCES

Multiple tribes were contacted and are engaged in identifying tribal resources in the Facility area. Coordinated by the Tribal Historic Preservation Office from Sisseton Wahpeton Oyate, tribal representatives from Sisseton Wahpeton Oyate, Yankton Sioux, Spirit Lake Nation and Crow Creek Sioux have been involved in supporting micrositing and surveys.

Level III field surveys using pedestrian transects surveys have been conducted in multiple mobilizations and are currently on-going for archaeological, historical, and tribal resources within areas potentially affected by construction including turbine foundations, underground collection, access roads, substations, and turning radii. The Level III field survey is being performed jointly with tribal members from the Sisseton Wahpeton Oyate, Yankton Sioux, and Spirit Lake Nation selected to represent those tribes in identifying significant tribal resources are led by archaeologists meeting the U.S. Secretary of the Interior's Professional Qualification Standards.

All tribal sites, which are represented by rock cairns, alignments, and other traditionally recognized features on the landscape, are considered important to the tribes and will be considered for avoidance during the design process.

Avoidance of Potential Impacts

Planned construction activities for the Project may occur within the vicinity of sites important to tribal cultural traditions, archaeological sites, or historic standing structures. Sites evaluated as not eligible for the National Register of Historic Places (NRHP) listing are not significant and impacts to these sites would therefore not be considered. Those sites that are evaluated as eligible or of undetermined NRHP eligibility will be protected from direct impacts by establishing avoidance buffers around these resources.

III. ADDITIONAL INFORMATION

1) CONDITIONAL USE PERMIT STANDARDS

Crowned Ridge will be consistent with the requirements of §1211 Energy System (WES) Requirements, Ord. 2004-1. Crowned Ridge will insure that the placement, construction and modification of a wind Energy System (WES) facility is consistent with the County's and use policies, to minimize the impact of WES facilities, to establish a fair and efficient process for review and approval of applications, to assure a comprehensive review of environmental impacts of such facilities and to protect the health, safety, and welfare of the County's citizens.

LOCAL REQUIREMENTS

In accordance with the Zoning Ordinance for Grant County, a Conditional Land Use Permit must meet the following general standards pursuant to §1211: Energy System (WES) Requirements.

1211.01: Applicability

Crowned Ridge is submitting for consideration to construct approximately 32 turbines in Grant County. Crowned Ridge has entered into a long term agreement to distribute the electricity generated into the region. Crowned Ridge is in compliance with §1211 of Ord. 2004-1, Energy System (WES) Requirements for Grant County.

1211.01: Purpose

The purpose of this ordinance is to insure that the placement, construction and modification of a Wind Energy System (WES) Facility is consistent with the County's land use policies, to minimize the impact of WES facilities, to establish a fair and efficient process for review and approval of applications, to assure a comprehensive review of environmental impacts of such facilities, and to protect the health, safety, and welfare of the County's citizens. [Ord. 2004-1, Rev. 2004-1G]

1211.02: Federal and State Requirements

Crowned Ridge will meet or exceed all applicable federal and South Dakota standards and regulations and those of any agency of federal or state government with the authority to regulate WESs.

1211.04: General Provisions

1. Mitigation Measures:
   (a) Site Clearance
   Crowned Ridge will disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the WES.

   (b) Topsoil Protection
   Crowned Ridge will implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner.

(c) Compaction
Crowned Ridge will implement measures to minimize compaction of all lands during all phases of the project's life and will confine compaction to as small an area as practicable.

(d) Live Stock Protection
Crowned Ridge will take precautions to protect livestock during all phases of the Facilities life.

(e) Fences
Crowned Ridge will promptly replace or repair all fences and gates removed or damaged during all phases of the Facilities life unless otherwise negotiated with the affected landowner.

(f) Roads

Public Roads

i. Prior to commencement of construction, Crowned Ridge will identify all state, county or township "haul roads" that will be used for the Facility and will notify the state, county or township governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body will be provided adequate time to inspect the haul roads prior to use of theses haul roads. Where practical, existing roadways will be used for all activates associated with the WES. Where practical, all-weather roads will be used to deliver cement, turbines, towers, assemble nacelles and all other heavy components to and from the turbine sites.

Haul Roads

ii. Crowned Ridge will, prior to the use of approved haul roads, make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the WES for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and WES components. Crowned Ridge will notify the County of such arrangements upon request of the County.

Turbine Access Roads

iii. Construction of turbine access roads will be minimized. Access roads will be low profile roads so that farming equipment can cross them and will be covered with Class 5 gravel or similar material. When access roads are constructed across streams and drainage ways, the access roads will be designed in a manner so runoff form the upper portions of the watershed can readily flow to the lower portion of the watershed.

Private Roads

Crowned Ridge will promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner.

Control of Dust

iv. Crowned Ridge will utilize all reasonable measures and practices of construction to control dust.

(g) Soil Erosion and Sediment Control Plan

Crowned Ridge will develop a detailed Stormwater Pollution Prevention plan (SWPPP) prior to construction and submit the plan to the County, and to the State. The SWPPP will address the erosion control measures for each project phase and, at a minimum will identify plans for grading, construction and drainage of roads and turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive revegetation plan to maintain and ensure adequate erosion control and slop stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Other practices may include containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The SWPPP will identify methods for disposal or storage of excavated material, per Appendix L.

2. Setbacks

Crowned Ridge will site the Facility consistent with the Requirements for Energy System (WES) as proposed in ordinance 2004-1, Rev. 2004-1G, §1211.

Crowned Ridge requests the setbacks between parcels that are obtained by either Crowned Ridge Wind, LLC or Crowned Ridge Wind II, LLC project are waived as the parcels are participants in the Crowned Ridge project as a whole.

- Pursuant to Grant County Ordinance 2004-1, Rev. 2004-1G, §1211, Crowned Ridge will maintain a distance of at least one thousand (1,000) feet from existing off-site residences, business, churches, and buildings owned and/or maintained by a governmental entity and public buildings. Distance from on-site or lessor's residence will be five hundred (500) feet. Distance to be measured from the wall line of the neighboring principal building to the base of the WES tower. These setbacks are further illustrated in **Appendix F**.

- The distance from centerline of public right-of-way will be at least five hundred (500) feet or one hundred ten percent (110%) the height of the wind turbines, whichever distance is greater, two (2) times the height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position. These setbacks are further illustrated in **Appendix F**.

- The distance from any property line will be at least five hundred (500) feet or one hundred ten percent (110%) the height of the wind turbine, whichever distance is greater, two (2) times the height of the wind turbine, measured from the ground surface to the tip of the blade when in a fully vertical position unless wind easement has been obtained from adjoining property owner. These setbacks are further illustrated in **Appendix F**.
- *Exception: The board of adjustment may allow setback/separation distances to be less than the established distances identified above, if the adjoining landowners agree to*

a lesser setback/separation distance. If approved, such agreement is to be recorded and filed with the register of deeds.

3. Electromagnetic Interference

   Crowned Ridge will not operate the WES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event such interference is caused by the WES or its operation, Crowned Ridge will take the measures necessary to correct / mitigate any problems. Prior to construction Crowned Ridge will conduct a beam path study to further mitigate any potential interference.

4. Lighting

   Towers will be marked as required by the Federal Aviation Administration (FAA). There will be no lights on the towers other than what is required by the FAA. *This restriction shall not apply to infrared heating devices used to protect the monitoring equipment. Upon commencement of construction of a tower, in cases where there are residential uses located within a distance which is three hundred (300) percent of the height of the tower from the tower and when required by federal law, dual mode lighting shall be requested from the FAA. Beacon lighting, unless required by FAA, shall not be utilized.* Crowned Ridge will pursue approval for alternative lighting systems from the FAA within one (1) year of completion of construction. This restriction will not apply to infrared heating devices used to protect the monitoring equipment. In the event FAA does not approve an alternative lighting system, Crowned Ridge will comply with all lighting and markings otherwise required by FAA.

5. Turbine Spacing

   The turbines will be spaced no closer together than three (3) rotor diameters (RD) within a string and 10 RDs between strings. If required during final micro siting of the turbines to account for topographic conditions, up to ten (10%) percent of the towers may be sited closer than the above spacing but Crowned Ridge will minimize the need to site the turbines closer.

6. Footprint Minimization

   Crowned Ridge will design and construct the WES so as to minimize the amount of land that is impacted by the WES. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems will, to the greatest extent feasible, be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner.

7. Collector Lines

   Collector lines are the conductors of electric energy from the WES to the feeder lines. When located on private property, Crowned Ridge will place electrical lines, known as collectors, and communication cables underground between the WES and the feeder lines when located on private property. The exception to this requirement is when the total distance of collectors from the substation requires an overhead installation due to line loss of current from an underground installation. Collectors and cables will also be placed within or immediately adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner. This paragraph does not apply to feeder lines.

8. Feeder Lines

Feeder lines are the conductors of electric energy from the collector lines to the main electric terminal, and may be located either above or below ground. Crowned Ridge will place overhead electric lines, known as feeders, on public rights of way or private property if no public right-of-way exists. Changes in routes may be made as long as feeders remain on public rights-of-way and approval has been obtained from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, Crowned Ridge will place feeders on private property. When placing feeders on private property, Crowned Ridge will place the feeder in accordance with the easement negotiated with the affected landowner. Crowned Ridge will submit the site plan and engineering drawings for the feeder lines before commencing construction. Feeder line support structures (power poles) will be placed on private property where concrete or other similar materials are used as an exposed or above-ground permanent foundation.

9. Decommissioning/Restoration/Abandonment

a. Cost Responsibility

The owner or operator of a WES is responsible for decommissioning that facility and for all costs associated with decommissioning that facility and associated facilities.

b. Decommissioning Plan

Within 120 days of completion of construction, Crowned Ridge will submit to the County a decommissioning plan describing the manner in which Crowned Ridge anticipates decommissioning the project in accordance with the requirements of paragraph (e) below. The plan will include a description of the manner in which Crowned Ridge will ensure that it has the financial capability to carry out these restoration requirements when they go into effect. Crowned Ridge will ensure that it carries out its obligation to provide for the resources necessary to fulfill these requirements. The County may at any time request Crowned Ridge to file a report with the county describing how Crowned Ridge are fulfilling this obligation.

c. Financial Assurance

After the tenth (10th) year of operation of a WES facility, the Board may require a performance bond, surety bond, letter of credit, corporate guarantee, or other form of financial assurance that is acceptable to the Board to cover the anticipated costs of decommissioning the WES facility.

d. Site Restoration

Decommissioning of the WES will begin within eight (8) months of the expiration of this permit, or earlier termination of operation of the WES and be completed within eighteen (18) months of the expiration of this permit or earlier termination of operation of the WES. Upon expiration of this permit, or upon earlier termination of operation of the WES, Crowned Ridge will have the obligation to dismantle and remove from the site all towers, turbine generators, transformers, overhead and underground cables, foundations, buildings and ancillary equipment to a depth of four

(4) feet. To the extent possible Crowned Ridge will restore and reclaim the site to its pre-project topography and topsoil quality. All access roads will be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. Any agreement for removal to a lesser depth or for no removal will be recorded with the County and will show the locations of all such foundations. All such agreements between the permittees and the affected landowner will be submitted to the County prior to completion of restoration activities. The site will be restored in accordance with the requirements of this condition within eighteen (18) months after expiration. [Ord. 2004-1 Rev.2004-1G]

e. Failure to Decommission

If Crowned Ridge does not complete decommissioning, the Board may take such action as may be necessary to complete decommissioning, including requiring forfeiture of the bond. The entry into a participating landowner agreement will constitute agreement and consent of the parties to the agreement, their respective heirs, successors, and assigns, that the board may take such action as may be necessary to decommission a WES facility.

10. Abandoned Turbines

Crowned Ridge will advise the County of any turbines that are abandoned prior to the termination of operation of the WES. The County may require the permittees to decommission any abandoned turbine.

11. Height from Ground Surface

The minimum height of blade tips, measured from ground surface when a blade is in fully vertical position, will be greater than twenty-five (25) feet.

12. Towers

a. Color and Finish

The finish of the exterior surface of all turbines installed as part of this Facility will be white, non-reflective, and non-glass.

b. Design

All towers installed as part of this Facility will be singular tubular design.

13. Noise

a. Noise level will not exceed 50 dBA, including constructive interference effects at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity property line of existing off-site residences, businesses, and buildings, and public buildings. [Ord. 2004-1, Rev. 2004-1G] An acoustic analysis for the Project is included with this application and can be found in **Appendix J**.

14. Permit Expiration

Crowned Ridge acknowledges that the permit will be voided if no substantial construction as described in the application has been completed within two (2) years of issuance.

15. Required Information for Permit [Ord. 2004-1, Rev. 2004-1G]
    a. **Appendix A** -- Boundaries of the site proposed for WES and associated facilities on United States Geological Survey Map or other map as appropriate.
    b. **Appendix B** -- Map of easements for WES.
    c. **Appendix C** -- Copy of easement agreements with landowners. Affidavit attesting that necessary easement agreements with landowners have been obtained.
    d. **Appendix D** -- Map of occupied residential structures, businesses, churches, and buildings owned and/or maintained by a governmental entity and public buildings within one (1) mile of the project area.
    e. **Appendix F** -- Map of sites for WES, access roads, and utility lines. Preliminary map of sites for WES, access roads, and collector and feeder lines. Final map of sites for WES, access roads, and utility lines to be submitted sixty (60) days prior to construction.
    f. **Appendix G** -- Proof of utility right-of-way easement for access to transmission lines and/or utility interconnection.
    g. **Appendix H** -- Location of other WES in general area.
    h. **Appendix M** -- Project specific environmental concerns (e.g. native habitat, rare species, and migratory routes).
    i. Final haul road agreements to be submitted sixty (60) days prior to construction.

