APPENDIX A - WIND TURBINE CHARACTERISTICS

Wind Turbine Characteristics

	Turbine Model[a]
Characteristic	**GE 3.8-137**
Nameplate capacity	3.83 MW
Hub height	110 meters (361 feet)
Rotor diameter	137 meters (449 feet)
Total height	178.5 +/- 1 meters (586 +/- 3 feet)
Cut-in speed[b]	3 m/s
Rated speed[c]	12 m/s
Cut-out speed[d]	25 m/s over 600s 30 m/s over 30s 34 m/s over 3s
Rotor area	14,741 m^2
Rotor speed	Variable – max is around 13.6 rpm

(a) MW = megawatt; m/s = meters per second; m^2 = square meters; rpm = revolutions per minute

(b) Cut-in wind speed = wind speed at which turbine begins operation

(c) Rated speed = wind speed at which turbine reaches its rated capacity

(d) Cut-out wind speed = wind speed above which turbine shuts down operation

(e) High Wind Operation package

APPENDIX B - SOUND STUDY

Sound Study

Prevailing Wind Park, LLC

Prevailing Wind Park
Project No. 105644

Revision 5
05/30/2018

Sound Study

prepared for

Prevailing Wind Park, LLC
Prevailing Wind Park
Bon Homme/Charles Mix/Hutchinson Counties, SD

Project No. 105644

Revision 5
05/30/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
ANSI	American National Standards Institute
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CadnaA	Computer Aided Design for Noise Abatement
dB	Decibel
dBA	A-weighted decibels
DEM	Digital Elevation Model
Developer	Prevailing Wind Park, LLC
GE	General Electric
Hz	Hertz
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
L_{90}	the sound level exceeded 90 percent of the time period
L_{eq}	equivalent-continuous sound level
LWES	Large Wind Energy System
L_x	exceedance sound level
MP	measurement point
Project	Prevailing Wind Park
The Act	The Noise Control Act of 1972
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WES	Wind Energy System

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REVISION HISTORY

Rev	Issue Date	Release Notes
0	03-Apr-2018	Original release
1	09-Apr-2018	Revised wind turbine layout, incorporated client comments
2	11-Apr-2018	Added REC-138
3	16-Apr-2018	Revised wind turbine layout
4	27-Apr-2018	Revised wind turbine layout
5	14-May-2018	Incorporated client comments

1.0 EXECUTIVE SUMMARY

Prevailing Wind Park, LLC (Developer) is proposing to construct the Prevailing Wind Park near Avon, South Dakota, in Bon Homme, Hutchinson, and Charles Mix Counties (Project). The Project will consist of 57 to 61 wind turbines with a maximum nameplate capacity of up to 219.6 megawatts (MW), although output at the point of interconnection will be limited to a maximum of 200 MW. A total of 63 wind turbine sites were analyzed for two turbine models: General Electric (GE) 3.8-137 and Vestas V136-3.6. This sound assessment was completed to determine if the Project can operate in compliance with the applicable sound regulations.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) conducted an ambient sound survey and sound modeling study for the proposed Project. There were several objectives in this study, which included:

- Identification of any applicable county, city, state, or federal noise ordinances and other applicable sound guidelines;
- Measure ambient sound levels at noise-sensitive receivers;
- Estimation of the operational sound levels from the hypothetical Project layout using the three-dimensional sound modeling program Computer Aided Design for Noise Abatement (CadnaA); and
- Determination if the wind farm can operate in compliance with the identified applicable regulatory standards.

There are no federal or state noise regulations that apply to this Project. Therefore, only local regulations would apply. Bon Homme County has adopted a zoning ordinance that pertains to wind energy systems. The ordinance limits sound levels of WES to 45 dBA at occupied receptors, unless a signed waiver or easement is obtained from the owner of the residence. Neither Charles Mix nor Hutchinson County has a numerical noise limit. Therefore, the Bon Homme County ordinance sound level limit was used as the design goal for all areas of the Project.

The wind turbines were modeled using manufacturer-specified sound power levels. Sound pressure levels were predicted at all receivers within and surrounding the Project area. There are no expected exceedances of the identified regulations due to operation of any of the proposed wind turbine locations of the Project.

2.0 ACOUSTICAL TERMINOLOGY

The term “sound level” is often used to describe two different sound characteristics: sound power and sound pressure. Every source that produces sound has a sound power level. The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the surrounding environment. The acoustical energy produced by a source propagates through media as pressure fluctuations. These pressure fluctuations, also called sound pressure, are what human ears hear and microphones measure.

Sound is physically characterized by amplitude and frequency. The amplitude of sound is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals). The reference sound pressure corresponds to the typical threshold of human hearing. To the average listener, a 3-dB change in a continuous broadband sound is generally considered “just barely perceptible”; a 5-dB change is generally considered “clearly noticeable”; and a 10-dB change is generally considered a doubling (or halving, if the sound is decreasing) of the apparent loudness.

Sound waves can occur at many different wavelengths, also known as the frequency. Frequency is measured in hertz (Hz) and is the number of wave cycles per second that occur. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the lower and higher frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, or dBA. For reference, the A-weighted sound pressure level and subjective loudness associated with some common sound sources are listed in Table 2-1.

Table 2-1: Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)[a]	Subjective Evaluation	Environment	
		Outdoor	**Indoor**
140	Deafening	Jet aircraft at 75 feet	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	--
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd noise at football game	--
90	--	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph)[a] at 50 feet	Inside auto at high speed, garbage disposal
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source: Adapted from *Architectural Acoustics*, M. David Egan, 1988 and *Architectural Graphic Standards*, Ramsey and Sleeper, 1994.
(a) dBA = A-weighted decibels; mph = miles per hour

Sound metrics have been developed to quantify fluctuating environmental sound levels. These metrics include the exceedance sound level. The exceedance sound level, L_x, is the sound level exceeded during "x" percent of the sampling period and is also referred to as a statistical sound level. L_{90} levels are presented throughout this study. The L_{90} is a common L_x value and represents the sound level with minimal influence from short-term, loud transient sound sources. The L_{90} represents the sound level exceeded for 90 percent of the time period during which sound levels are measured. The L_{90} value is regarded as the most accurate tool for measuring relatively constant background noise and for minimizing the influence of isolated spikes in sound levels (i.e., barking dog, door slamming).

3.0 REGULATIONS

Federal, state, and county regulations were reviewed to determine the applicable overall sound level limits for the Project.

The Noise Control Act of 1972 (the Act) (U.S.C. 4901) mandated a national policy "to promote an environment for all Americans free from noise that jeopardizes their health or welfare, to establish a means for effective coordination of Federal research activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting the noise emission and noise reduction characteristics of such products."

As required by the Act, the EPA established criteria for protecting the public health and wellbeing. However, these criteria do not constitute enforceable federal regulations or standards. The EPA has since delegated regulatory authority to local entities. Therefore, there are no federal noise regulations that apply to this Project.

Bon Homme County has adopted a zoning ordinance that pertains to wind energy systems. The ordinance limits sound levels of WES to 45 dBA at occupied receptors, unless a signed waiver or easement is obtained from the owner of the residence. Charles Mix County is only zoned in the townships, and because there are no turbines proposed for the townships, there are no zoning requirements for the Project within Charles Mix County (i.e., no zoning noise limits). Hutchinson County does not have a numerical noise ordinance.

Because there are no limits in Charles Mix and Hutchinson counties, the Bon Homme County ordinance sound level limit was used as the design goal for all areas of the Project. Therefore, the design criteria for the Project is 45 dBA at occupied receptors, unless a signed waiver or easement is obtained from the owner of the residence.