2) §504. POWERS AND JURISDICTION RELATING TO CONDITIONAL USES

The County Board of Adjustment shall have the power to hear and decide, in accordance with the provisions of this regulation, requests for conditional uses or for decisions upon other special questions upon which the Board of Adjustments is authorized by this regulation to pass; to decide such questions as are involved in determining whether special conditions and safeguards as are appropriate under this regulation or to deny conditional uses when not in harmony with the purpose and intent of this regulation. A Conditional Use Permit shall not be granted by the Board of Adjustment unless and until:

Pursuant to §1211 Energy System (WES) Requirements of the Grant County Zoning Ordinance, these regulations shall apply to Crowned Ridge. Crowned Ridge has submitted for consideration a WES consisting of 32 wind turbines locations reaching a maximum height of approximately 486ft. Consequently, the WES Requirements shall apply to Crowned Ridge. Crowned Ridge will not adversely affect the public interest. Crowned Ridge will provide positive economic benefit to the community in the form of approximately 450 temporary construction jobs, payments directly to land owners, as well as tax payments to Grant County.

1. A written application for a conditional use is submitted, indicating the section of this regulation under which the special exception is sought and stating the grounds on which it is requested.

> Crowned Ridge has submitted a written application for a Conditional Use Permit §504 for §1211 Energy System (WES) Requirements.

2. Notice of hearing shall be published once ten (10) days prior to the hearing in a paper of general circulation in the area affected.

3. The public hearing shall be held. Any party may appear in person, or by agent or attorney.

4. The Board of Adjustment shall make a finding that it is empowered under the section of this ordinance described in the application to grant the conditional use, grant with conditions, or deny the conditional use, and that the granting of the conditional use will not adversely affect the public interest.

> Crowned Ridge will not adversely affect the public interest. Crowned Ridge will provide positive economic benefit to the community in the form of approximately 450 temporary construction jobs, payments directly to land owners, as well as tax payments to Grant County. Crowned Ridge has followed the siting guidelines as established by the County Zoning Code, which has considered the safety, health, and welfare of the public.

5. Before any conditional use is granted, the Board of Adjustment shall make written findings certifying compliance with the specific rules governing individual conditional uses and that satisfactory provision and arrangement has been made concerning the following, where applicable:

a. Entrance to and exit from property and proposed structures thereon with particular reference to automotive and pedestrian safety and convenience, traffic flow, and control, and access in case of fire or catastrophe.

Crowned Ridge will work closely with Grant County and the South Dakota Department of Transportation to obtain all necessary Permits relevant to the highway access, utility crossings and ROW features.

b. Off-street parking and loading areas where required, with particular attention to the items in (a) above and the economic, noise, glare, odor, or other effects of the conditional use on adjoining properties and properties generally in the district.

Crowned Ridge has included with this application for consideration an acoustic analysis for Grant County which can be found at Appendix J. The findings of the acoustic analysis will indicate that Crowned Ridge is in compliance with §1211 Energy System (WES) Requirements.

Additionally, included with this application is a shadow flicker analysis which can be found in Appendix J. The findings of the shadow flicker analysis indicate that Crowned Ridge has submitted turbine locations that do not exceed a maximum of thirty (30) hours of shadow flicker per year at any existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity, unless otherwise agreed to by the landowner.

Crowned Ridge has provided additional information regarding the economic benefits that the project will generate. This information can be found on Page 6.

Crowned Ridge will minimize any impact form parking and loading on the general community. Normal construction practices will be utilized to ensure as little disruption to adjoining parcels as possible.

c. Refuse and service areas, with particular reference to the items in (a) and (b) above.

Crowned Ridge will adhere to all state and local requirements for any disposal of refuse from the construction and operation of the project.

d. Utilities, with reference to locations, availability, and compatibility.

This information can be found in Appendix F.

e. Screening and buffering with reference to type, dimensions, and character.

Crowned Ridge will meet and exceed the siting requirements set forth in §1211 Energy System (WES) Requirements. The Crowned Ridge Site Plan located in **Appendix F** depicts compliance with this requirement.

e. Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect, and compatibility and harmony with properties in the district.

Crowned Ridge will meet all lighting requirements listed in §1211 of the Energy System (WES) Requirements.

f. Signs, if any, and proposed exterior lighting with reference to glare, traffic safety, economic effect, and compatibility, and harmony with properties in the district.

Crowned Ridge will meet or exceed the required yard (setback) requirements as outlined in the applicable sections of the WES policies of the Grant County Zoning Ordinance.

g. Required yards and other open spaces.

Crowned Ridge has complied with the siting criteria as outlined in §1211 of the County's code.

h. General compatibility with adjacent properties and other property.

Crowned Ridge is purposed to be located on Agricultural Land (A). Adjacent properties and other properties in the general area are primarily used for the same purpose i.e.: pasture land, and agriculture. Energy Systems (WES) is a use that is considered permissible as a conditional use in the Agricultural Zoning District. Crowned Ridge will comply with both State and County requirements for an Energy System (WES). Crowned Ridge has taken several steps to minimize any potential impact on surrounding properties.

6. A conditional use that is granted but not used within two (2) years will be considered invalid unless an extension has been requested and approved by the Board of Adjustment.

Crowned Ridge acknowledges that if a Conditional Use Permit is granted, and not used within two (2) years, it shall be considered invalid, unless an extension has been approved by the Board of Adjustments.

7. The affirmative vote of two-thirds (2/3) five (5) votes of the full membership of the Board of Adjustment is required to approve a conditional use.

Acknowledged.

8. In granting the Conditional Use Permit, the Board of Adjustment may prescribe appropriate conditions and safeguards, in conformity with this regulation. Violation of such conditions and safeguards, when made a part of the terms under which the Conditional Use Permit is granted, shall be deemed a violation of this ordinance and punishable under § 808 of this ordinance.

Crowned Ridge will conform with any conditions and safeguards prescribed by the Board of Adjustments.

9. Reapplication. No applicant requesting a Conditional Use Permit whose application includes the same or substantially the same requirements for the same or substantially the same property which has been denied by the Board of Adjustment shall be again considered by the Board of Adjustment before the expiration date of six (6) months from the date of the final action on the petition.

This is the initial submittal for Crowned Ridge, and it does not contain a duplicate request that was previously denied by the Board of Adjustment.

3) DESCRIPTION OF PROPOSED FACILITIES

An individual lease agreement, permitting the siting of a facility/turbine, has been signed by the respective landowner for each proposed wind turbine and related facilities location. In addition, Crowned Ridge Wind has written agreements with each consenting landowner, which ensures minimal impact to their land and that public health and safety guidelines will be followed. The proposed Facility will not emit any fumes. Below, please find a listing of all proposed Crowned Ridge Wind facilities. See site plan in **Appendix F** for locations of all proposed facilities.

- **Generation Equipment Description**
  Crowned Ridge proposes to use GE 2.3 MW 116 meter (380ft) diameter rotor, 90 meter (295ft) tubular steel monopole, GE 2.1 MW 116 meter (380) diameter rotor, 80 meter (262ft) tubular steel monopole, and GE 1.7 MW 103 meter (337ft) diameter rotor, 80 meter (262ft) steel monopole throughout the Facility. These turbines employ active yaw control to steer the machine with respect to the wind. They have active blade pitching to maximize power output. The towers and turbines will be painted with a non-reflective/off-white color designed to minimize visual impacts. No advertising or graphics will be placed on any part of the tower or blades, however, the turbines will be clearly numbered above the entrance doors for identification and emergency response. The towers will not be illuminated except as required by the FAA.

- **Electrical Collection System**
  The power generated by the Facility will be collected and conveyed to the Crowned Ridge substations by an electrical power collection system as shown on the site plans. Crowned Ridge energy collection system will include pad-mounted transformers, buried cables, and junction boxes.

- **Overhead Transmission Line Connection**
  An overhead transmission line will be constructed to transfer wind energy system power from the substation into the switchyard. The proposed transmission line will be constructed and run within easements negotiated with private landowners.

- **Laydown Yard**
  Multiple gravel base laydown areas including small temporary concrete batch plants, located on approximately 25-28 acres of land, will be required during the construction phase of Crowned Ridge. The Laydown yards will be used to temporarily store turbine parts, equipment, office trailers, and employee parking. Upon completion of all reclamation activities, these laydown yards will be reclaimed to the pre-construction state. Prior to construction the location of the laydown yards will be provided to the County.

- **Anemometer Tower ("Met Tower")**
  The proposed Facility will require approximately four (4) Met Towers. The towers will be approximately 263 ft. in height and properly lighted according to recommendations from the FAA. The tower will be mounted with equipment used to monitor wind speed, wind direction, temperature, barometric pressure, data logging and data transfer equipment. The tower will not generate electricity.

4) ACCESS ROADS

- **Existing Access Roads**
  There is an existing highway system for sufficient transportation to the Facility location and to the necessary county roads providing access to each proposed wind turbine generator. It may be necessary to improve some existing roads (grade or widen) during construction to accommodate construction equipment and equipment transport trucks. A Transportation Plan outlining the proposed improvements will be presented for approval by Grant County before construction commences. In accordance to the Transportation Plan, Crowned Ridge will restore existing public roads after construction where improvements are necessary. It may also be necessary to repair, repave, or reconstruct existing county roads damaged by Facility construction. Crowned Ridge would promptly repair any Facility-related damage to existing county roads after construction to standards specified by road managers, and as agreed before construction begins.

- **New Turbine Access Roads**
  Newly constructed turbine access roads will be rough graded, and will consist of approximately 4-6 inches of gravel over compacted material. The gravel will be obtained from local crushed rock gravel pits. The access roads will generally be constructed at-grade. Built material will be used only where needed to supplement the existing base or to blend the road into the surroundings. Culverts may be installed if ditches cannot be crossed at grade and as a preventive measure to avoid any damages to the existing or new access roads and the existing highway/county road system. When construction is complete, the access roads will be left in place to provide access for future operations and maintenance activities. After construction, these roads will be graded where low spots and ruts have occurred and culverts will be left in place. The roads will also be available for the use of the landowner.

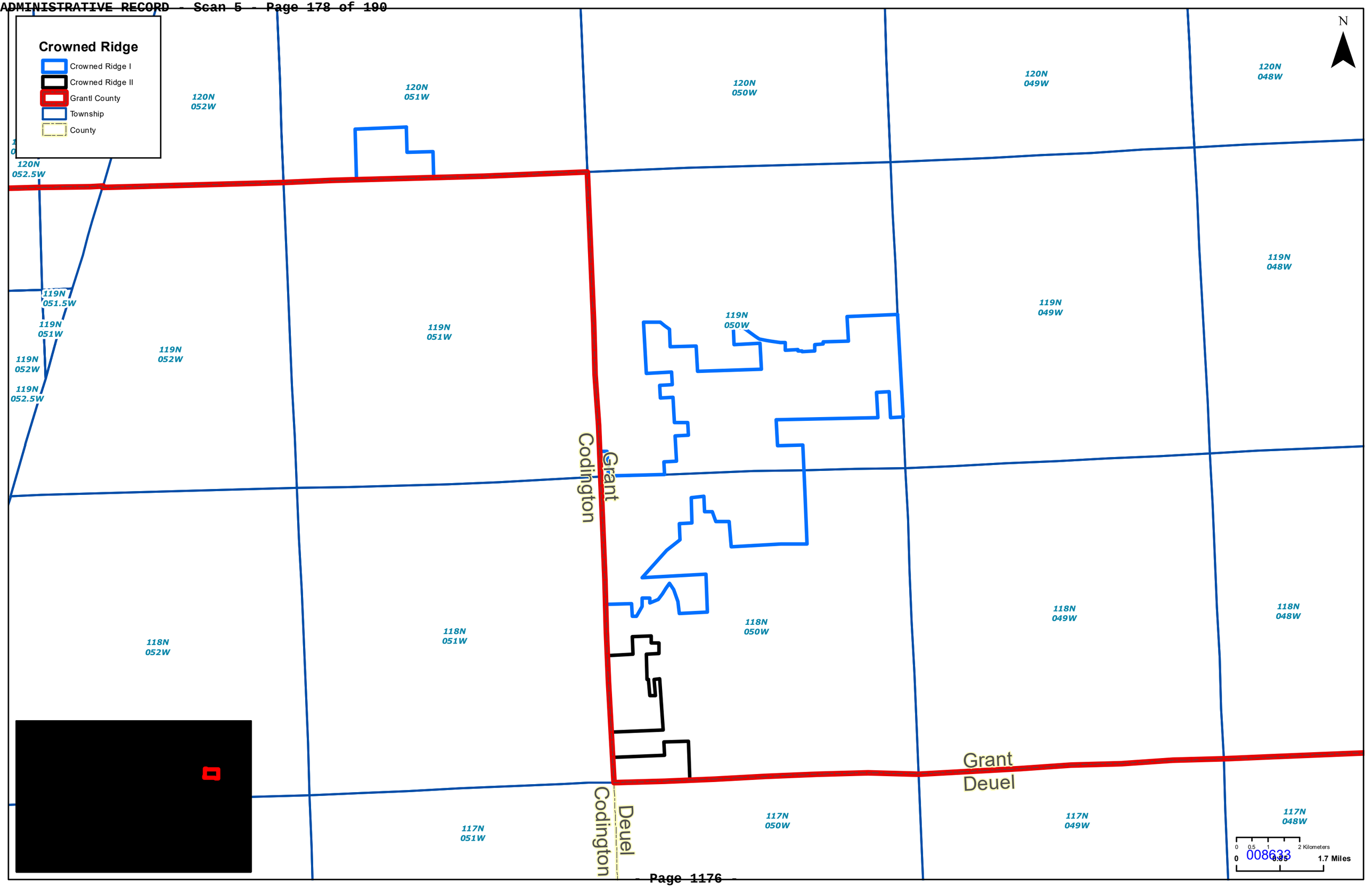
IV. CONCLUSION

This Application and its attachments demonstrate Crowned Ridge's compliance with the Grant County Zoning Ordinance and with the general and specific standards and requirements for conditional land uses as described in the §1211 Energy System (WES) Requirements. Crowned Ridge respectfully requests a separate Conditional Use Permit approval for a Wind Energy System for the Crowned Ridge Wind, LLC and Crowned Ridge Wind II, LLC Facilities.

As explained thus far, upon approval of the Conditional Use Permit, Crowned Ridge Wind, LLC, and Crowned Ridge Wind II, LLC are anticipated to begin construction upon approval of all necessary permits. The Facility will be supported by approximately 450 construction workers, will supply clean renewable energy, and will operate safely and in compliance with all applicable local, state, and federal regulations. Crowned Ridge looks forward to the opportunity to continue investing in Grant County for the foreseeable future.

Appendix: A

Boundaries of the site proposed for WES


Crowned Ridge
Crowned Ridge I
Crowned Ridge II
Grantl County
Township
County
N
120N 052W
120N 051W
120N 050W
120N 049W
120N 048W
120N 052.5W
119N 051.5W
119N 051W
119N 052W
119N 052.5W
119N 051W
119N 052W
119N 050W
119N 049W
119N 048W
118N 052W
118N 051W
118N 050W
118N 049W
118N 048W
117N 051W
117N 050W
117N 049W
117N 048W
Codington
Grant
Grant
Deuel
Deuel
Codington
0 0.5 1 2 Kilometers
0 0.85 1.7 Miles

Appendix: B

Map of easements for WES

Crowned Ridge

- Non-Participating
- Participating
- Crowned Ridge I
- Crowned Ridge II
- Grantl County
- Township
- County

N

120N 052W
120N 051W
120N 050W
120N 049W
120N 048W
119N 051.5W
119N 051W
119N 052W
119N 052.5W
119N 051W
119N 050W
119N 049W
119N 048W
118N 052W
118N 051W
118N 050W
118N 049W
118N 048W
117N 051W
117N 050W
117N 049W
117N 048W

Codington
Grant
Grant
Deuel
Deuel
Codington

0 0.5 1 2 Kilometers
0 0.85 1.7 Miles

008635

Appendix: C

Copy of easement agreements with landowners

STATE OF FLORIDA	)	AFFIDAVIT OF
	:SS	
COUNTY OF PALM BEACH	)	JOHN DI DONATO

Comes now, the undersigned, John Di Donato, having first been duly sworn on oath, and states and alleges as follows:

1. Your affiant is the Vice President of NextEra Energy Resources (NEER), LLC., and has knowledge of the matters asserted herein.

2. Crowned Ridge Wind I, LLC and Crowned Ridge II, LLC is an indirect wholly owned subsidiary of NEER and is the applicant for a permit for a Wind Energy System (WES) from Grant County, South Dakota.

3. The necessary easements from landowners have been obtained for development and construction of the WES, and attached hereto is the Map of Easements for the WES.

Dated this 10th day of September, 2018.

John Di Donato

Subscribed and sworn to before me this 10th day of September, 2018.

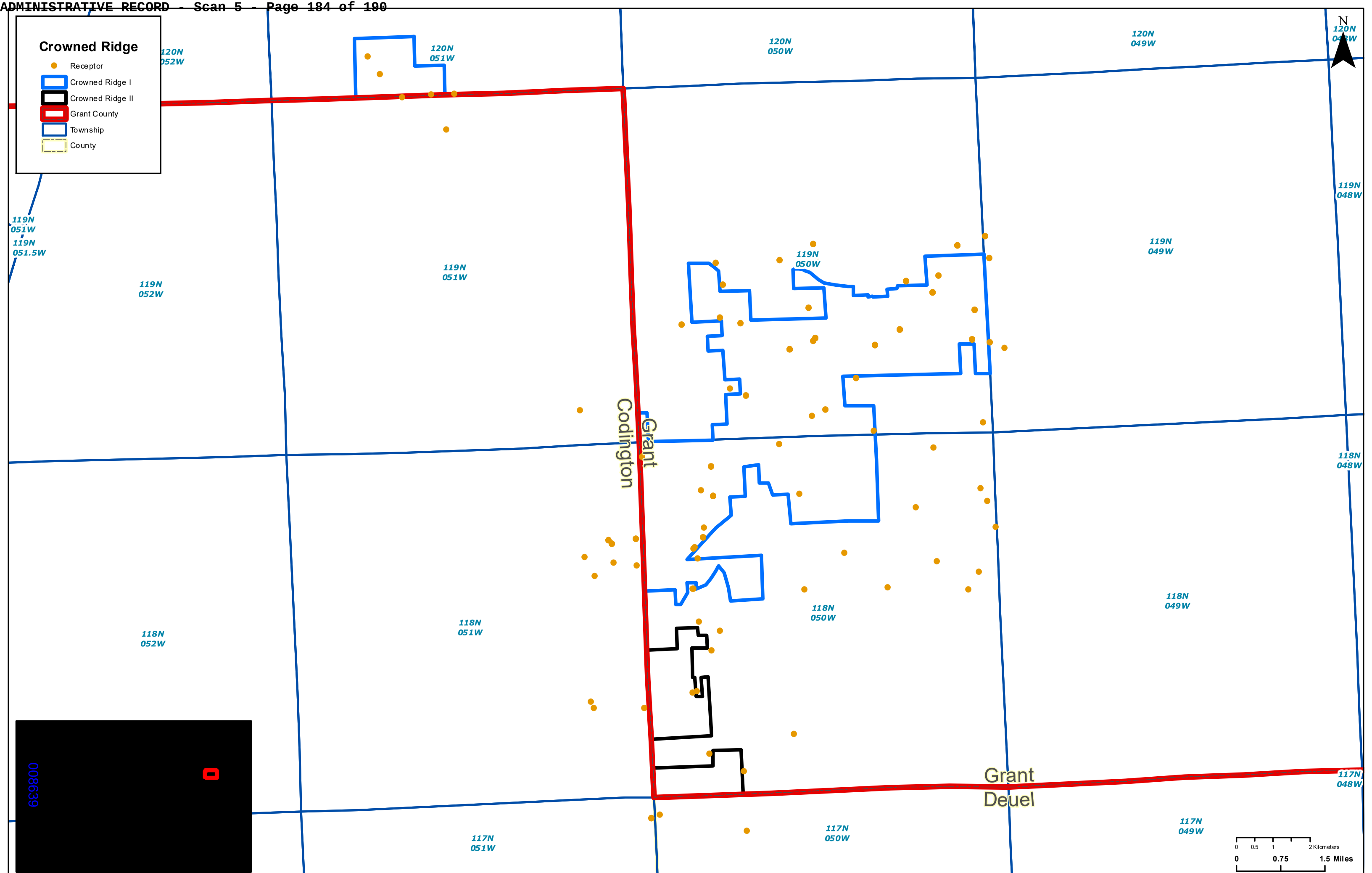
Notary Public, Florida

(SEAL)

NOTARY PUBLIC
Kim L. Otto
Notary Public - State of Florida
My Commission # FF 939840
Expires March 28, 2020

Appendix: D

Map of occupied residential structures


Crowned Ridge
Receptor
Crowned Ridge I
Crowned Ridge II
Grant County
Township
County
N
120N 052W
120N 051W
120N 050W
120N 049W
120N 048W
119N 051W
119N 051.5W
119N 052W
119N 051W
119N 050W
119N 049W
119N 048W
118N 052W
118N 051W
118N 050W
118N 049W
118N 048W
117N 051W
117N 050W
117N 049W
117N 048W
Grant
Codington
Grant
Deuel
008639
0 0.5 1 2 Kilometers
0 0.75 1.5 Miles

008640

Appendix: E

Participating Property Owner List

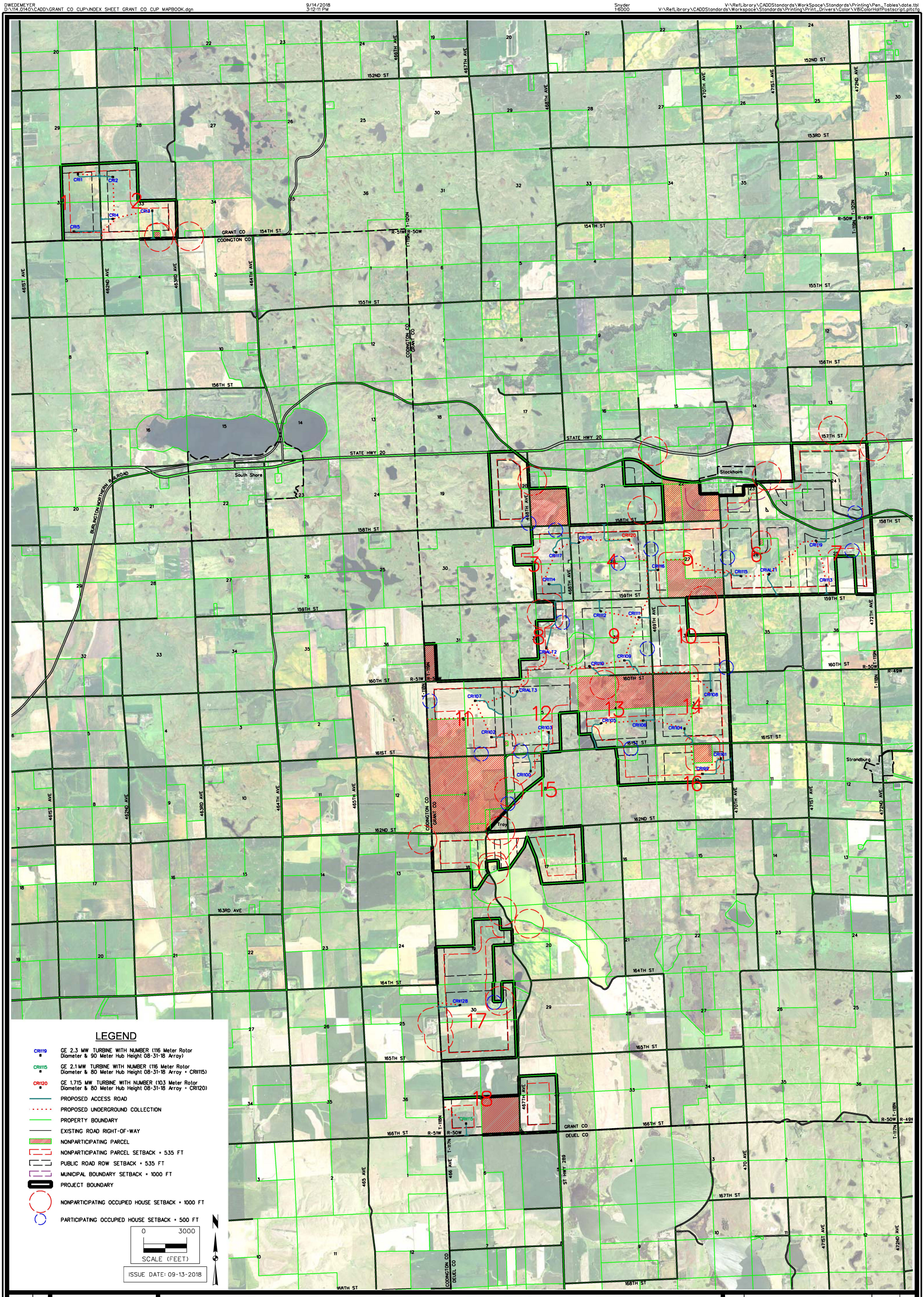
Parcel ID	Acres	Landowner Name	PLSS Section	PLSS Township	PLSS Range	Parcel County
1020752077	159.7798	LARSON GILBERT	31	118N	050W	Grant
1020749082	149.6334	ZEMLICKA DEWEY L	32	118N	050W	Grant
1020749080	79.00769	ZEMLICKA DEWEY L	32	118N	050W	Grant
1020746790	162.3955	ZEMLICKA DARON A	30	118N	050W	Grant
1020746782	162.264	ZEMLICKA DARON A	30	118N	050W	Grant
1020746781	162.0814	EVJEN JOYCE A	30	118N	050W	Grant
1020749085	140.0065	EVJEN JOYCE A	30	118N	050W	Grant
1020753021	161.3144	LARSON ELMER G	19	118N	050W	Grant
1020746767	80.59571	LARSON ELMER G	19	118N	050W	Grant
1020749087	96.78363	LARSON ELMER G	19	118N	050W	Grant
1020746780	24.63964	RITTMANN JOHN E	18	118N	050W	Grant
1020746791	17.70622	RITTMANN JOHN E	18	118N	050W	Grant
1020746805	147.2169	ANDERSON HAROLD L	17	118N	050W	Grant
1020746776	64.14385	RITTMANN JOHN E	18	118N	050W	Grant
1020746792	138.5525	RITTMANN JOHN E	18	118N	050W	Grant
1020746774	156.7187	ANDERSON HAROLD L	17	118N	050W	Grant
1020750669	15.00008	WOLLSCHLAGER DOUGLAS	7	118N	050W	Grant
1020749012	2.099232	LINDBERG TERRY L	7	118N	050W	Grant
1020749013	7.116745	LINDBERG TERRY L	7	118N	050W	Grant
1020749026	9.368104	WOLLSCHLAGER DOUGLAS	7	118N	050W	Grant
1020749014	160.9136	WOLLSCHLAGER DOUGLAS E	7	118N	050W	Grant
1020750915	160.7344	BREYER DWAYNE J	11	118N	050W	Grant
1020749006	16.39542	MILLER KEVIN R	8	118N	050W	Grant
1020749030	140.6232	LINDBERG TERRY L	8	118N	050W	Grant
1020749047	132.4422	DAHLGREN KEVIN	9	118N	050W	Grant
1020749052	159.5552	GRANQUIST GARY	10	118N	050W	Grant
1020749051	159.6486	GRANQUIST GARY	10	118N	050W	Grant
1020746252	159.6953	BREYER DWAYNE J	11	118N	050W	Grant
1020749702	30.27497	DAHLGREN KEVIN	9	118N	050W	Grant
1020746242	160.2331	GRABOW TYLER	6	118N	050W	Grant
1020750982	156.3538	LINDBERG TERRY L	5	118N	050W	Grant
1020751004	79.7364	LINDBERG TERRY L	5	118N	050W	Grant
1020750893	159.1193	DAHLGREN KEVIN	4	118N	050W	Grant
1020750691	134.8045	DAHLGREN KEVIN K	4	118N	050W	Grant
1020746237	157.6296	FIELDS ROBERT A	3	118N	050W	Grant
1020746240	158.6681	FOX JOHN L	3	118N	050W	Grant
1020751037	160.912	RUHR MARY B	6	118N	050W	Grant
1020751026	160.8411	KRAKOW MARY M	6	118N	050W	Grant
1020750971	155.8953	AMBERG NANCY	5	118N	050W	Grant
1020750904	151.0978	PEKELDER RYAN R	5	118N	050W	Grant
1020750826	138.1246	PEKELDER RYAN R	3	118N	050W	Grant
1020748985	159.2069	KRAKOW KEVIN	31	119N	050W	Grant
1020746235	119.6866	PEKELDER ROBERT O	32	119N	050W	Grant
1020746227	120.9373	BOULAY CAROLYN LOY	33	119N	050W	Grant
1020746228	159.0887	FIELDS ROBERT A	33	119N	050W	Grant
1020750702	158.1188	PEKELDER RYAN R	34	119N	050W	Grant
1020750602	315.794	FOX JOHN L	34	119N	050W	Grant
1020748998	166.4626	PEKELDER ROBERT	32	119N	050W	Grant
1020748992	31.51747	PEKELDER ROBERT O	33	119N	050W	Grant
1020748990	159.3422	FIELDS ROBERT A	33	119N	050W	Grant
1020748991	119.9588	SONSTEGARD GARY	33	119N	050W	Grant
1020746210	39.71264	BERKNER	25	119N	050W	Grant
1020748967	118.9953	SONSTEGARD GARY	28	119N	050W	Grant
1020748977	159.7853	PEKELDER RYAN R	29	119N	050W	Grant