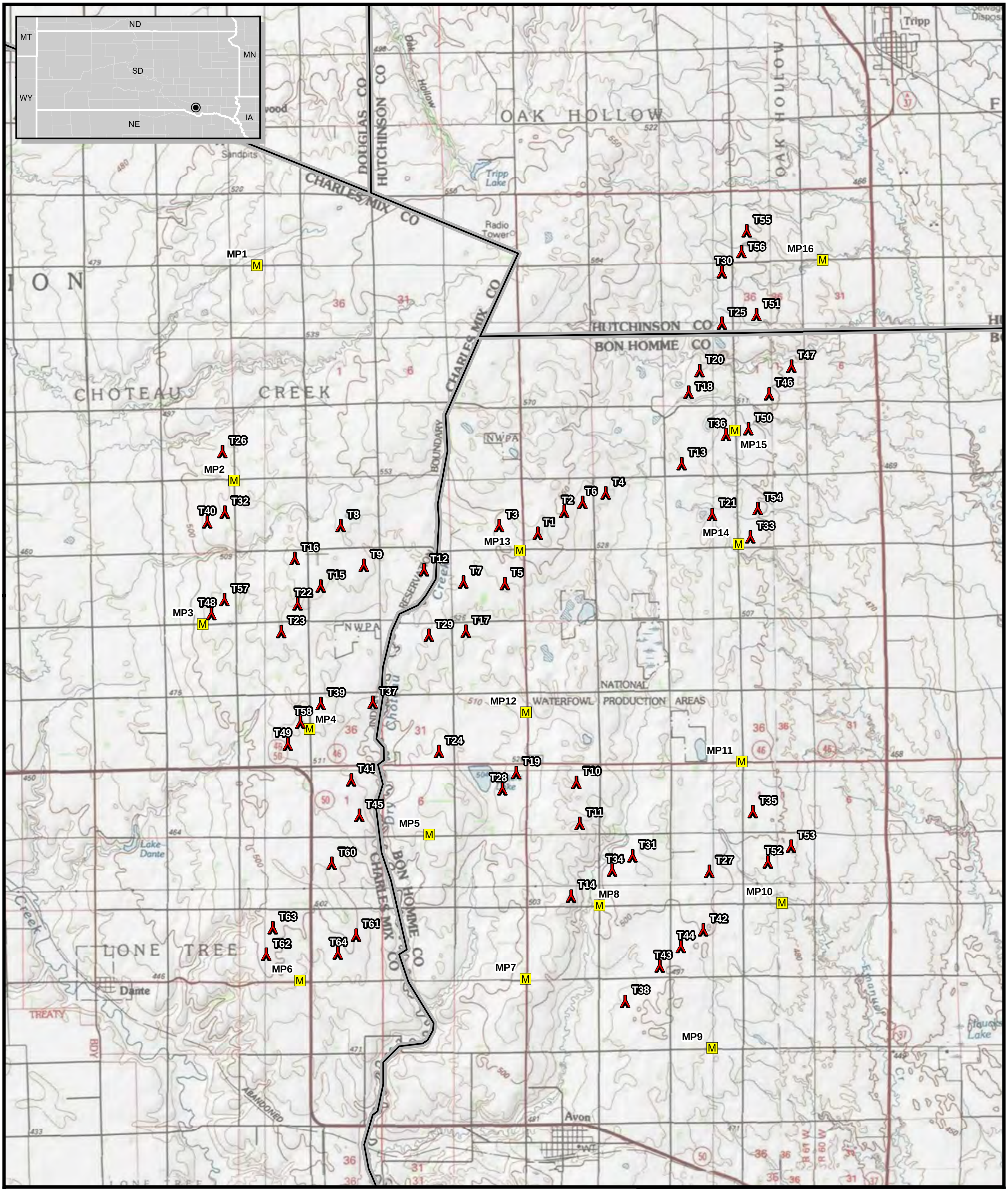
4.0 AMBIENT SOUND SURVEY

Burns & McDonnell personnel conducted an ambient sound survey of surrounding Project areas on March 12 and 13, 2018.

Measurements were taken using an American National Standards Institute (ANSI) S1.4 type 1 sound level meter (Larson David Model 831). The sound level meter was calibrated at the beginning and end of each set of measurements. None of the calibration level changes exceeded ± 0.5 dB. A windscreen was used at all times on the microphone, and the meter was mounted on a tripod. Certificates of calibration for the equipment used are available upon request. The microphone was located approximately 5 feet above ground level with the microphone directed towards the closest proposed wind turbine location and angled per the manufacturer’s recommendation. All measurements were taken when meteorological conditions were favorable for conducting ambient sound measurements, per ANSI standards (low wind, moderate temperatures, humidity, and no precipitation).

Ambient far-field measurements were made at 16 locations, labeled measurement point (MP) MP1 through MP16, as shown in Figure 4-1. The measurement points were selected because they were accessible and representative of existing ambient sound levels in the vicinity of noise-sensitive receivers.

The far-field sound level measurements were 5 minutes in duration, and measured values were logged by the sound meter at each measurement point. The sound levels varied at each measurement point due to the extraneous sounds that occurred during each measurement. The overall A-weighted L_{eq} and L_{90} sound levels collected during the ambient far-field measurements are shown below in Table 4-1. Sound levels measured were in the range of 21.5 dBA to 45.0 dBA L_{90}.



LEGEND

▭ County Boundary

⅄ Wind Turbine

M Measurement Points

REFERENCE

PREVAILING WIND PARK
Measurement Points

LOCATION:	Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT:	Prevailing Wind Park, LLC
PROJ. NO.:	105644
CREATED:	04/25/2018

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Path: \\bmcd\dfs\Clients\BTS\SPowerDC\105644_PrvWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter

Table 4-1: Ambient Measurements Data

Measurement Location	Sound Pressure Level (dBA)					
	Ambient (5:00 PM on 03/12/18)		Ambient (12:00 AM on 03/13/18)		Ambient (10:00 AM on 03/13/18)	
	L_{eq}	L_{90}	L_{eq}	L_{90}	L_{eq}	L_{90}
MP1	34.6	26.0	40.4	30.0	35.2	25.1
MP2	36.5	29.6	35.7	28.6	39.0	30.2
MP3	37.7	29.2	32.6	22.3	41.0	28.0
MP4	39.6	29.1	33.7	24.3	35.0	28.9
MP5	36.9	28.0	34.6	22.6	35.4	25.4
MP6	47.9	33.4	34.7	26.3	40.0	31.8
MP7	38.3	31.0	30.2	24.0	42.6	37.7
MP8	34.8	28.4	28.6	22.7	47.7	27.9
MP9	35.7	27.0	35.3	29.5	33.2	24.4
MP10	37.4	30.6	39.4	35.2	35.0	27.1
MP11	62.7	45.0	35.6	31.6	69.1	28.1
MP12	39.5	32.6	37.1	21.5	40.6	29.4
MP13	36.3	27.1	38.9	32.1	59.5	28.4
MP14	35.7	28.8	34.1	27.4	35.1	28.9
MP15	33.8	28.4	35.7	28.7	35.0	29.3
MP16	49.8	36.9	39.0	29.8	35.0	28.8

Extraneous sounds during the measurement periods included high speed traffic, birds, wind noise, and farm equipment. The measured sound levels and noise sources are presented in Appendix A.

5.0 SOUND MODELING

5.1 Wind Turbine and Transformer Sound Characteristics

The sound commonly associated with a wind turbine is described as a rhythmic "whoosh" caused by aerodynamic processes. This sound is created as air flow interacts with the surface of rotor blades. As air flows over the rotor blade, turbulent eddies form in the surface boundary layer and wake of the blade. These eddies are where most of the "whooshing" sound is formed. Additional sound is generated from vortex shedding produced by the tip of the rotor blade. Air flowing past the rotor tip creates alternating low-pressure vortices on the downstream side of the tip, causing sound generation to occur. Older wind turbines, built with rotors which operate downwind of the tower (downwind turbines), often have higher aerodynamic impulse sound levels. This is caused by the interaction between the aerodynamic lift created on the rotor blades and the turbulent wake vortices produced by the tower. Modern wind turbine rotors are mostly built to operate upwind of the tower (upwind turbines). Upwind wind turbines are not impacted by wake vortices generated by the tower and, therefore, overall sound levels can be as much as 10 dBA less. The rhythmic fluctuations of the overall sound level are less perceivable the farther one gets from the turbine. Additionally, multiple turbines operating at the same time will create the whooshing sound at different times. These non-synchronized sounds will blend together to create a more constant sound to an observer at most distances from the turbines. Another phenomenon that reduces perceivable noise from turbines is the wind itself. Higher wind speed produces noise in itself that tends to mask (or drown out) the sounds created by wind turbines.