1020748937	199.5902	C D FARM INC	28	119N	050W	Grant
1020746208	79.35668	BAXTER PATRICIA J	25	119N	050W	Grant
1020746213	79.95232	DORSETT MARK D	25	119N	050W	Grant
1020746218	156.186	GRANQUIST MARK	26	119N	050W	Grant
1020746209	39.6569	BERKNER	25	119N	050W	Grant
1020746220	158.0585	DOLEN DUANE A	27	119N	050W	Grant
1020746217	312.5508	SCHULTZ LARRY	26	119N	050W	Grant
1020746686	6.100185	SCHULTZ LARRY A	26	119N	050W	Grant
1020748970	40.21449	C D FARM INC	29	119N	050W	Grant
1020748939	108.3927	C D FARM INC	29	119N	050W	Grant
1020746219	237.6032	SCHULTZ LARRY	27	119N	050W	Grant
1020748966	160.0421	C D FARM INC	28	119N	050W	Grant
1020746214	158.644	BAXTER PATRICIA J	26	119N	050W	Grant
1020748965	160.1962	C D FARM INC	28	119N	050W	Grant
1020748993	120.1203	BERKNER	25	119N	050W	Grant
1020748980	79.15733	DOLEN DUANE A	27	119N	050W	Grant
1020748979	137.6714	BERKNER	25	119N	050W	Grant
1020748938	51.40875	PEKELDER KRIS	29	119N	050W	Grant
1020748844	31.80666	GRANQUIST GARY	25	119N	050W	Grant
1020748968	15.19227	BERKNER	25	119N	050W	Grant
1020748948	0.362678	BERKNER	24	119N	050W	Grant
1020748924	161.2278	LARSEN DONALD A	20	119N	050W	Grant
1020748961	61.7948	GRANQUIST GARY	23	119N	050W	Grant
1020748854	117.7863	LUNDIN LV TR	23	119N	050W	Grant
1020748838	141.1063	GRANQUIST GARY	24	119N	050W	Grant
1020748962	87.96601	GRANQUIST GARY	23	119N	050W	Grant
1020748947	1.575029	STOCKHOLM TOWNSHIP EXEMPT	23	119N	050W	Grant
1020748949	157.6369	BERKNER	24	119N	050W	Grant
1020748875	17.43792	GRANQUIST GARY	24	119N	050W	Grant
1020748861	27.84427	BERG JAMES B	22	119N	050W	Grant
1020748958	51.73303	BERG JAMES B	21	119N	050W	Grant
1020748927	148.0182	LARSEN DONALD A	20	119N	050W	Grant
1020748849	155.6657	BERKNER	24	119N	050W	Grant
1020748850	154.3173	BERKNER	24	119N	050W	Grant
1020746457	161.105	SCHMELING RONALD	32	120N	051W	Grant
1020748178	161.8354	GTV LAND & CATTLE CO INC	33	120N	051W	Grant
1020748179	156.3683	ZIRBEL JAMES G	33	120N	051W	Grant
1020748161	161.1267	HENRICHS MICHAEL	32	120N	051W	Grant
1020748168	162.0413	GTV LAND & CATTLE CO INC	33	120N	051W	Grant

Appendix: F

Project Area Maps

DWEDEMEYER
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LEGEND

- CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)
- CRI115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI115)
- CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT

0 3000
SCALE (FEET)

ISSUE DATE: 09-13-2018

Sheet 1 of 1
Project No: 140140

NEXTERA ENERGY - CROWNED RIDGE I & II, LLC

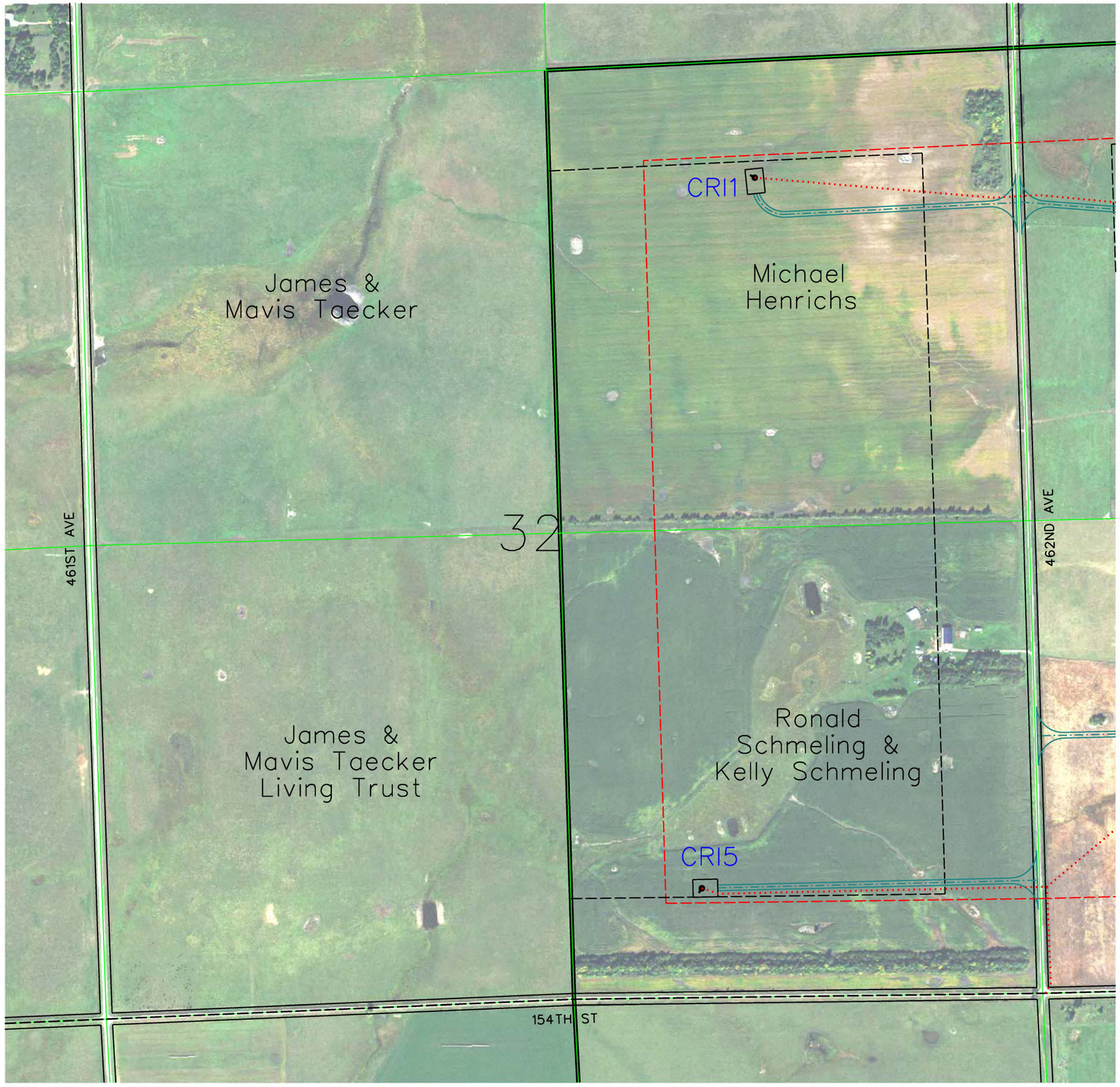
CONDITIONAL USE PERMIT MAPBOOK

GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

MARK	REVISION	DATE	BY

Engineer: SCH | Checked By: MGG | Scale: 1"= 3000'
Technician: DW | Date: 8/24/18 | Field Bk: Pg:
Project No: 114.0140 | 908648 | Sheet 1 of 1



LEGEND

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.1MW 116RD 80HH AND GE 1.715MW 103RD 80HH TURBINE WITH NUMBER
122'
72'

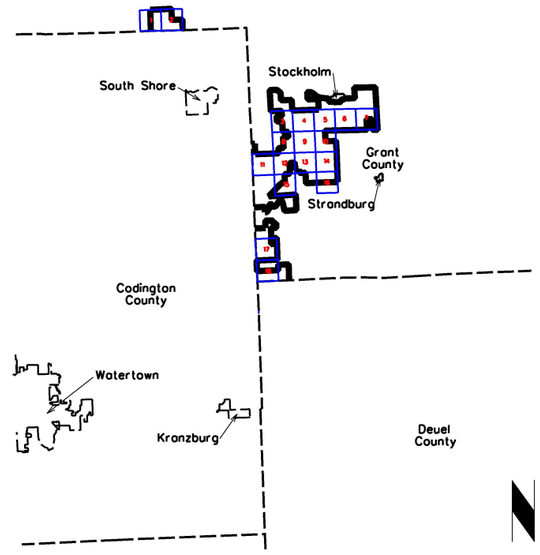
PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.3MW 116RD 90HH TURBINE WITH NUMBER
140'
90'
100'

CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)

CRII115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRII115)

CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)

- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



0 600
SCALE (FEET)

ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer: SCH	Checked By: MGG	Scale: 1"=	
Technician: DW	Date: 8/24/18	Field Bk:	Pg:

Project No: 1140140 Sheet 1 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 32, TWP 120N, RNG 51W

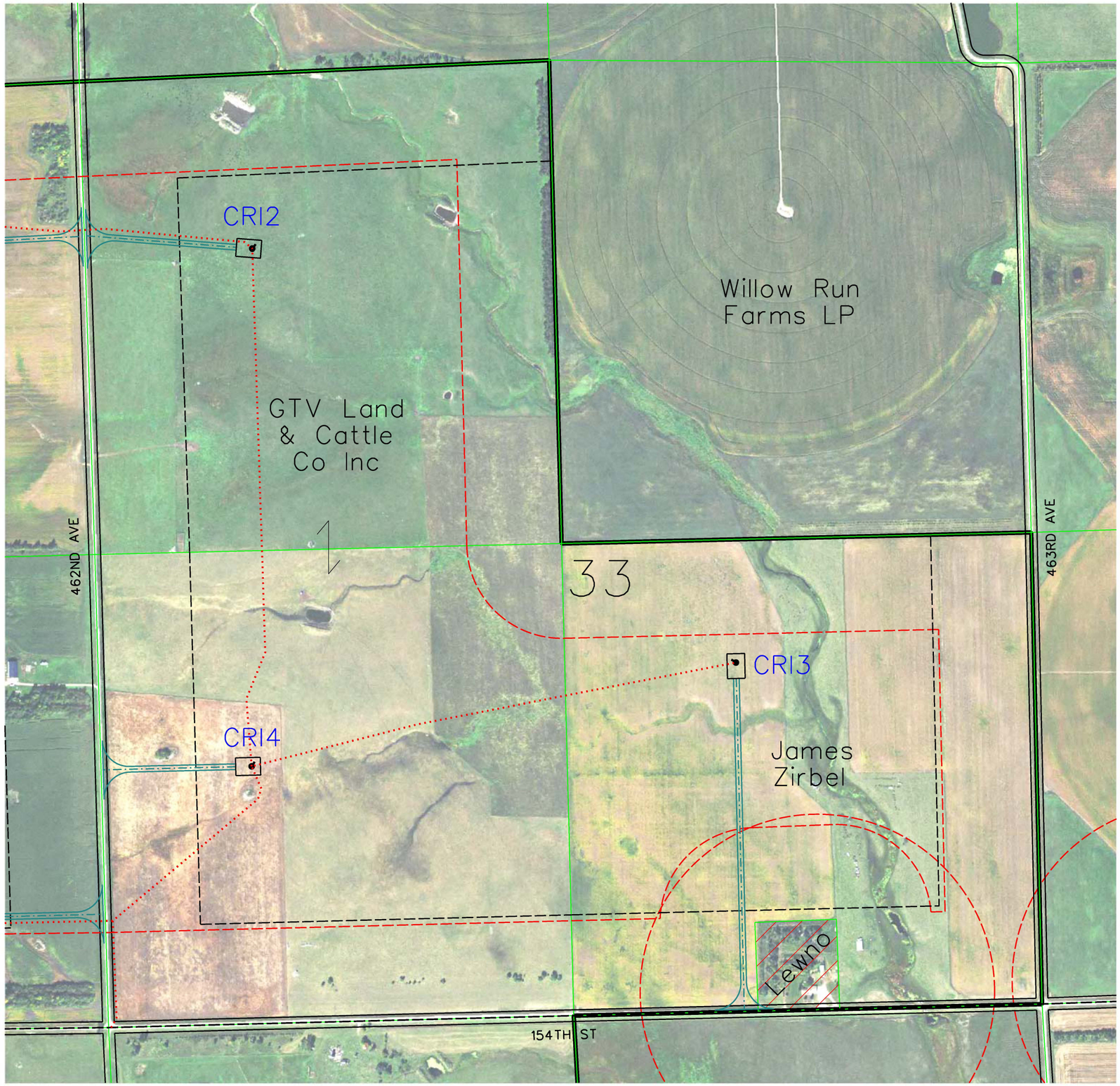
GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.

1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

Project No: 1140140
Sheet 1 of 18

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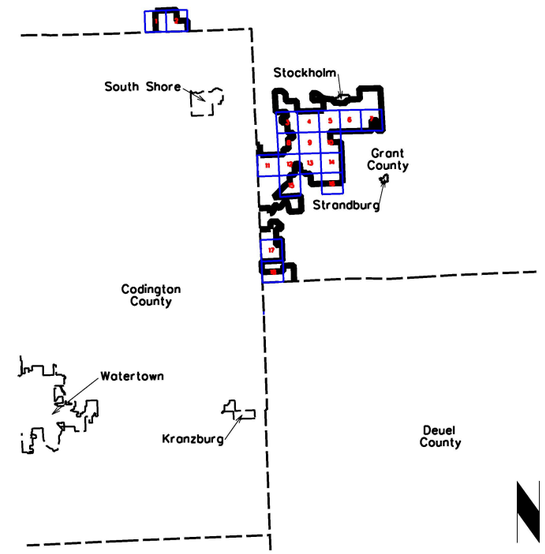


LEGEND

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.1MW 116RD 80HH AND GE 1.715MW 103RD 80HH TURBINE WITH NUMBER
122'
72'

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.3MW 116RD 90HH TURBINE WITH NUMBER
140'
90'
100'

- CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)
- CRI115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI1115)
- CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



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SCALE (FEET)

ISSUE DATE: 09-13-2018

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Technician: DW	Date: 8/24/18	Field Bk:	Pg:

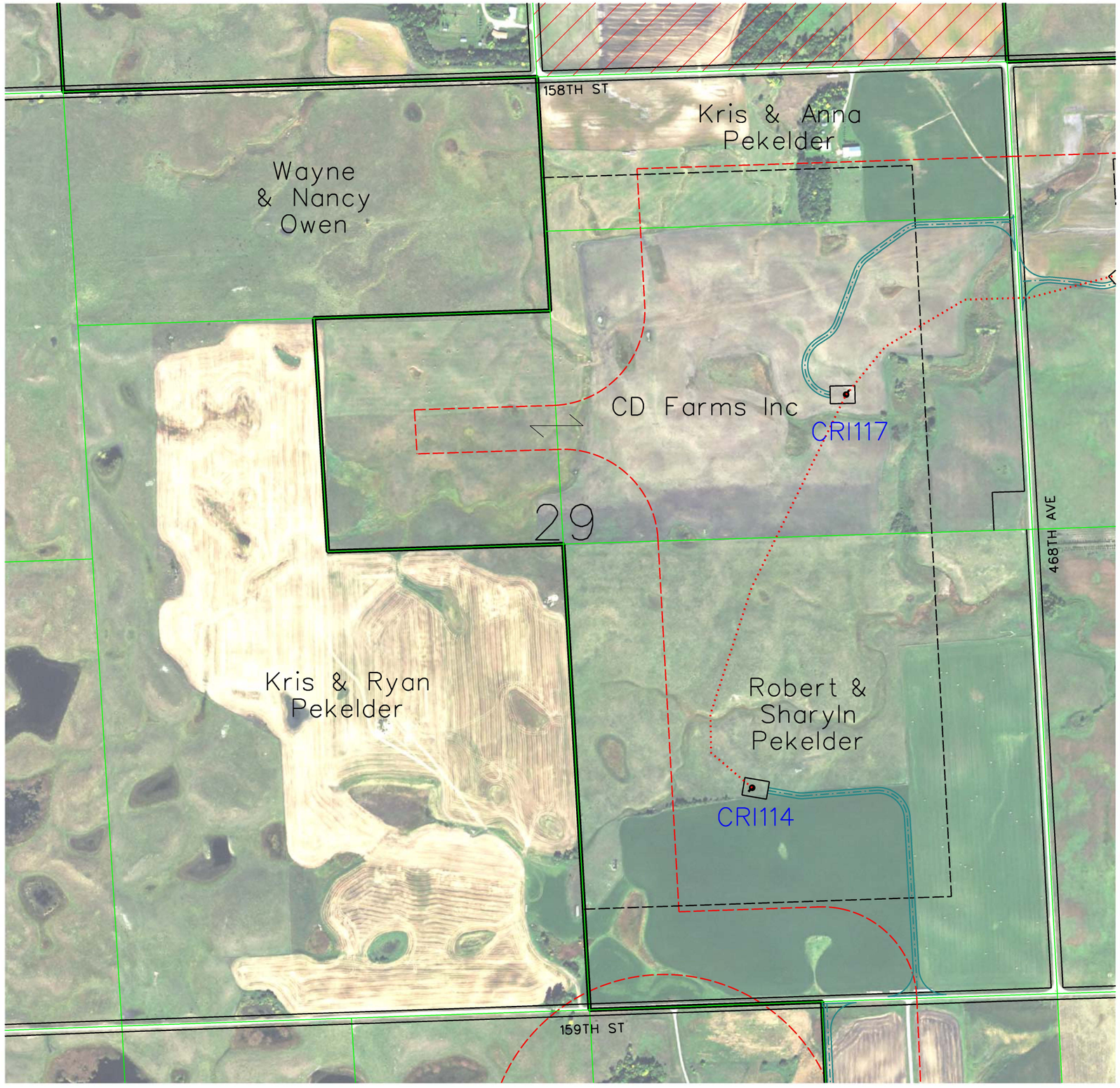
Project No: 1140140 — Sheet 2 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC
CUP MAPBOOK SEC 33, TWP 120N, RNG 51W
GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

Project No: 1140140
Sheet 2 of 18

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LEGEND

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.1MW 116RD 80HH AND GE 1.715MW 103RD 80HH TURBINE WITH NUMBER
122'
72'

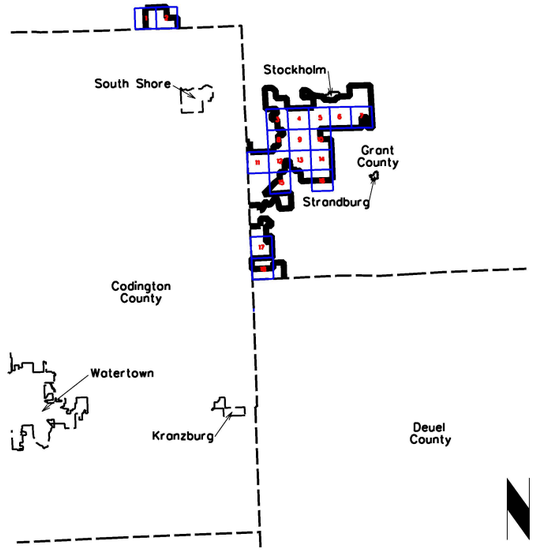
PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.3MW 116RD 90HH TURBINE WITH NUMBER
140'
90'
100'

CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)

CRI115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI115)

CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)

- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



0 600
SCALE (FEET)

ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer: SCH	Checked By: MGG	Scale: 1"=	
Technician: DW	Date: 8/24/18	Field Bk:	Pg:

Project No: 1140140

Sheet 3 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 29, TWP 119N, RNG 50W

GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.

1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

Project No: 1140140

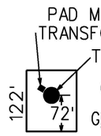
Sheet 3 of 18

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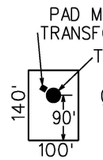
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LEGEND



CRANE PAD & GE 2.1MW 116RD 80HH AND GE 1.715MW 103RD 80HH TURBINE WITH NUMBER



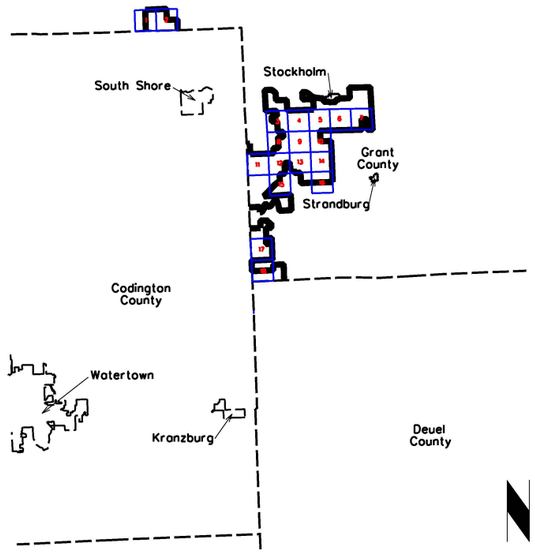
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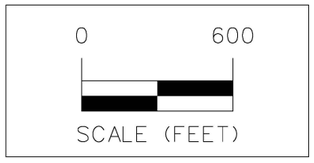
CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)

CRI1115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI1115)

CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)

- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT





ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer: SCH	Checked By: MGG	Scale: 1"=	
Technician: DW	Date: 8/24/18	Field Bk:	Pg:

Project No: 1140140 — Sheet 4 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 28, TWP 119N, RNG 50W

GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.

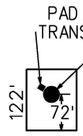
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

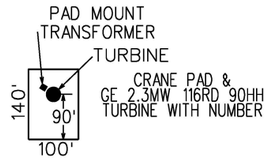
Project No: 1140140
Sheet 4 of 18

008649



LEGEND





CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)

CRI115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI115)

CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

PROPERTY BOUNDARY

EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

NONPARTICIPATING PARCEL SETBACK = 535 FT

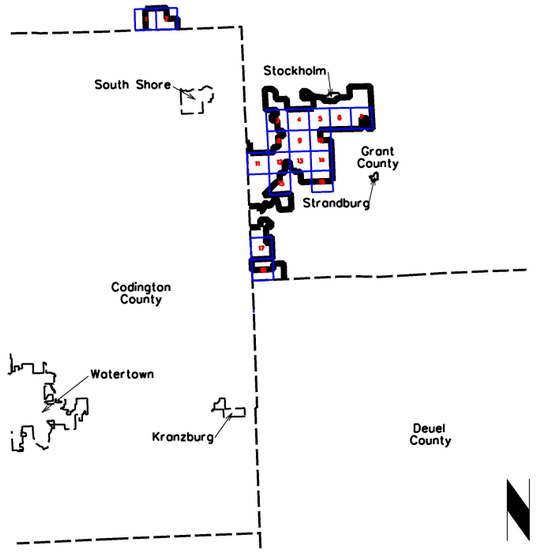
PUBLIC ROAD ROW SETBACK = 535 FT

MUNICIPAL BOUNDARY SETBACK = 1000 FT

PROJECT BOUNDARY

NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT

PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



0 600

SCALE (FEET)

ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer: SCH	Checked By: MGG	Scale: 1"=	
Technician: DW	Date: 8/24/18	Field Bk:	Pg:

Project No: 1140140

Sheet 5 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 27, TWP 119N, RNG 50W

GRANT COUNTY, SOUTH DAKOTA

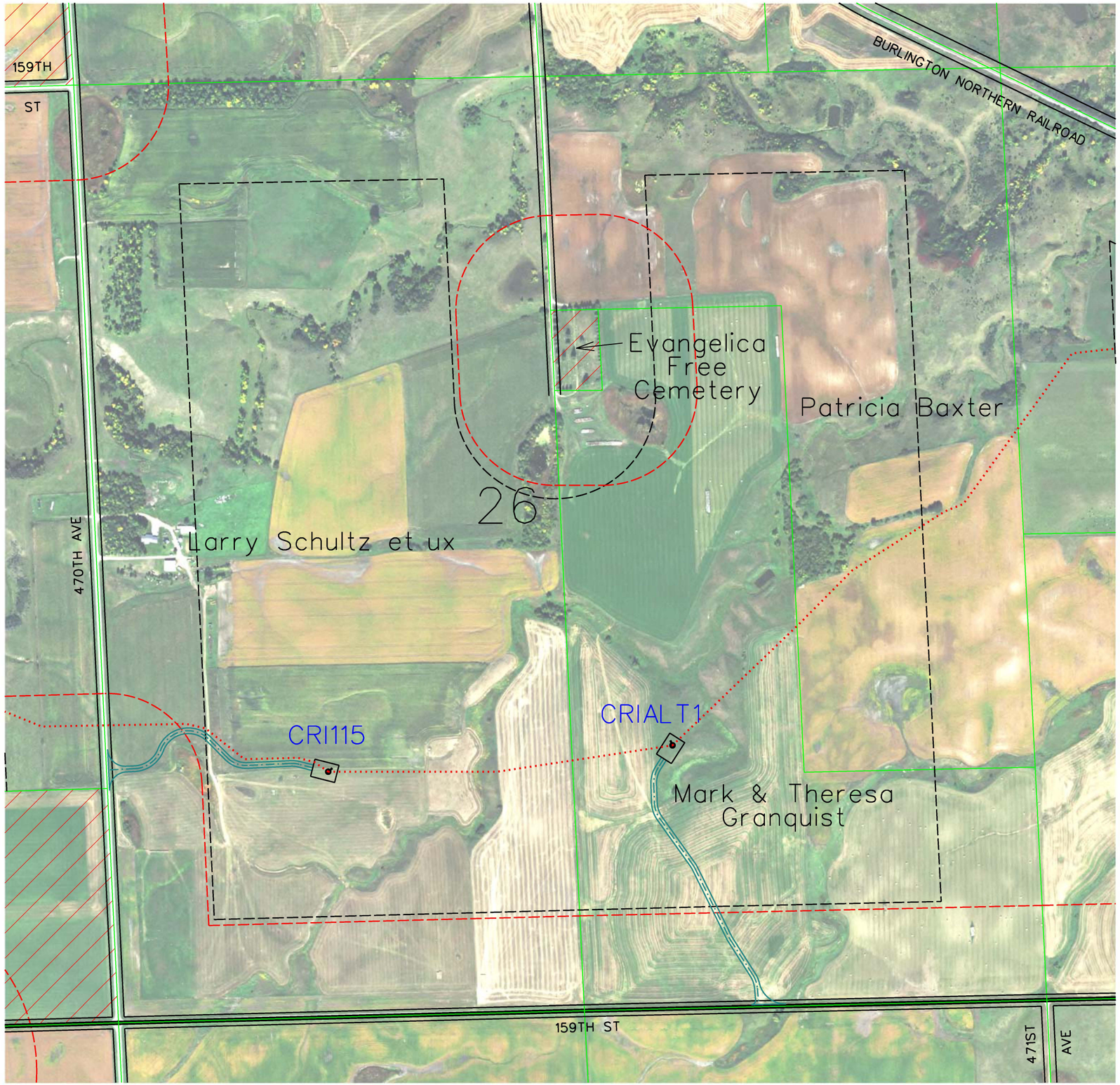
SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