Advancement in wind turbine technology has reduced pure tonal emissions of modern wind turbines. Manufacturers have reduced distinct tonal sounds by reshaping turbine blades and adjusting the angle at which air contacts the blade. Pitching technology allows the angle of the blade to adjust when the maximum rotational speed is achieved, which allows the turbine to maintain a constant rotational velocity. Therefore, sound emission levels remain constant as the velocity remains the same.

Wind turbines can create noise in other ways as well. Wind turbines have a nacelle where the mechanical portions of the turbine are housed. The current generation of wind turbines uses multiple techniques to reduce the noise from this portion of the turbine: vibration isolating mounts, special gears, and acoustic insulation. In general, all moving parts and the housing of the current generation wind turbines have been designed to minimize the noise they generate.

5.2 Model Inputs and Settings

Predicted sound levels were modeled using industry-accepted sound modeling software. The program used to model the turbines was the CadnaA, Version 2017, published by DataKustik, Ltd., Munich, Germany. The CadnaA program is a scaled, three-dimensional program that accounts for air absorption, terrain, ground absorption, and ground reflection for each piece of noise-emitting equipment and predicts downwind sound pressure levels. The model calculates sound propagation based on International Organization for Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613, and therefore CadnaA, assesses the sound pressure levels based on the Octave Band Center Frequency range from 31.5 to 8,000 Hz. Compliance with the regulations for all turbines operating should equate to compliance for any combination of the turbines operating.

5.2.1 Project Layout

Prevailing Wind's hypothetical layout contains 63 wind turbine sites, including alternatives. Predictive modeling was conducted to determine the impacts at the occupied residences shown in Appendix B.

5.2.2 Terrain and Vegetation

Terrain and attenuation from ground absorption can have a significant impact on sound transmission. U.S. Geological Survey (USGS) Digital Elevation Model (DEM) contours were imported into the model to account for topographic variations around the Project. The contours were overlaid onto high resolution, digital orthoimagery obtained from the U.S. Department of Agriculture (USDA) to visually check proper contour positioning. The terrain around the proposed Project is mostly rural with few minor changes in elevation. The land is primarily used for agricultural purposes. As such, vegetation is mostly low-lying with some small areas of trees. Therefore, vegetation was excluded from the analysis to maintain conservativeness in the model. Ground attenuation is expected to be fairly high, due to the "soft ground" of the surrounding areas; however, a conservative value was used in the model.

5.2.3 Sound Propagation and Directivity

CadnaA calculates downwind sound propagation using ISO 9613 standards, which use omnidirectional downwind sound propagation and worst-case directivity factors. In other words, the model assumes that each turbine propagates its maximum sound level in all directions at all times. While this may seem to over-predict upwind sound levels, this approach has been validated by field measurements. Under most normal circumstances, wind turbine noise is not significantly directional, but tends to radiate uniformly in all directions.

5.2.4 Atmospheric Conditions

Atmospheric conditions were based on program defaults. Layers in the atmosphere often form where temperature increases with height (temperature inversions). Sound waves can reflect off of the temperature inversion layer and return to the surface of the earth. This process can increase sound levels at the surface, especially if the height of the inversion begins near the surface of the earth. Temperature inversions tend to occur mainly at night when winds are light or calm, usually when wind turbines are not operating. CadnaA calculates the downwind sound in a manner which is favorable for propagation (worst-case scenario) by assuming a well-developed moderate ground-based temperature inversion such as can occur at night. Therefore, predicted sound level results tend to be higher than would actually occur.

The atmosphere does not flow smoothly and tends to have swirls and eddies, also known as turbulence. Turbulence is basically formed by two processes: thermal turbulence and mechanical turbulence. Thermal turbulence is caused by the interaction of heated air rapidly rising from the heated earth's surface, with cooler air descending from the atmosphere. Mechanical turbulence is caused as moving air interacts with objects such as trees, buildings, and wind turbines. Turbulent eddies generated by wind turbines and other objects can cause sound waves to scatter, which in turn, provides sound attenuation between the wind turbine and the receiver. The acoustical model assumes laminar air flow, which minimizes sound attenuation that would occur in a realistic inhomogeneous atmosphere. This assumption also causes the predicted sound levels to be higher than would actually occur.

5.2.5 Sound Emission Data

Acoustical modeling was conducted for the entire Project. Wind turbine heights and acoustical emissions were input into the model. The expected worst-case sound power levels for the GE 3.8-137 and Vestas V136-3.6 turbines were contained in documents provided by GE and Vestas based on various wind speeds. The sound emissions data supplied was developed using the International Electrotechnical Commission (IEC) 61400-11 acoustic measurement standards. The expected sound power level and modeled height for each turbine is displayed in Table 5-1.

Table 5-1: Wind Turbine Sound Power Levels

		Sound Power Level (dBA)									
Turbine	**Height**	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A-wt.**[a]
GE 3.8-137	110 m	78.5	86.8	92.6	96.4	99.4	102.1	102.0	93.7	79.2	**107.0**
Vestas V136-3.6	105 m	81.3	86.5	94.5	97.2	101.0	104.0	102.4	92.7	77.3	**108.2**

(a) A-wt. = A-weighted decibels

A point source at the hub was used to model sound emissions from the wind turbines. This approach is appropriate for simulating wind turbine noise emissions due to the large distances between the turbines and the receivers as compared to the dimensions of the wind turbines. The corresponding sound levels from the table above were applied to every point source.

Figure 4-1 shows the entire wind farm layout. Locations of receivers and wind turbines around the Project area were provided by the developer and are listed in Appendix B. Each receiver was assumed to have a height of 1.52 meters (5.0 feet) above ground level. Compliance with the regulation was assessed at the physical residence (each receiver).

The following assumptions were made to maintain the inherent conservativeness of the model and to estimate the worst case modeled sound levels:

- Attenuation was not included for sound propagation through wooded areas, existing barriers, and shielding
- All turbines were assumed to be operating at maximum power output (and therefore, maximum sound levels) at all times to represent worst-case noise impacts from the wind farm as a whole

5.3 Acoustical Modeling Results

Sound pressure levels were predicted for the identified receivers in the CadnaA noise modeling software using the manufacturer-specified sound power levels at each frequency and the assumptions listed above. CadnaA modeling results have been demonstrated in previous studies to conservatively approximate real-life measured noise from a source when extraneous noises are not present.

As previously mentioned, decibels are a logarithmic ratio of a sound pressure to a reference sound pressure. Therefore, they must be logarithmically added to determine a cumulative impact (i.e., logarithmically adding 50 dBA and 50 dBA results in 53 dBA). Logarithmically adding each of the individual turbine’s impacts together at each receiver provides an overall Project impact at each receiver.

The maximum model-predicted L_{eq} sound pressure levels at each receiver (the logarithmic addition of sound levels from each frequency from every turbine) are included in Appendix C. These values represent only the noise emitted by the wind turbines and do not include any extraneous noises (traffic, etc.) that could be present during physical noise measurements. There are no expected exceedances of the identified regulations due to operation of any of the proposed wind turbine locations of the Project. Extraneous sounds (grain dryers, traffic, etc.) may make the overall sound level higher than 45.0 dBA in some circumstances, but the turbines alone are not expected to cause that to happen.

Appendix D contains graphical representation of the Project’s impact on the surrounding area for both GE and Vestas turbines. The figure depicts the maximum sound levels attributable to the new turbines.

6.0 CONCLUSION

Burns & McDonnell conducted a predictive sound assessment study for the proposed Prevailing Wind Park. The study included identification of applicable sound regulations and predictive modeling to estimate Project-related sound levels in the surrounding community.