Project No: 1140140

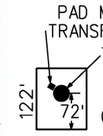
Sheet 5 of 18

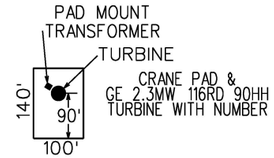
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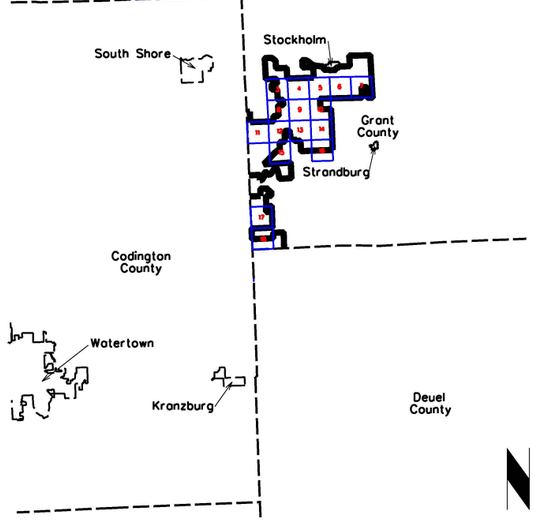


LEGEND





- CRI119 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)
- CRI1115 — GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI1115)
- CRI120 — GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



0 600

SCALE (FEET)

ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer:	SCH	Checked By:	MGG
Technician:	DW	Date:	8/24/18

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Pg:

Project No: 1140140

Sheet 6 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 26, TWP 119N, RNG 50W

GRANT COUNTY, SOUTH DAKOTA

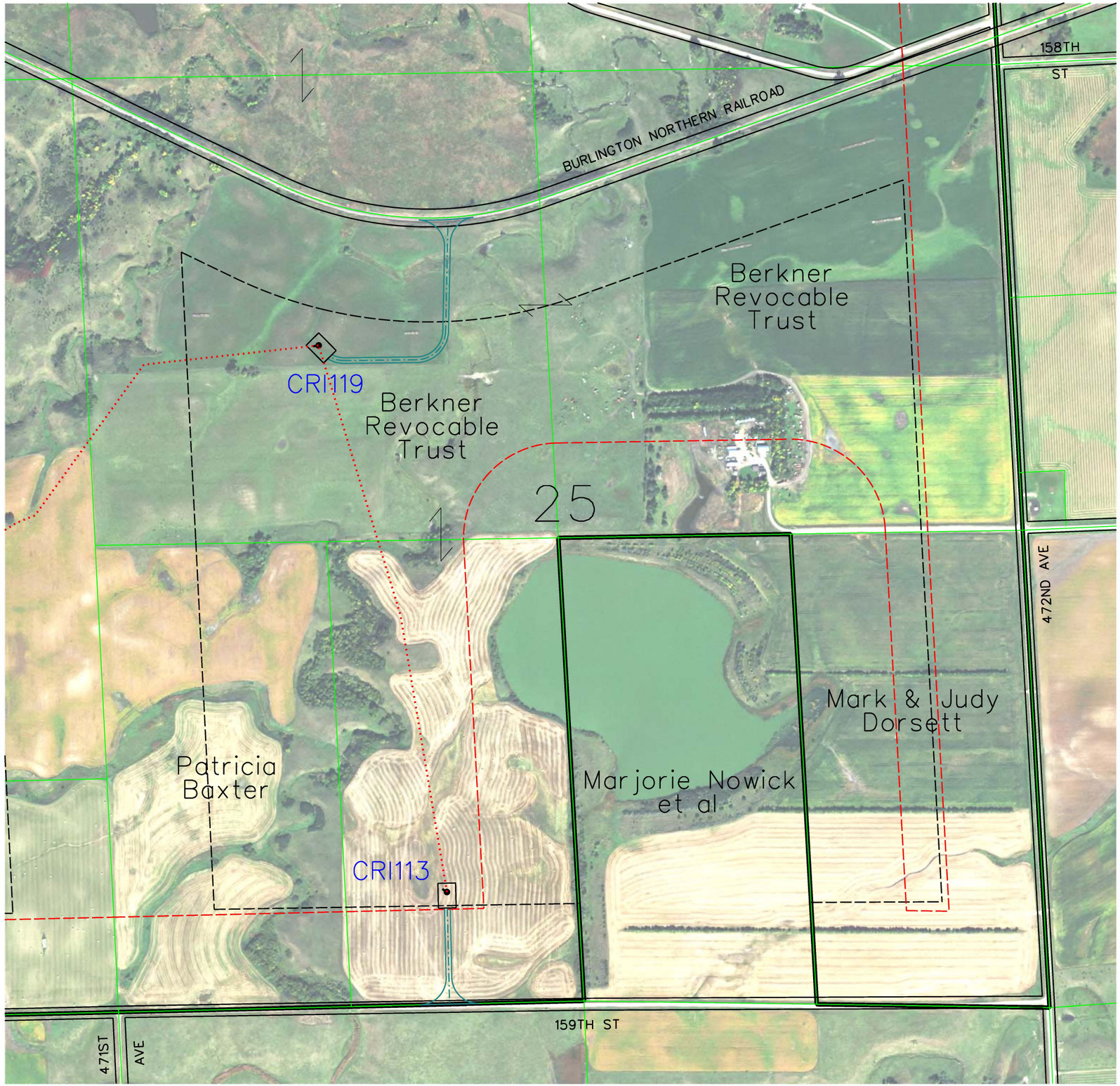
SNYDER & ASSOCIATES, INC.

1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

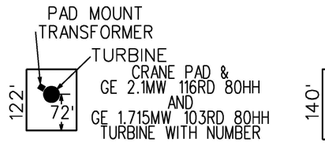
Project No: 1140140

Sheet 6 of 18

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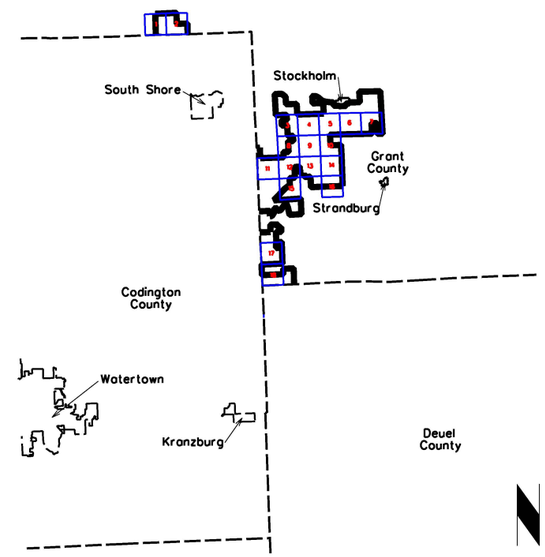


LEGEND



CRI119	GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 90 Meter Hub Height 08-31-18 Array)
CRI115	GE 2.1 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI1115)
CRI120	GE 1.715 MW TURBINE WITH NUMBER (103 Meter Rotor Diameter & 80 Meter Hub Height 08-31-18 Array = CRI120)

- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- NONPARTICIPATING PARCEL SETBACK = 535 FT
- PUBLIC ROAD ROW SETBACK = 535 FT
- MUNICIPAL BOUNDARY SETBACK = 1000 FT
- PROJECT BOUNDARY
- NONPARTICIPATING OCCUPIED HOUSE SETBACK = 1000 FT
- PARTICIPATING OCCUPIED HOUSE SETBACK = 500 FT



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SCALE (FEET)

ISSUE DATE: 09-13-2018

MARK	REVISION	DATE	BY
Engineer: SCH	Checked By: MGG	Scale: 1"=	
Technician: DW	Date: 8/24/18	Field Bk:	Pg:

Project No: 1140140

Sheet 7 of 18

NEXTERA ENERGY - CROWNED RIDGE, LLC

CUP MAPBOOK SEC 25, TWP 119N, RNG 50W

GRANT COUNTY, SOUTH DAKOTA

SNYDER & ASSOCIATES, INC.
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COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

Project No: 1140140

Sheet 7 of 18

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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN GRANT, CODINGTON AND DEUEL COUNTIES	)))))	**EL19-027** **CERTIFICATE OF SERVICE** **EXHIBIT LIST**

Certificate of Service

I hereby certify a true copy of Amber Christenson's Evidentiary Hearing Exhibit List and Certificate of Service were served electronically to the Parties listed below, on the 29th day of January 2020, addressed to:

Ms. Patricia Van Gerpen Executive Director South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 patty.vangerpen@state.sd.us (605) 773-3201 – voice	Ms. Kristen Edwards Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 Kristen.edwards@state.sd.us (605) 773-3201 - voice
Ms. Amanda Reiss Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 amanda.reiss@state.sd.us (605) 773-3201 - voice	Mr. Mikal Hanson Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 mikal.hanson@state.sd.us (605) 773-3201 - voice
Mr. Darren Kearney Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 darren.kearney@state.sd.us (605) 773-3201 – voice	Mr. Jon Thurber Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 jon.thurber@state.sd.us (605) 773-3201 – voice

Mr. Eric Paulson Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 eric.paulson@state.sd.us (605) 773-3201- voice Mr. Tyler Wilhelm Senior Project Manager Crowned Ridge Wind II, LLC 700 Universe Blvd. Juno Beach, FL 33408 Tyler.Wilhelm@nexteraenergy.com (561) 694-3193 – voice Ms. Cindy Brugman Auditor Codington County 14 First Ave. SE Watertown, SD 57201 cbrugman@codington.org (605) 882-6297 – voice Ms. Mary Korth Auditor Deuel County PO Box 616 408 4th St. West Clear Lake, SD 57226 dcaudit1@itctel.com (605) 874-2312 - voice (605) 874-1306 - fax Mr. Allen Robish 47278 161st St. Strandburg, SD 57265 allen.robish@gmail.com (605) 949-2648 - voice Mr. A.J. Swanson - Representing: Garry Ehlebracht, Steven Greber, Mary Greber, Richard Rall, Amy Rall and Laretta Kranz Attorney ARVID J. SWANSON, P.C. 27452 482nd Ave. Canton, SD 57013 aj@ajswanson.com (605) 743-2070 - voice	Mr. Miles Schumacher - Representing Crowned Ridge Wind II, LLC Lynn, Jackson, Shultz and Lebrun, PC 110 N. Minnesota Ave., Ste. 400 Sioux Falls, SD 57104 mschumacher@lynnjackson.com (605) 332-5999 - voice (605) 332-4249 - fax Mr. Brian J. Murphy Managing Attorney NextEra Energy Resources, LLC 700 Universe Blvd. Juno Beach, FL 33408 Brian.J.Murphy@nee.com (561) 694-3814 - voice Ms. Karen Layher Auditor Grant County 210 E. Fifth Ave. Milbank, SD 57252 Karen.Layher@state.sd.us (605) 432-6711 – voice Ms. Kristi Mogen 15160 471st Ave. Twin Brooks, SD 57269 silversagehomestead@gmail.com (307) 359-2928 - voice Ms. Amber Christenson 16217 466th Ave. Strandburg, SD 57265 amber@uniformoutlet.net (605) 756-4119 - voice

/s/ Amber Christenson

Amber Christenson
16217 466th Ave
Strandburg, SD 57265
605-756-4119

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN GRANT, CODINGTON AND DEUEL COUNTIES	)))))	**EL19-027** **AMBER CHRISTENSON'S** **EXHIBIT LIST**

Amber Christenson hereby submits my Exhibit List in preparation for the evidentiary hearing in the above-captioned docket.

I intend to offer the following exhibits. I reserve the right to introduce additional exhibits necessary to rebut evidence presented by any other party in this docket or for impeachment and other legally permissible purposes. All of my exhibits are or will be available electronically in the docket.

Exhibit #	Description
AC-1	A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin
AC-2	McPherson 6 18 May
AC-3	Riina_Bray_IWT_Niagara
AC-4	Applicant's Responses to Amber Christenson's DR
AC-5	Applicant's Responses to Staff's 3rd Set
AC-6	Attachment 1 to Staff DR 3-2
AC-7	Attachment 1 to Staff DR 3-8
AC-8	Applicant's Supplemental Responses to Staff's Second Set of DR
AC-9	Applicant's Responses to Intervenors' Second Set of DR (4)
AC-10	MN-buyout-20186-143575-01
AC-11	Attachment 1 to Intervenor 2-2
AC-12	Attachment 1 to Intervenors 2-10
AC-13	Attachment 1 to Intervenors 2-16
AC-14	Attachment 1 to Intervenor 1-1 Applicant's Responses to Staff's First Set of DR
AC-15	Attachment 1 to Intervenor 1-4 Part 1
AC-17	Applicant Response to Intevenor's First Data Request

Dated this 29th day of January 2020.

/s/ Amber Christenson

Amber Christenson
16217 466th Ave
Strandburg, SD 57265
605-756-4119

Exhibit AC-17

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	EL19-027 **APPLICANT'S RESPONSES TO INTERVENORS AMBER CHRISTENSON, KRISTI MOGEN AND ALLEN ROBISH'S FIRST SET OF DATA REQUESTS TO APPLICANT**

Attached please find Applicant's Responses to Intervenors Amber Christenson, Kristi Mogen and Allen Robish's First Set of Data Requests to Applicant.

Dated December 2, 2019.

Miles F. Schumacher
Attorneys for Applicant
Lynn, Jackson, Shultz & Lebrun, PC
110 N. Minnesota Ave., Suite 400
Sioux Falls, SD 57104

1-1) Provide copies of all data requests submitted to or by you and copies of all responses provided to those data requests. Provide this information to date and on an ongoing basis.

Response: Crowned Ridge Wind II will provide copies of all data requests submitted to or by Crowned Ridge Wind II and copies of all public responses provided to those data requests. This information will be provided on the date it is submitted.

Respondent: Miles Schumacher, Attorney

1-2) Provide any correspondence with the Minnesota PUC regarding Crowned Ridge II. Include all correspondence relating to the MISO interconnection, project ownership, commercial operation date, project progress and schedule, current status as relating to project development and target dates, landowner notifications, and any project delays, changes, concerns or failures.

Response: Crowned Ridge Wind II has submitted no correspondence to the Minnesota PUC, and, therefore, there are no documents responsive to this request.

Respondent: Daryl Hart, Director Business Development

1-3) Provide all FAA Determinations for the Crowned Ridge II project. At the public input hearing, August 26, 2019, 4 turbines were still undetermined. Please identify those 4 turbines and provide the updated status of those turbines as well the determinations of all other turbines.

Response: Please see Attachment 1 to Crowned Ridge Wind II's response to Staff Data Request 1-6 for the FAA determination of no hazard (DNH) received to date. Please see Crowned Ridge Wind II's response to Staff Data Request 2-11, which lists all turbine locations that require DNHs from the FAA. The 4 turbine locations noted as undetermined at the public input meeting were associated with pending easement agreements, which Crowned Ridge Wind II has since obtained. One of the 4 locations noted at the public input meeting requires a DNH; that turbine location is CRII-126.

Respondent: Tyler Wilhelm, Senior Project Manager

1-4) Provide Applications, Staff Reports, Findings of Fact and any Conditions regarding Grant and Codington County CUPs.

1-1) Provide copies of all data requests submitted to or by you and copies of all responses provided to those data requests. Provide this information to date and on an ongoing basis.

Response: Crowned Ridge Wind II will provide copies of all data requests submitted to or by Crowned Ridge Wind II and copies of all public responses provided to those data requests. This information will be provided on the date it is submitted.

Respondent: Miles Schumacher, Attorney

1-2) Provide any correspondence with the Minnesota PUC regarding Crowned Ridge II. Include all correspondence relating to the MISO interconnection, project ownership, commercial operation date, project progress and schedule, current status as relating to project development and target dates, landowner notifications, and any project delays, changes, concerns or failures.

Response: Crowned Ridge Wind II has submitted no correspondence to the Minnesota PUC, and, therefore, there are no documents responsive to this request.

Respondent: Daryl Hart, Director Business Development

1-3) Provide all FAA Determinations for the Crowned Ridge II project. At the public input hearing, August 26, 2019, 4 turbines were still undetermined. Please identify those 4 turbines and provide the updated status of those turbines as well the determinations of all other turbines.

Response: Please see Attachment 1 to Crowned Ridge Wind II's response to Staff Data Request 1-6 for the FAA determination of no hazard (DNH) received to date. Please see Crowned Ridge Wind II's response to Staff Data Request 2-11, which lists all turbine locations that require DNHs from the FAA. The 4 turbine locations noted as undetermined at the public input meeting were associated with pending easement agreements, which Crowned Ridge Wind II has since obtained. One of the 4 locations noted at the public input meeting requires a DNH; that turbine location is CRII-126.

Respondent: Tyler Wilhelm, Senior Project Manager

1-4) Provide Applications, Staff Reports, Findings of Fact and any Conditions regarding Grant and Codington County CUPs.

Response: Crowned Ridge Wind II objects to Data Request 1-4 because the information sought is a matter of public record and equally available to intervenors. Crowned Ridge Wind II also objects because Data Request 1-4 is not reasonably calculated to lead to discovery of admissible evidence in this proceeding before the PUC. Subject to and without waiving these objections, Crowned Ridge Wind II provides Attachments 1 and 2.

Respondent: Tyler Wilhelm, Senior Project Manager

1-5) At the public input meeting, August 26, 2019, when asked about funding the project, Daryl Hart answered, 'There is no money assigned to Crowned Ridge II." Provide with specificity how Crowned Ridge II would fund this project if permitted.

Response: As explained in Sections 1.1 and 3 of the Application, Crowned Ridge Wind II will be transferred to Northern States Power Company, who will own the project after the sale transaction is completed.

Respondent: Daryl Hart, Director Business Development

1-6) Please provide the annual balance sheet annual profit and loss statement for the Applicant for the last three years. The undersigned intervenors will sign an appropriate protective agreement on this matter.

Response: Crowned Ridge Wind II does not have an annual balance sheet annual profit and loss statement for the last three years, and, therefore, there are no documents responsive to this request.

Respondent: Daryl Hart, Director Business Development

1-7) Is the Applicant a party to any litigation with respect to this Project or the combined project which includes Crowned Ridge Wind, LLC? If yes, provide details.

Response: Crowned Ridge Wind objects to Request 1-7, because it is not reasonably calculated to lead to discovery of admissible evidence in this proceeding before the PUC. Subject to and without waiving the objection, Crowned Ridge provides the following response:

Crowned Ridge Wind II is a party to the following cases: CIV. 19-303 (Codington County); CIV. 19-009 (Grant County); CIV. 19-007 (Grant County) and CIV. 18-061 (Deuel County).

Respondent: Miles Schumacher, Attorney

1-8) Provide in detail, Applicant's plan of disposal of any and all blades during the construction, operations, and decommissioning phases of the project. Include documentation of acceptance by the refuse authority, and details of requirements of the acceptance, such as size, composite materials allowed or disallowed, full blades, cut size, crushed, ground, or any conditions required of disposal.

Response: Wind turbine blade disposal at the end of the blade's useful life will be handled either by Crowned Ridge Wind II or contracted to entities which specialize in the transportation and disposal of fiberglass wind turbine blades. The blades will be cut into 8' to 10' increments and deposed of in landfills pursuant to applicable law.

Respondent: Mark Thompson, Manager Wind Engineering

1-9) Tyler Wilhelm's Direct Testimony, page 12, lines 9-11, "How many homes can be served by the clean energy that the wind facility will deliver? The Wind Facility will deliver enough energy to power more than 150,000 homes." Please explain. Is the power continuous, nighttime, wintertime, high load time, annually, weekly, hourly? Specify kilowatts of power provided per household, size of residence, location of residences, duration of power provided. Provide the study.

Response: The Crowned Ridge Wind II facility can deliver power to satisfy the demand for approximately 150,000 homes located in South Dakota. To elaborate, the Crowned Ridge Wind II facility can produce 1,314,000,000 kilowatthour (kWh)/yr. or 109,500,000 kWh/mo. A single family home in South Dakota consumes approximately 65 kWh/mo. in the summer and 942 kWh/mo. during the winter, according to data from Otter Tail Power Company, which can be found at the following link as Attachment 3s – SD Rate Base Summary https://puc.sd.gov/Dockets/Electric/2018/el18-021.aspx. Therefore, Crowned Ridge Wind II can supply 148,004 homes in the summer and 120,194 homes in the winter. The power from the Crowned Ridge Wind II is continuous, and provided nighttime, wintertime, high load time, annually, weekly, hourly when the wind is powering the turbines. When producing power, Crowned Ridge Wind II's energy generated is integrated into the existing power grid and becomes part of the energy mix that is available during all periods of demand including at nights and at peak demand throughout the year.

Respondent: Mark Thompson, Manager Wind Engineering

1-10) Provide a list of all the affiliations, entities, affiliated entities, corporations, associations, doing business as (DBA), limited liability company (LLC), incorporation (INC), partnerships and agents that have been associated with the applicant Next Era and CRW II LLC since 2008 in South Dakota.

Response: Crowned Ridge Wind II objects to Data Request 1-10 as overly broad, not relevant to the scope of the proceeding, and not reasonably calculated to lead to the discovery of admissible evidence in this proceeding before the Commission. Subject to and without waiving these objections, Crowned Ridge Wind II provides the following response.

To the best of Crowned Ridge Wind II's knowledge, the following list includes all affiliations, entities, affiliated entities, corporations, associations, doing business as, limited liability company, incorporation, partnerships and/or agents that have been associated with Crowned Ridge Wind II since 2008 in South Dakota:

- Crowned Ridge Wind, LLC;
- Crowned Ridge Wind II, LLC;
- Cattle Ridge Wind Farm, LLC;
- Cattle Ridge Wind Holdings, LLC;
- Tower Associates, LLC;
- Boulevard Associates, LLC;
- SWCA Environmental Consultants, Inc.;
- EAPC Wind Energy Services, LLC.;
- OEHM
- HDR Engineering, Inc.;
- Ulteig Engineers, Inc.;
- Burns & McDonnell Engineering Company Inc.;
- P&E Engineering Co.;
- Barr Engineering Co.;
- Snyder & Associates, Inc.;
- Capitol Airspace Group, LLC;
- Beta Land Services, LLC; and
- CanAcre.

Respondent: Tyler Wilhelm, Senior Project Manager

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN GRANT, CODINGTON AND DEUEL COUNTIES	)))))	**EL19-027** **CERTIFICATE OF SERVICE** **EXHIBIT LIST**

Certificate of Service

I hereby certify a true copy of Exhibit AC-17 and Certificate of Service were served electronically to the Parties listed below, on the 29th day of January 2020, addressed to:

Ms. Patricia Van Gerpen Executive Director South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 patty.vangerpen@state.sd.us (605) 773-3201 – voice	Ms. Kristen Edwards Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 Kristen.edwards@state.sd.us (605) 773-3201 - voice
Ms. Amanda Reiss Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 amanda.reiss@state.sd.us (605) 773-3201 - voice	Mr. Mikal Hanson Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 mikal.hanson@state.sd.us (605) 773-3201 - voice
Mr. Darren Kearney Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 darren.kearney@state.sd.us (605) 773-3201 – voice	Mr. Jon Thurber Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 jon.thurber@state.sd.us (605) 773-3201 – voice
Mr. Eric Paulson Staff Analyst	Mr. Miles Schumacher - Representing Crowned Ridge Wind II, LLC

South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
eric.paulson@state.sd.us
(605) 773-3201- voice

Mr. Tyler Wilhelm
Senior Project Manager
Crowned Ridge Wind II, LLC
700 Universe Blvd.
Juno Beach, FL 33408
Tyler.Wilhelm@nexteraenergy.com
(561) 694-3193 – voice

Ms. Cindy Brugman
Auditor
Codington County
14 First Ave. SE
Watertown, SD 57201
cbrugman@codington.org
(605) 882-6297 – voice

Ms. Mary Korth
Auditor
Deuel County
PO Box 616
408 4th St. West
Clear Lake, SD 57226
dcaudit1@itctel.com
(605) 874-2312 - voice
(605) 874-1306 - fax

Mr. Allen Robish
47278 161st St.
Strandburg, SD 57265
allen.robish@gmail.com
(605) 949-2648 - voice

Mr. A.J. Swanson - Representing: Garry Ehlebracht, Steven Greber, Mary Greber, Richard Rall, Amy Rall and Laretta Kranz
Attorney
ARVID J. SWANSON, P.C.
27452 482nd Ave.
Canton, SD 57013
aj@ajswanson.com
(605) 743-2070 - voice

Lynn, Jackson, Shultz and Lebrun, PC
110 N. Minnesota Ave., Ste. 400
Sioux Falls, SD 57104
mschumacher@lynnjackson.com
(605) 332-5999 - voice
(605) 332-4249 - fax

Mr. Brian J. Murphy
Managing Attorney
NextEra Energy Resources, LLC
700 Universe Blvd.
Juno Beach, FL 33408
Brian.J.Murphy@nee.com
(561) 694-3814 - voice

Ms. Karen Layher
Auditor
Grant County
210 E. Fifth Ave.
Milbank, SD 57252
Karen.Layher@state.sd.us
(605) 432-6711 – voice

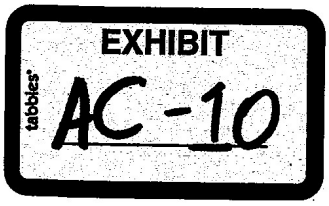
Ms. Kristi Mogen
15160 471st Ave.
Twin Brooks, SD 57269
silversagehomestead@gmail.com
(307) 359-2928 - voice

Ms. Amber Christenson
16217 466th Ave.
Strandburg, SD 57265
amber@uniformoutlet.net
(605) 756-4119 - voice

/s/ Amber Christenson

008665

Amber Christenson
16217 466th Ave
Strandburg, SD 57265
605-756-4119



BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Nancy Lange	Chair
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
Katie J. Sieben	Commissioner
John A. Tuma	Commissioner

In the Matter of the Site Permit Issued to the Wisconsin Power and Light Company for the Bent Tree Wind Project in Freeborn County, Minnesota

ISSUE DATE: June 5, 2018

DOCKET NO. ET-6657/WS-08-573

ORDER DISMISSING COMPLAINT AND FEBRUARY 18, 2018 MOTION WITH CONDITIONS

PROCEDURAL HISTORY

On October 20, 2009, the Commission issued a large wind energy conversion system (LWECS) site permit to Wisconsin Power and Light Company (WPL) for the approximately 200-megawatt first phase of the Bent Tree Wind Project (the Project), located in Freeborn County. The Project commenced commercial operation in February 2011.