Sound pressure levels were predicted at occupied receivers within and surrounding the Project area using manufacturer-specified sound power levels for each wind turbine. A number of conservative assumptions were applied to provide worst-case predicted sound pressure levels. Those results were then compared to the identified applicable regulations. There are no expected exceedances of the identified regulations due to operation of any of the proposed wind turbine locations of the Project.

APPENDIX A - AMBIENT MEASUREMENT DATA

Appendix A - Ambient Measurement Data

Prevailing Winds

Point Number	*LAeq*	*LA90*	*Notes*
03/12/18 - 5:00PM to 7:00PM			**Meter1 Calibration before: 114.11** **Meter2 Calibration before: 114.05**
36°F, 60% hm, 31°F dp, 4-9mph , clear skies			**Meter1 Calibration after: 113.91** **Meter2 Calibration after: 113.91**
MP1	34.6 dBA	26.0 dBA	Distant traffic, light wind, existing wind farm not audible
MP2	36.5 dBA	29.6 dBA	Distant traffic, birds, light wind, fan noise from nearby business
MP3	37.7 dBA	29.2 dBA	Birds, light wind, distant traffic including large trucks, very distant airplane
MP4	39.6 dBA	29.1 dBA	Birds, light wind, distant traffic
MP5	36.9 dBA	28.0 dBA	Highway traffic, birds
MP6	47.9 dBA	33.4 dBA	Highway traffic dominant, paused for local traffic
MP7	38.3 dBA	31.0 dBA	Highway traffic, birds
MP8	34.8 dBA	28.4 dBA	Birds, distant high speed traffic
MP9	35.7 dBA	27.0 dBA	Nearby high speed traffic (409th Street), birds
MP10	37.4 dBA	30.6 dBA	Distant high speed traffic, birds, horns
MP11	62.7 dBA	45.0 dBA	Birds dominant, two high speed car passbys
MP12	39.5 dBA	32.6 dBA	Birds, farm equipment, slight wind
MP13	36.3 dBA	27.1 dBA	Slight wind
MP14	35.7 dBA	28.8 dBA	Slight wind, distant high speed traffic
MP15	33.8 dBA	28.4 dBA	Slight wind, distant birds, distant high speed traffic, backup alarm
MP16	49.8 dBA	36.9 dBA	Birds dominant, slight wind

Appendix A - Ambient Measurement Data

Prevailing Winds

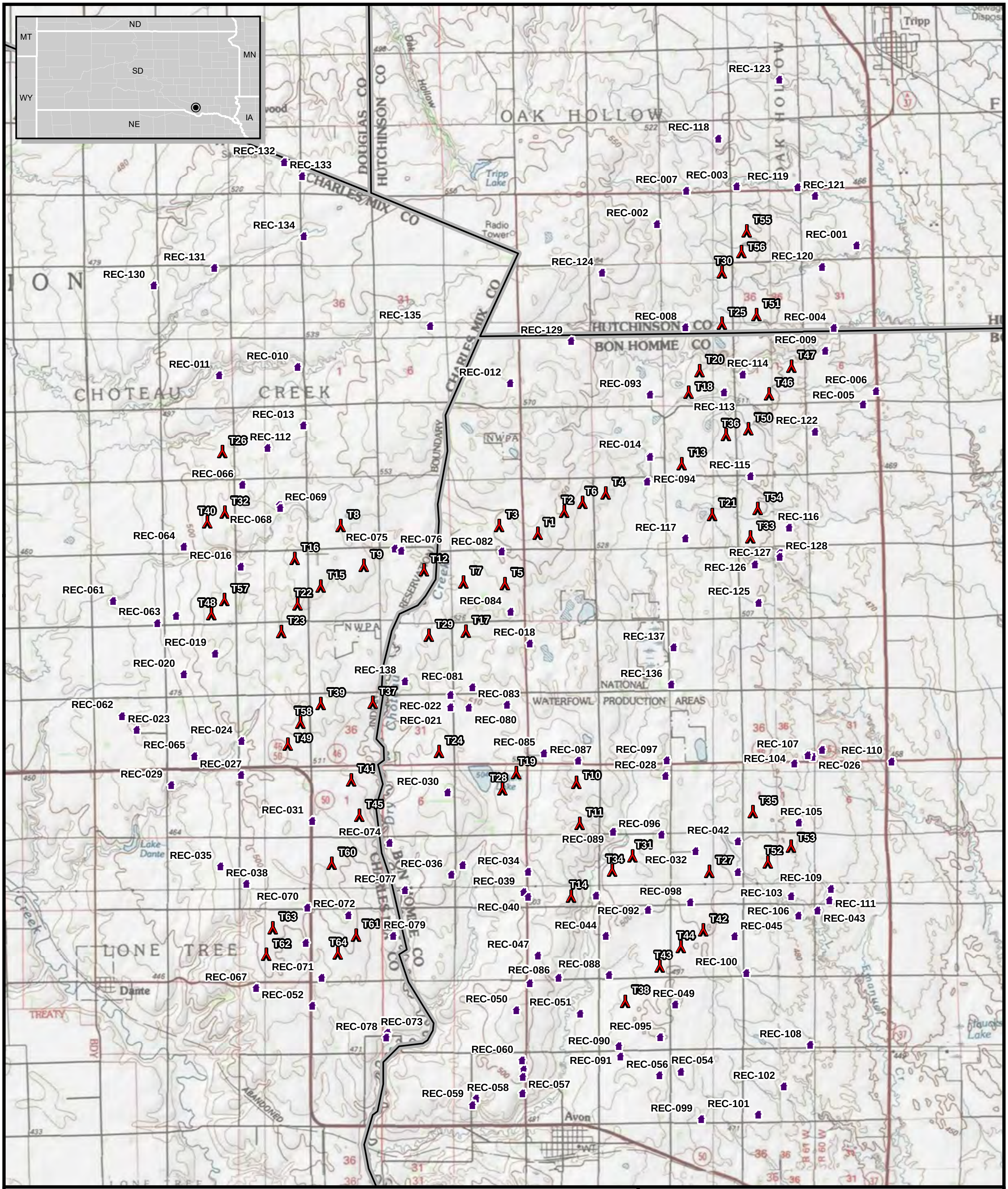
Point Number	*LAeq*	*LA90*	*Notes*	
03/13/18 - 12:00AM to 2:00AM			**Meter1 Calibration before: 114.19**	**Meter2 Calibration before: 113.87**
29°F, 74% hm, 21°F dp, 6-9 mph , clear skies			**Meter1 Calibration after: 113.83**	**Meter2 Calibration after: 114.20**
MP1	40.4 dBA	30.0 dBA	Wind turbines audible, light winds	
MP2	35.7 dBA	28.6 dBA	Wind turbines audible, light winds, sheep noise	
MP3	32.6 dBA	22.3 dBA	Very quiet, faint traffic	
MP4	33.7 dBA	24.3 dBA	Very quiet, faint traffic	
MP5	34.6 dBA	22.6 dBA	Distant traffic, large trucks, bull snort	
MP6	34.7 dBA	26.3 dBA	Traffic	
MP7	30.2 dBA	24.0 dBA	Traffic	
MP8	28.6 dBA	22.7 dBA	Distant high speed traffic	
MP9	35.3 dBA	29.5 dBA	Distant high speed traffic	
MP10	39.4 dBA	35.2 dBA	Slight wind	
MP11	35.6 dBA	31.6 dBA	Slight wind	
MP12	37.1 dBA	21.5 dBA	Distant high speed traffic	
MP13	38.9 dBA	32.1 dBA	Slight wind	
MP14	34.1 dBA	27.4 dBA	Slight wind	
MP15	35.7 dBA	28.7 dBA	Slight wind, distant high speed traffic	
MP16	39.0 dBA	29.8 dBA	Distant high speed traffic	

Appendix A - Ambient Measurement Data

Prevailing Winds

Point Number	*LAeq*	*LA90*	*Notes*
03/13/18 - 10:00AM to 12:00PM			**Meter1 Calibration before: 114.24** **Meter2 Calibration before: 114.04**
30°F, 62% hm, 19°F dp, 3-4 mph , clear skies			**Meter1 Calibration after: 113.82** **Meter2 Calibration after: 113.97**
MP1	35.2 dBA	25.1 dBA	Distant traffic, distant plane, wind turbines barely audible
MP2	39.0 dBA	30.2 dBA	Birds, wind turbines barely audible, tractor distant loading/unloading Birds,
MP3	41.0 dBA	28.0 dBA	distant traffic, wind
MP4	35.0 dBA	28.9 dBA	Birds, distant traffic, wind, distant airplane
MP5	35.4 dBA	25.4 dBA	Birds, wind, distant traffic
MP6	40.0 dBA	31.8 dBA	Birds, highway traffic
MP7	42.6 dBA	37.7 dBA	Birds, distant traffic, paused for local traffic
MP8	47.7 dBA	27.9 dBA	Owl, birds, distant high speed traffic, woman speaking (very end) Birds
MP9	33.2 dBA	24.4 dBA	Birds, dog barking, distant high speed traffic
MP10	35.0 dBA	27.1 dBA	High speed car passing
MP11	69.1 dBA	28.1 dBA	Farm equipment, cows
MP12	40.6 dBA	29.4 dBA	Birds, one car passing
MP13	59.5 dBA	28.4 dBA	Distant constant high speed traffic, birds
MP14	35.1 dBA	28.9 dBA	Birds, distant high speed traffic
MP15	35.0 dBA	29.3 dBA	Distant birds, distant high speed traffic
MP16	35.0 dBA	28.8 dBA	

APPENDIX B - SITE LAYOUT AND RECEIVER LOCATIONS



Path: \\bmcd\dfs\Clients\BTS\SPowerDC\105644_PrvWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter

LEGEND

▭ County Boundary

⅄ Wind Turbine

● Receptor

REFERENCE

0 1 2

MILES

0 1 2

KILOMETERS

N

PREVAILING WIND PARK

Project Site Layout

LOCATION:	Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT:	Prevailing Wind Park, LLC
PROJ. NO.:	105644
CREATED:	04/25/2018

BURNS McDONNELL

www.burnsmcd.com

APPENDIX C - MODELING RESULTS

Appendix C - Modeling Results

GE 3.8-137, 110 m

	Coordinates			Modeled		Exceed?
Receiver	*Easting (m)*	*Northing (m)*	*Base Elevation (m)*	*LAeq*	*Limit Value*	*(Y/N)*
REC-001	583178.93	4781949.36	473.94	24.7	45	N
REC-002	578731.00	4782428.97	540.99	29.1	45	N
REC-003	580506.89	4783273.92	505.27	33.7	45	N
REC-004	582678.66	4780104.52	480.03	32.4	45	N
REC-005	583326.78	4778396.84	476.81	27.5	45	N
REC-006	583615.28	4778695.43	471.94	26.2	45	N
REC-007	579386.45	4783171.84	519.65	29.7	45	N
REC-008	579364.54	4780122.78	515.18	38.2	45	N
REC-009	582485.70	4779597.03	481.47	34.3	45	N
REC-010	570706.40	4779232.69	531.85	20.3	45	N
REC-011	568954.92	4779049.93	516.88	23.0	45	N
REC-012	575450.96	4778869.67	571.47	-	45	N
REC-013	570834.43	4777923.92	539.22	27.4	45	N
REC-014	578568.31	4777265.47	526.35	38.1	45	N
REC-015	578578.94	4777228.45	526.13	38.3	45	N
REC-016	569437.95	4774776.35	523.53	38.9	45	N
REC-017	567999.72	4773683.50	489.60	36.8	45	N
REC-018	575893.85	4773069.05	525.25	32.5	45	N
REC-019	568870.35	4772837.61	510.51	36.3	45	N
REC-020	568170.58	4772373.09	491.63	30.5	45	N
REC-021	574122.73	4771641.66	507.46	35.0	45	N
REC-022	574117.98	4771913.43	508.31	34.7	45	N
REC-023	567115.19	4771132.04	470.89	-	45	N
REC-024	569455.79	4770885.60	499.55	34.2	45	N
REC-025	582409.59	4770691.28	486.10	26.3	45	N
REC-026	582205.90	4770538.43	489.18	27.7	45	N
REC-027	569450.78	4770122.57	499.25	32.0	45	N
REC-028	578915.96	4770106.59	519.65	30.5	45	N
REC-029	567890.47	4769896.98	472.42	19.1	45	N
REC-030	574057.84	4769738.20	530.58	35.9	45	N
REC-031	571038.40	4769099.63	510.51	36.6	45	N
REC-032	579594.58	4768433.69	507.46	40.2	45	N
REC-033	574388.42	4768112.11	502.26	29.5	45	N
REC-034	575856.91	4767968.51	509.35	34.3	45	N
REC-035	568988.11	4768088.17	487.50	27.6	45	N
REC-036	574139.54	4767903.27	507.06	28.6	45	N
REC-037	580534.75	4767955.77	497.42	40.6	45	N
REC-038	569570.52	4767693.73	493.87	33.1	45	N
REC-039	575753.59	4767511.52	511.25	33.5	45	N
REC-040	575853.92	4767408.85	513.56	34.3	45	N
REC-041	577365.54	4767429.45	496.85	41.4	45	N
REC-042	580534.93	4768649.62	501.93	40.0	45	N
REC-043	582314.18	4767105.01	476.98	30.8	45	N
REC-044	577581.91	4766535.38	501.37	35.6	45	N
REC-045	580459.53	4766528.35	495.27	37.9	45	N
REC-046	570892.00	4766384.10	500.34	39.9	45	N
REC-047	576071.91	4766099.10	511.58	28.5	45	N
REC-048	575888.47	4765484.03	507.46	26.2	45	N
REC-049	579136.06	4765003.57	501.37	36.3	45	N
REC-050	575594.26	4764877.78	513.56	22.9	45	N
REC-051	577014.96	4764806.12	483.08	32.6	45	N
REC-052	571034.71	4764976.49	483.08	32.4	45	N
REC-053	575751.76	4763553.72	504.89	18.1	45	N
REC-054	579261.02	4763508.83	493.92	26.2	45	N
REC-055	575738.19	4763383.18	501.37	18.7	45	N