On August 24, 2016, the Commission issued an order requiring noise monitoring and a noise study at the Project site.

During the period of September 2016 through February 2018, Bernie and Cheryl Hagen, landowners within the Project area, filed approximately 20 letters regarding health effects that they claim were caused by the Project. David Langrud, another landowner within the Project area, filed five letters during that time, two in conjunction with the Hagens (the Hagens and the Langruds are jointly referred to as the Landowners).

On September 28, 2017, Department of Commerce Energy Environmental Review and Analysis Unit (EERA) filed a post-construction noise assessment report for the Project (Phase 1 Report)[1] identifying 16 hours of non-compliance with Minnesota Pollution Control Agency (MPCA) ambient noise standards during the two-week monitoring period.

On October 11, 2017, WPL filed a letter disputing the analysis in the Phase 1 Report and arguing the Project remains in compliance with noise requirements.

On February 7, 2018, EERA filed a Phase 2 post-construction noise assessment report (Phase 2 Report) concluding that certain Project turbines are a significant contributor to exceedances of MPCA ambient noise standards at certain wind speeds.

[1] The Phase 1 and Phase 2 Noise Assessment Reports were prepared by DNV-GL.

On February 8, 2018, WPL filed a letter informing the Commission that it would respond to the Phase 2 Report at a later date and would immediately curtail three turbines that are part of the Project, two that are identified in the Phase 2 Report as T132 and T397, and located in the vicinity of the Hagen Property and one that is identified as T362 and located in vicinity of the Langrud property.

On February 20, 2018, the Landowners filed a *Motion for Order to Show Cause and for Hearing*, requesting that the Commission issue an Order to Show Cause why the site permit for the Project should not be revoked, and requesting a contested-case hearing on the matter.

On March 23, 2018, the Commission issued an *Order to Show Cause, Requiring Further Review by the Department of Commerce, and Continuing Curtailment.*

On April 19, 2018, WPL filed with the Commission a *Notice of Confidential Settlement Agreement and Joint Recommendation and Request*, under which, among other provisions: (1) WPL shall purchase each Landowner's property; (2) each Landowner shall enter into a Neighbor agreement and Easement that shall be binding on any future owners of the property; and (3) each Landowner shall release any and all past, present, and future claims against WPL. The Confidential Settlement Agreement provides that it is contingent on the Commission issuing a written order specifying the terms under which WPL agrees to take possession of the properties.

On April 30, 2018, WPL filed a response to the *Order to Show Cause.*

On May 1, 2018, the EERA filed comments on the Confidential Settlement Agreement, indicating no opposition to the request to dismiss the Complaint and terminate curtailment, nor to the condition that further noise monitoring related to Turbine Nos. T132, T397, and T362 not be required based upon the Phase 1 and Phase 2 Reports.

On May 17, 2018, the Commission met to consider the matter.

FINDINGS AND CONCLUSIONS

I. The Confidential Settlement Agreement

WPL has entered into a Confidential Settlement Agreements with each Landowner, by which the parties agree to the terms of sale of their properties to WPL, execution of easements on the property, and a release of all the Landowners' claims against WPL. The Agreement also outlines the terms by which the Agreement would be executed. The finality of the Confidential Settlement Agreements is conditioned on the Commission making specific findings on which the parties and the Department agree. These findings include, among others:

- Dismissal of the Landowners' February 20, 2018 motion and all noise-related complaints filed in this matter;

- Termination of the required curtailment of turbines T132, T397, and T362 based on the Phase 1 and 2 Reports;

- Transfer of possession of each property to WPL; and
- Requiring a compliance filing be filed with the Commission.

Finally, the settlement states that the Commission will require no further sound monitoring at any location pertaining to Bent Tree on the basis of the Phase 1 and Phase 2 Reports.

II. EERA Comments

After review and analysis of the parties' April 19, 2018 filing, the EERA did not object to the proposed Confidential Settlement Agreement. The EERA noted, however, that any new residents could not waive WPL's duty to meet noise standards even if they may be willing to live with violations of the Minnesota Pollution Control Agency's ambient noise standard in exchange for payment or through some other agreement. The EERA cautioned that the noise compliance issue would likely need to be reopened if the Hagen or Langrud properties were returned in the future to residential use.

III. Commission Action

After its own review, and with modifications set forth below related to the possibility of the potential future sale of the properties for residential use, the Commission finds that resolving this dispute and the terms of the Confidential Agreement are in the public interest and will result in a reasonable and prudent resolution of the issues raised in the Landowners' Complaints. While WPL stated at the hearing that it had no plans to occupy or sell the properties in the immediate future, it would not object to conducting a new noise study in the future prior to residential occupancy should the likelihood of such use arise. Therefore, the Commission will add the conditions listed in Ordering Paragraphs 6 (A)-(D) below.

Finally, in resolving this matter the Commission recognizes that under the terms of the Confidential Settlement Agreement, no party has made any admissions of law and/or fact. Accordingly, the Commission will approve the Confidential Settlement Agreement as filed, with the modifications as set out below.

ORDER

1. The prior and current Langrud and Hagen complaints are deemed resolved under the terms of Wisconsin Power and Light's Site Permit for the Bent Tree Wind Project Phase I Project. At the request of the settling parties, the complainants' February 20, 2018 Motion and all of the Landowners' complaints in this matter are dismissed.

2. The required curtailment of turbines T132 and T397 based on the Phase 1 and 2 Sound Reports shall terminate on the date on which the Hagens transfer possession of their property to WPL.

3. The required curtailment of turbine T362 based on the Phase 1 and 2 Sound Reports shall terminate on the date on which the Langruds transfer possession of their property to WPL.

4. WPL shall file with the Commission within 30 days of the transfer of possession of each property a compliance filing indicating the date of commencement of operations of the turbines associated with that property.

5. The Commission will not require any further sound monitoring at any location pertaining to Bent Tree on the basis of the Phase 1 and Phase 2 Reports.

6. Upon the sale of either the Langrud or Hagen property, WPL shall file with the Commission notification of the sale and indicate whether the property will be used as a residence. If the property is intended to be used as a residence after sale or upon lease, the permittee shall file with the Commission:

   A. Notification of the sale or lease;

   B. Documentation of present compliance with noise standards of turbines T132, T397, and T362;

   C. Documentation of any written notice to the potential residence of past noise studies alleging noise standard exceedances, and if applicable, allegations of present noise standard exceedances related to the property; and

   D. Any mitigation plans or other relevant information.

7. This order shall become effective immediately.

BY ORDER OF THE COMMISSION

Daniel P. Wolf

Daniel P. Wolf
Executive Secretary

This document can be made available in alternative formats (e.g., large print or audio) by calling 651.296.0406 (voice). Persons with hearing loss or speech disabilities may call us through their preferred Telecommunications Relay Service or email consumer.puc@state.mn.us for assistance.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN GRANT, CODINGTON AND DEUEL COUNTIES	)))))	**EL19-027** **CERTIFICATE OF SERVICE**

Certificate of Service

I hereby certify a true copy of Exhibit AC-10, and Certificate of Service were served electronically to the Parties listed below, on the 29th day of January 2020, addressed to:

Ms. Patricia Van Gerpen Executive Director South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 patty.vangerpen@state.sd.us (605) 773-3201 – voice	Ms. Kristen Edwards Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 Kristen.edwards@state.sd.us (605) 773-3201 - voice
Ms. Amanda Reiss Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 amanda.reiss@state.sd.us (605) 773-3201 - voice	Mr. Mikal Hanson Staff Attorney South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 mikal.hanson@state.sd.us (605) 773-3201 - voice
Mr. Darren Kearney Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 darren.kearney@state.sd.us (605) 773-3201 – voice	Mr. Jon Thurber Staff Analyst South Dakota Public Utilities Commission 500 E. Capitol Ave. Pierre, SD 57501 jon.thurber@state.sd.us (605) 773-3201 – voice
Mr. Eric Paulson Staff Analyst	Mr. Miles Schumacher - Representing Crowned Ridge Wind II, LLC

South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
eric.paulson@state.sd.us
(605) 773-3201- voice

Mr. Tyler Wilhelm
Senior Project Manager
Crowned Ridge Wind II, LLC
700 Universe Blvd.
Juno Beach, FL 33408
Tyler.Wilhelm@nexteraenergy.com
(561) 694-3193 – voice

Ms. Cindy Brugman
Auditor
Codington County
14 First Ave. SE
Watertown, SD 57201
cbrugman@codington.org
(605) 882-6297 – voice

Ms. Mary Korth
Auditor
Deuel County
PO Box 616
408 4th St. West
Clear Lake, SD 57226
dcaudit1@itctel.com
(605) 874-2312 - voice
(605) 874-1306 - fax

Mr. Allen Robish
47278 161st St.
Strandburg, SD 57265
allen.robish@gmail.com
(605) 949-2648 - voice

Mr. A.J. Swanson - Representing: Garry Ehlebracht, Steven Greber, Mary Greber, Richard Rall, Amy Rall and Laretta Kranz
Attorney
ARVID J. SWANSON, P.C.
27452 482nd Ave.
Canton, SD 57013
aj@ajswanson.com
(605) 743-2070 - voice

Lynn, Jackson, Shultz and Lebrun, PC
110 N. Minnesota Ave., Ste. 400
Sioux Falls, SD 57104
mschumacher@lynnjackson.com
(605) 332-5999 - voice
(605) 332-4249 - fax

Mr. Brian J. Murphy
Managing Attorney
NextEra Energy Resources, LLC
700 Universe Blvd.
Juno Beach, FL 33408
Brian.J.Murphy@nee.com
(561) 694-3814 - voice

Ms. Karen Layher
Auditor
Grant County
210 E. Fifth Ave.
Milbank, SD 57252
Karen.Layher@state.sd.us
(605) 432-6711 – voice

Ms. Kristi Mogen
15160 471st Ave.
Twin Brooks, SD 57269
silversagehomestead@gmail.com
(307) 359-2928 - voice

Ms. Amber Christenson
16217 466th Ave.
Strandburg, SD 57265
amber@uniformoutlet.net
(605) 756-4119 - voice

/s/ Amber Christenson

008672

Amber Christenson
16217 466th Ave
Strandburg, SD 57265
605-756-4119

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	**STAFF'S PARTIAL JOINDER OF MOTION TO STRIKE** **EL19-027**

Staff hereby submits this Partial Joinder of Motion to Strike filed by Crowned Ridge Wind II, LLC (Applicant) on January 14, 2020. The witnesses proffering the testimony have not been qualified as experts, therefore, Staff joins in Applicant's argument supporting striking portions of the testimony in which the witness is offering legal opinion. In addition, the statements in the testimony that the witness attributes to their lawyer are hearsay and should be stricken.

However, Staff disagrees with Applicant as to what testimony should be stricken for the above-mentioned reasons and would not go as far as Applicant in the Motion to Strike. Rather, Staff limits its Joinder to the following portions of testimony:

- Greber
  - Page 3, line 18 at "including" through line 26
  - Page 4, lines 6-7 and 29-30 beginning at "I am advised"
- Rall – Staff does not join in the Motion as to any portion of this testimony.
- Ehlebracht
  - Page 3, lines 16-17 as requested
  - Page 4, lines 14-15, only the words "having been advised by my counsel"
  - Page 4, lines 20-22 as requested
  - Page 4, lines 24-25, first sentence only

Staff believes this fairly balances the need to abide by the rules of civil procedure and the desire to allow for a full explanation of landowner concerns.

Dated this 31st day of January 2020.

Kristen N. Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501
Phone (605)773-3201
Kristen.edwards@state.sd.us

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY CROWNED RIDGE WIND II, LLC FOR A PERMIT OF A WIND ENERGY FACILITY IN DEUEL, GRANT AND CODINGTON COUNTIES	)))))	**CERTIFICATE OF SERVICE** **EL19-027**

I hereby certify that true and correct copies of the Staff's Partial Joinder of Motion to Strike and Certificate of Service were served electronically on the 31st day of January 2020, addressed to those parties listed on the service list.



Kristen N. Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501
Phone (605)773-3201
Kristen.edwards@state.sd.us



January 30, 2020

Deuel Area Development, Inc.
[redacted]

SUBJECT: Docket EL19-027

Dear Commissioners Hansen, Hanson and Fiegen –

Greetings from Deuel County! I am the Executive Director of Deuel Area Development, Inc. in Clear Lake SD. My job as director is varied, one aspect and why I'm writing this letter today is in regards to Crowned Ridge II (Docket EL19-027). All of our local economies will benefit. This project could bring in 250 construction jobs, 12 full-time operations jobs and tens of millions in new tax revenue and landowner payments.

I would urge you to support Crowned Ridge II, just as you have supported other wind energy projects in South Dakota. Our region and our state *will benefit* from welcoming wind energy projects like Crowned Ridge II.

Thank you for your consideration.

Joan

Joan B. Sacrison
Executive Director
Deuel Area Development, Inc.
[redacted]

008677

From: PUC
Sent: Friday, January 31, 2020 4:28 PM
To: [redacted]
Subject: EL19-027

Ms. Sacrison,

Thank you for your message regarding the Crowned Ridge II wind project siting permit request, docket EL19-027. Commissioners Nelson, Fiegen and I base our decisions on evidence presented via the docket review process, as required by law. The primary determination is whether or not the location, construction and operation of the facilities will produce minimal adverse effects on the health, safety and welfare of South Dakota's environment and citizens. These standards are provided by South Dakota Codified Laws and Administrative Rules.

Your message and this response will be posted under Comments and Responses in the docket, and here is a link to EL19-027, https://puc.sd.gov/Dockets/Electric/2019/EL19-027.aspx. Here is a link to the commission's Siting Guidelines posted on the commission's website home page and in the siting docket: https://puc.sd.gov/commission/dockets/electric/2019/el19-027/sitinghandout.pdf.

Chairman Gary Hanson
South Dakota Public Utilities Commission
https://puc.sd.gov/

ADMINISTRATIVE RECORD - Scan 7 - Page 23 of 23