Appendix C - Modeling Results

GE 3.8-137, 110 m

	Coordinates					
Receiver	*Easting (m)*	*Northing (m)*	*Base Elevation (m)*	*Modeled LAeq*	*Limit Value*	*Exceed? (Y/N)*
REC-056	578784.40	4763423.45	495.27	26.8	45	N
REC-057	575728.70	4763020.56	496.19	-	45	N
REC-058	574689.98	4762905.51	489.18	-	45	N
REC-059	574608.88	4762765.31	484.23	-	45	N
REC-060	575719.36	4763758.78	507.46	19.6	45	N
REC-061	566590.17	4774005.26	470.89	25.5	45	N
REC-062	566794.52	4771446.01	467.84	-	45	N
REC-063	567575.59	4773523.26	480.49	32.1	45	N
REC-064	568169.85	4775221.75	493.83	37.5	45	N
REC-065	568402.45	4770548.21	483.08	24.8	45	N
REC-066	569474.73	4776605.15	525.75	39.0	45	N
REC-067	569782.41	4765373.88	493.98	36.1	45	N
REC-068	570301.18	4776152.11	533.82	35.8	45	N
REC-069	570320.63	4776086.07	530.62	36.0	45	N
REC-070	570930.65	4767169.47	502.79	37.7	45	N
REC-071	571246.87	4765598.42	488.81	38.5	45	N
REC-072	571847.73	4767001.23	507.46	41.7	45	N
REC-073	572712.41	4764371.30	476.98	25.2	45	N
REC-074	572760.45	4768609.65	494.96	35.3	45	N
REC-075	572875.14	4775183.93	528.80	39.1	45	N
REC-076	573023.77	4775137.74	528.80	39.6	45	N
REC-077	573104.39	4767558.79	488.61	31.1	45	N
REC-078	572689.83	4764269.58	472.84	24.7	45	N
REC-079	572840.24	4766532.05	483.08	35.8	45	N
REC-080	574527.24	4771635.20	508.86	34.0	45	N
REC-081	574606.23	4772084.46	513.56	34.0	45	N
REC-082	575265.41	4775117.32	552.59	41.9	45	N
REC-083	575384.42	4771695.61	513.56	32.3	45	N
REC-084	575459.57	4773771.95	533.47	39.2	45	N
REC-085	576210.31	4770611.18	524.57	38.1	45	N
REC-086	576537.52	4765598.06	498.89	30.2	45	N
REC-087	576971.43	4770447.24	531.85	40.8	45	N
REC-088	577659.69	4765661.22	489.18	38.1	45	N
REC-089	577747.37	4768859.92	513.80	40.5	45	N
REC-090	577878.24	4764078.53	490.80	32.8	45	N
REC-091	577915.85	4763844.06	489.18	30.5	45	N
REC-092	578531.67	4767119.28	501.56	37.6	45	N
REC-093	578575.67	4778618.52	525.75	36.7	45	N
REC-094	578514.65	4776677.36	519.65	37.9	45	N
REC-095	578804.05	4764274.93	501.37	32.8	45	N
REC-096	578827.98	4768793.31	520.74	37.4	45	N
REC-097	578943.49	4770454.51	519.65	29.0	45	N
REC-098	579475.34	4767289.07	507.32	40.3	45	N
REC-099	579720.64	4762441.83	480.38	-	45	N
REC-100	580720.17	4765706.10	489.18	32.2	45	N
REC-101	580991.94	4762540.89	476.98	-	45	N
REC-102	581560.41	4763175.20	470.14	-	45	N
REC-103	581721.12	4767420.32	484.05	35.9	45	N
REC-104	581794.35	4770381.50	494.21	30.1	45	N
REC-105	581890.50	4769063.10	495.27	40.1	45	N
REC-106	581882.94	4766984.50	478.66	32.1	45	N
REC-107	582089.90	4770568.08	488.75	27.9	45	N
REC-108	582148.44	4764102.27	470.89	-	45	N
REC-109	582609.65	4767582.94	483.08	31.6	45	N
REC-110	583963.39	4770430.23	460.42	18.2	45	N

Appendix C - Modeling Results

GE 3.8-137, 110 m

Receiver	*Coordinates* *Easting (m)*	*Northing (m)*	*Base Elevation (m)*	*Modeled LAeq*	*Limit Value*	*Exceed? (Y/N)*
REC-111	582577.80	4767332.36	480.99	30.7	45	N
REC-112	570034.28	4777428.88	531.85	33.7	45	N
REC-113	580225.65	4778670.25	516.61	41.3	45	N
REC-114	580643.69	4779065.86	510.51	40.5	45	N
REC-115	580812.98	4776797.89	507.54	39.5	45	N
REC-116	581676.22	4775653.66	495.49	37.4	45	N
REC-117	579367.75	4775404.23	525.75	36.8	45	N
REC-118	580095.28	4784336.60	507.46	25.3	45	N
REC-119	581867.73	4783246.46	489.52	29.7	45	N
REC-120	582410.57	4781467.20	486.13	30.9	45	N
REC-121	582256.16	4783054.99	483.20	28.4	45	N
REC-122	582261.38	4777793.15	487.45	33.8	45	N
REC-123	581460.71	4785645.95	483.97	-	45	N
REC-124	577505.30	4781336.06	557.16	19.3	45	N
REC-125	580995.88	4773976.31	501.99	29.4	45	N
REC-126	580915.69	4774830.29	502.29	38.6	45	N
REC-127	581473.61	4775075.61	495.27	37.0	45	N
REC-128	581468.21	4774997.26	495.27	36.4	45	N
REC-129	576815.58	4779814.18	556.23	21.4	45	N
REC-130	567502.00	4781060.00	502.37	-	45	N
REC-131	568850.00	4781446.00	523.04	-	45	N
REC-132	570408.00	4783811.00	527.44	-	45	N
REC-133	570806.00	4783497.00	538.25	-	45	N
REC-134	570845.00	4782153.00	543.29	-	45	N
REC-135	573665.00	4780153.00	564.37	-	45	N
REC-136	579049.00	4772150.00	519.65	-	45	N
REC-137	579104.00	4772978.00	519.65	17.9	45	N
REC-138	573105.45	4772224.12	513.56	37.1	45	N

"-" represents no expected impacts at the receiver location

Appendix C - Modeling Results

Vestas V136-3.6, 105 m

	Coordinates			*Modeled*		*Exceed?*
Receiver	*Easting (m)*	*Northing (m)*	*Base Elevation (m)*	*LAeq*	*Limit Value*	*(Y/N)*
REC-001	583178.93	4781949.36	473.94	26.2	45	N
REC-002	578731.00	4782428.97	540.99	30.6	45	N
REC-003	580506.89	4783273.92	505.27	35.3	45	N
REC-004	582678.66	4780104.52	480.03	33.9	45	N
REC-005	583326.78	4778396.84	476.81	29.0	45	N
REC-006	583615.28	4778695.43	471.94	27.6	45	N
REC-007	579386.45	4783171.84	519.65	31.2	45	N
REC-008	579364.54	4780122.78	515.18	39.7	45	N
REC-009	582485.70	4779597.03	481.47	35.8	45	N
REC-010	570706.40	4779232.69	531.85	21.7	45	N
REC-011	568954.92	4779049.93	516.88	24.2	45	N
REC-012	575450.96	4778869.67	571.47	-	45	N
REC-013	570834.43	4777923.92	539.22	28.8	45	N
REC-014	578568.31	4777265.47	526.35	39.5	45	N
REC-015	578578.94	4777228.45	526.13	39.7	45	N
REC-016	569437.95	4774776.35	523.53	40.4	45	N
REC-017	567999.72	4773683.50	489.60	38.3	45	N
REC-018	575893.85	4773069.05	525.25	34.0	45	N
REC-019	568870.35	4772837.61	510.51	37.8	45	N
REC-020	568170.58	4772373.09	491.63	32.0	45	N
REC-021	574122.73	4771641.66	507.46	36.5	45	N
REC-022	574117.98	4771913.43	508.31	36.2	45	N
REC-023	567115.19	4771132.04	470.89	-	45	N
REC-024	569455.79	4770885.60	499.55	35.7	45	N
REC-025	582409.59	4770691.28	486.10	27.7	45	N
REC-026	582205.90	4770538.43	489.18	29.2	45	N
REC-027	569450.78	4770122.57	499.25	33.5	45	N
REC-028	578915.96	4770106.59	519.65	32.0	45	N
REC-029	567890.47	4769896.98	472.42	20.5	45	N
REC-030	574057.84	4769738.20	530.58	37.4	45	N
REC-031	571038.40	4769099.63	510.51	38.1	45	N
REC-032	579594.58	4768433.69	507.46	41.7	45	N
REC-033	574388.42	4768112.11	502.26	31.0	45	N
REC-034	575856.91	4767968.51	509.35	35.8	45	N
REC-035	568988.11	4768088.17	487.50	29.1	45	N
REC-036	574139.54	4767903.27	507.06	30.0	45	N
REC-037	580534.75	4767955.77	497.42	42.1	45	N
REC-038	569570.52	4767693.73	493.87	34.6	45	N
REC-039	575753.59	4767511.52	511.25	35.0	45	N
REC-040	575853.92	4767408.85	513.56	35.8	45	N
REC-041	577365.54	4767429.45	496.85	42.9	45	N
REC-042	580534.93	4768649.62	501.93	41.5	45	N
REC-043	582314.18	4767105.01	476.98	32.3	45	N
REC-044	577581.91	4766535.38	501.37	37.2	45	N
REC-045	580459.53	4766528.35	495.27	39.4	45	N
REC-046	570892.00	4766384.10	500.34	41.4	45	N
REC-047	576071.91	4766099.10	511.58	30.0	45	N
REC-048	575888.47	4765484.03	507.46	27.6	45	N
REC-049	579136.06	4765003.57	501.37	37.8	45	N
REC-050	575594.26	4764877.78	513.56	24.3	45	N
REC-051	577014.96	4764806.12	483.08	34.1	45	N
REC-052	571034.71	4764976.49	483.08	33.9	45	N
REC-053	575751.76	4763553.72	504.89	19.6	45	N
REC-054	579261.02	4763508.83	493.92	27.7	45	N
REC-055	575738.19	4763383.18	501.37	20.1	45	N

Appendix C - Modeling Results

Vestas V136-3.6, 105 m

	Coordinates			Modeled LAeq		Exceed? (Y/N)
Receiver	*Easting (m)*	*Northing (m)*	*Base Elevation (m)*		*Limit Value*	
REC-056	578784.40	4763423.45	495.27	28.2	45	N
REC-057	575728.70	4763020.56	496.19	-	45	N
REC-058	574689.98	4762905.51	489.18	-	45	N
REC-059	574608.88	4762765.31	484.23	-	45	N
REC-060	575719.36	4763758.78	507.46	21.1	45	N
REC-061	566590.17	4774005.26	470.89	26.9	45	N
REC-062	566794.52	4771446.01	467.84	-	45	N
REC-063	567575.59	4773523.26	480.49	33.6	45	N
REC-064	568169.85	4775221.75	493.83	39.0	45	N
REC-065	568402.45	4770548.21	483.08	26.2	45	N
REC-066	569474.73	4776605.15	525.75	40.5	45	N
REC-067	569782.41	4765373.88	493.98	37.5	45	N
REC-068	570301.18	4776152.11	533.82	37.4	45	N
REC-069	570320.63	4776086.07	530.62	37.5	45	N
REC-070	570930.65	4767169.47	502.79	39.2	45	N
REC-071	571246.87	4765598.42	488.81	40.0	45	N
REC-072	571847.73	4767001.23	507.46	43.2	45	N
REC-073	572712.41	4764371.30	476.98	26.7	45	N
REC-074	572760.45	4768609.65	494.96	36.8	45	N
REC-075	572875.14	4775183.93	528.80	40.6	45	N
REC-076	573023.77	4775137.74	528.80	41.1	45	N
REC-077	573104.39	4767558.79	488.61	32.6	45	N
REC-078	572689.83	4764269.58	472.84	26.2	45	N
REC-079	572840.24	4766532.05	483.08	37.3	45	N
REC-080	574527.24	4771635.20	508.86	35.6	45	N
REC-081	574606.23	4772084.46	513.56	35.5	45	N
REC-082	575265.41	4775117.32	552.59	43.3	45	N
REC-083	575384.42	4771695.61	513.56	33.8	45	N
REC-084	575459.57	4773771.95	533.47	40.7	45	N
REC-085	576210.31	4770611.18	524.57	39.6	45	N
REC-086	576537.52	4765598.06	498.89	31.7	45	N
REC-087	576971.43	4770447.24	531.85	42.3	45	N
REC-088	577659.69	4765661.22	489.18	39.6	45	N
REC-089	577747.37	4768859.92	513.80	42.0	45	N
REC-090	577878.24	4764078.53	490.80	34.3	45	N
REC-091	577915.85	4763844.06	489.18	32.0	45	N
REC-092	578531.67	4767119.28	501.56	39.1	45	N
REC-093	578575.67	4778618.52	525.75	38.2	45	N
REC-094	578514.65	4776677.36	519.65	39.4	45	N
REC-095	578804.05	4764274.93	501.37	34.3	45	N
REC-096	578827.98	4768793.31	520.74	38.9	45	N
REC-097	578943.49	4770454.51	519.65	30.5	45	N
REC-098	579475.34	4767289.07	507.32	41.8	45	N
REC-099	579720.64	4762441.83	480.38	-	45	N
REC-100	580720.17	4765706.10	489.18	33.7	45	N
REC-101	580991.94	4762540.89	476.98	-	45	N
REC-102	581560.41	4763175.20	470.14	-	45	N
REC-103	581721.12	4767420.32	484.05	37.4	45	N
REC-104	581794.35	4770381.50	494.21	31.6	45	N
REC-105	581890.50	4769063.10	495.27	41.6	45	N
REC-106	581882.94	4766984.50	478.66	33.6	45	N
REC-107	582089.90	4770568.08	488.75	29.4	45	N
REC-108	582148.44	4764102.27	470.89	-	45	N
REC-109	582609.65	4767582.94	483.08	33.1	45	N
REC-110	583963.39	4770430.23	460.42	19.6	45	N

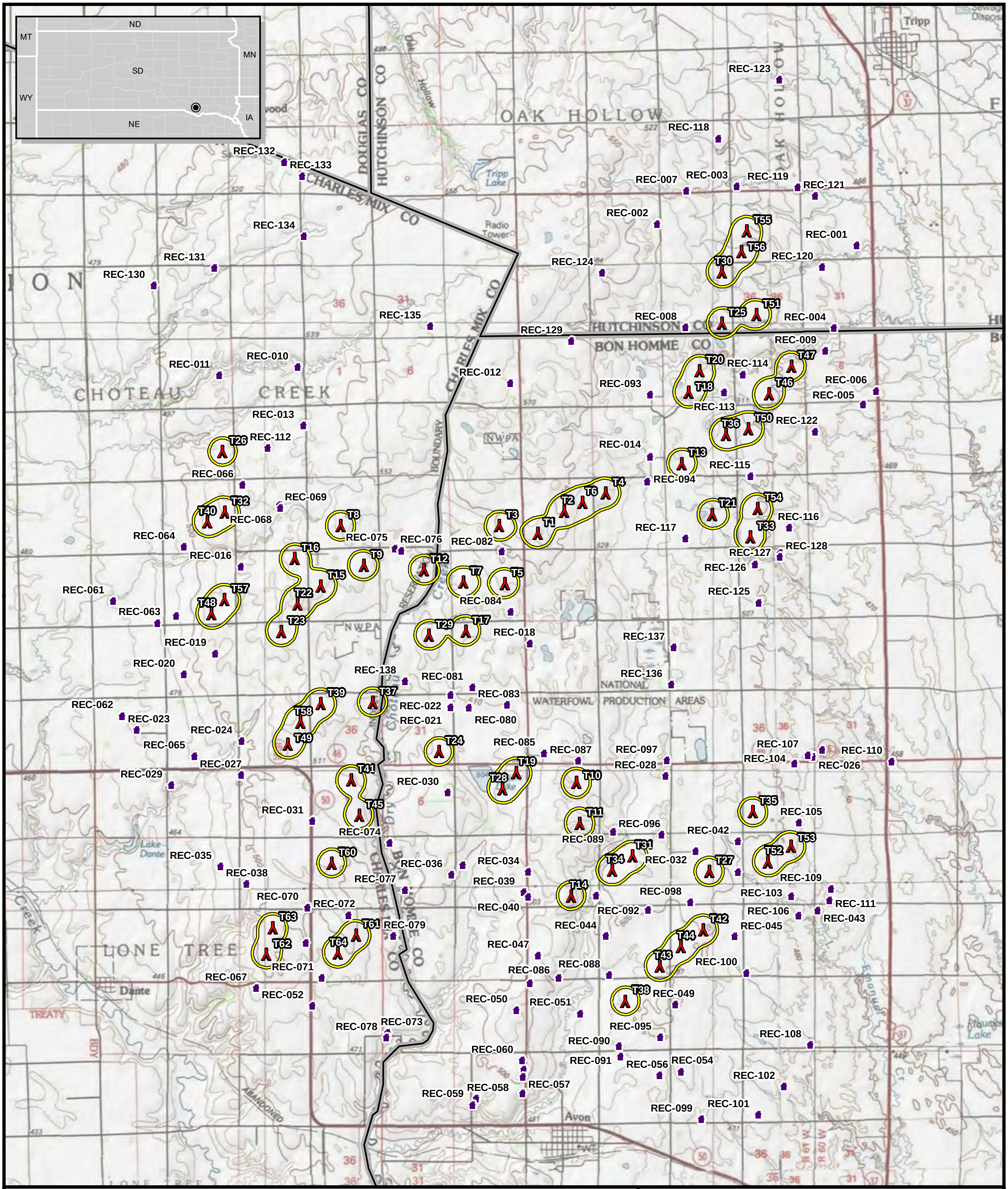
Appendix C - Modeling Results

Vestas V136-3.6, 105 m

	Coordinates			*Modeled*		*Exceed?*
Receiver	***Easting (m)***	***Northing (m)***	***Base Elevation (m)***	***LAeq***	***Limit Value***	***(Y/N)***
REC-111	582577.80	4767332.36	480.99	32.2	45	N
REC-112	570034.28	4777428.88	531.85	35.2	45	N
REC-113	580225.65	4778670.25	516.61	42.8	45	N
REC-114	580643.69	4779065.86	510.51	42.0	45	N
REC-115	580812.98	4776797.89	507.54	41.0	45	N
REC-116	581676.22	4775653.66	495.49	38.9	45	N
REC-117	579367.75	4775404.23	525.75	38.3	45	N
REC-118	580095.28	4784336.60	507.46	26.7	45	N
REC-119	581867.73	4783246.46	489.52	31.2	45	N
REC-120	582410.57	4781467.20	486.13	32.4	45	N
REC-121	582256.16	4783054.99	483.20	29.9	45	N
REC-122	582261.38	4777793.15	487.45	35.3	45	N
REC-123	581460.71	4785645.95	483.97	-	45	N
REC-124	577505.30	4781336.06	557.16	20.8	45	N
REC-125	580995.88	4773976.31	501.99	30.9	45	N
REC-126	580915.69	4774830.29	502.29	40.0	45	N
REC-127	581473.61	4775075.61	495.27	38.5	45	N
REC-128	581468.21	4774997.26	495.27	37.9	45	N
REC-129	576815.58	4779814.18	556.23	22.8	45	N
REC-130	567502.00	4781060.00	502.37	-	45	N
REC-131	568850.00	4781446.00	523.04	-	45	N
REC-132	570408.00	4783811.00	527.44	-	45	N
REC-133	570806.00	4783497.00	538.25	-	45	N
REC-134	570845.00	4782153.00	543.29	-	45	N
REC-135	573665.00	4780153.00	564.37	-	45	N
REC-136	579049.00	4772150.00	519.65	-	45	N
REC-137	579104.00	4772978.00	519.65	19.3	45	N
REC-138	573105.45	4772224.12	513.56	38.6	45	N

"-" represents no expected impacts at the receiver location

APPENDIX D - SOUND LEVEL CONTOURS



Path: \\bmcd\dfs\Clients\BTS\SPowerDC\105644_PrvWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter

LEGEND

▭	County Boundary
⅄	Wind Turbine
●	Receptor
▬	45 dBA Limit, GE 3.8-137

REFERENCE

0 1 2
MILES

0 1 2
KILOMETERS

N

PREVAILING WIND PARK
45 dBA Contours - GE 3.8-137 Layout

LOCATION:	Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT:	Prevailing Wind Park, LLC
PROJ. NO.:	105644
CREATED:	04/26/2018

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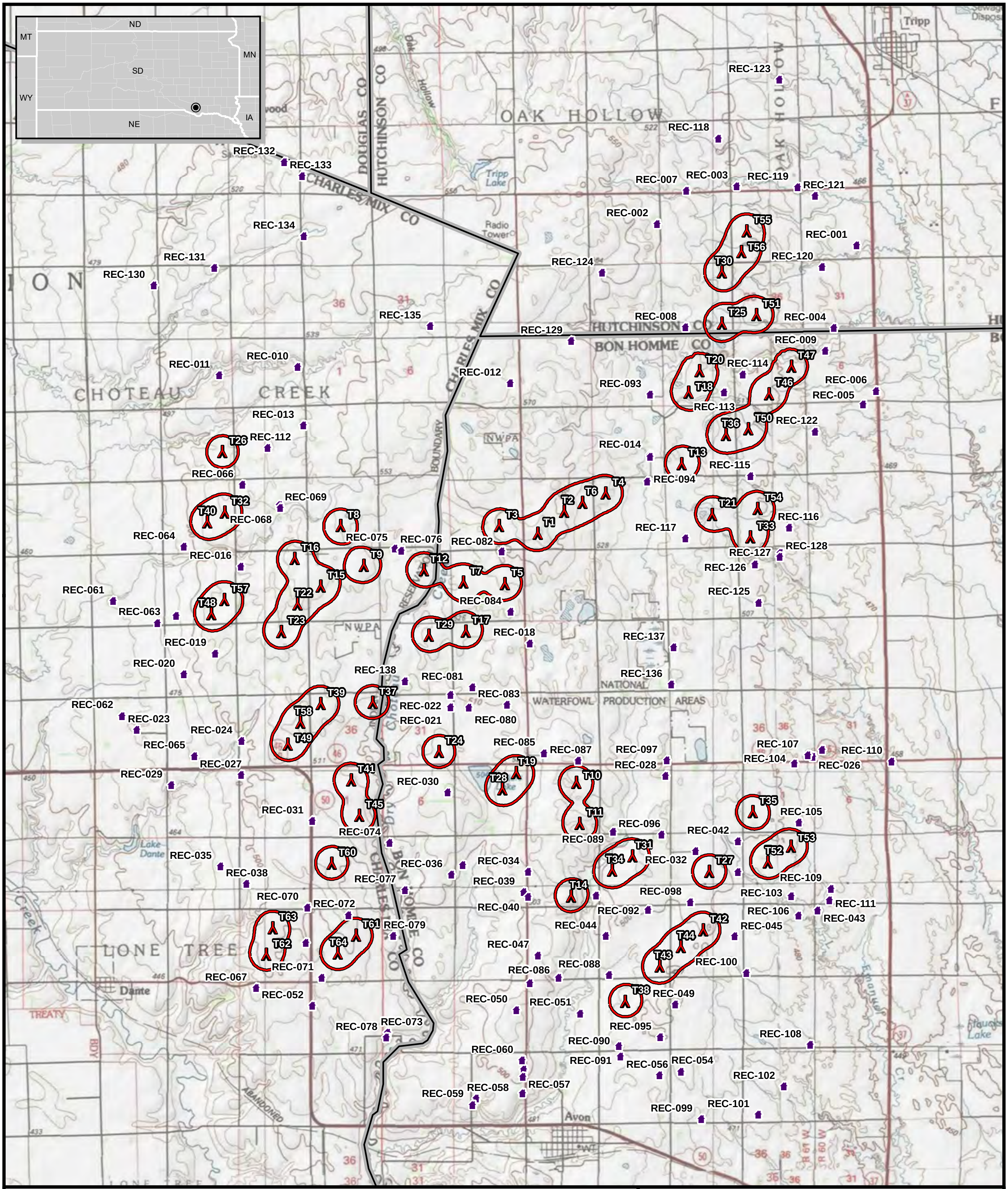

Path: \\bmcd\dfs\Clients\BTS\SPowerDC\105644_PrWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter

LEGEND

- ▭ County Boundary
- ⅄ Wind Turbine
- ● Receptor
- ━ 45 dBA Limit, Vestas V136-3.6

REFERENCE

0 1 2
MILES

0 1 2
KILOMETERS

N

PREVAILING WIND PARK
45 dBA Contours - Vestas V136-3.6 Layout

LOCATION: Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT: Prevailing Wind Park, LLC
PROJ. NO.: 105644
CREATED: 04/26/2018

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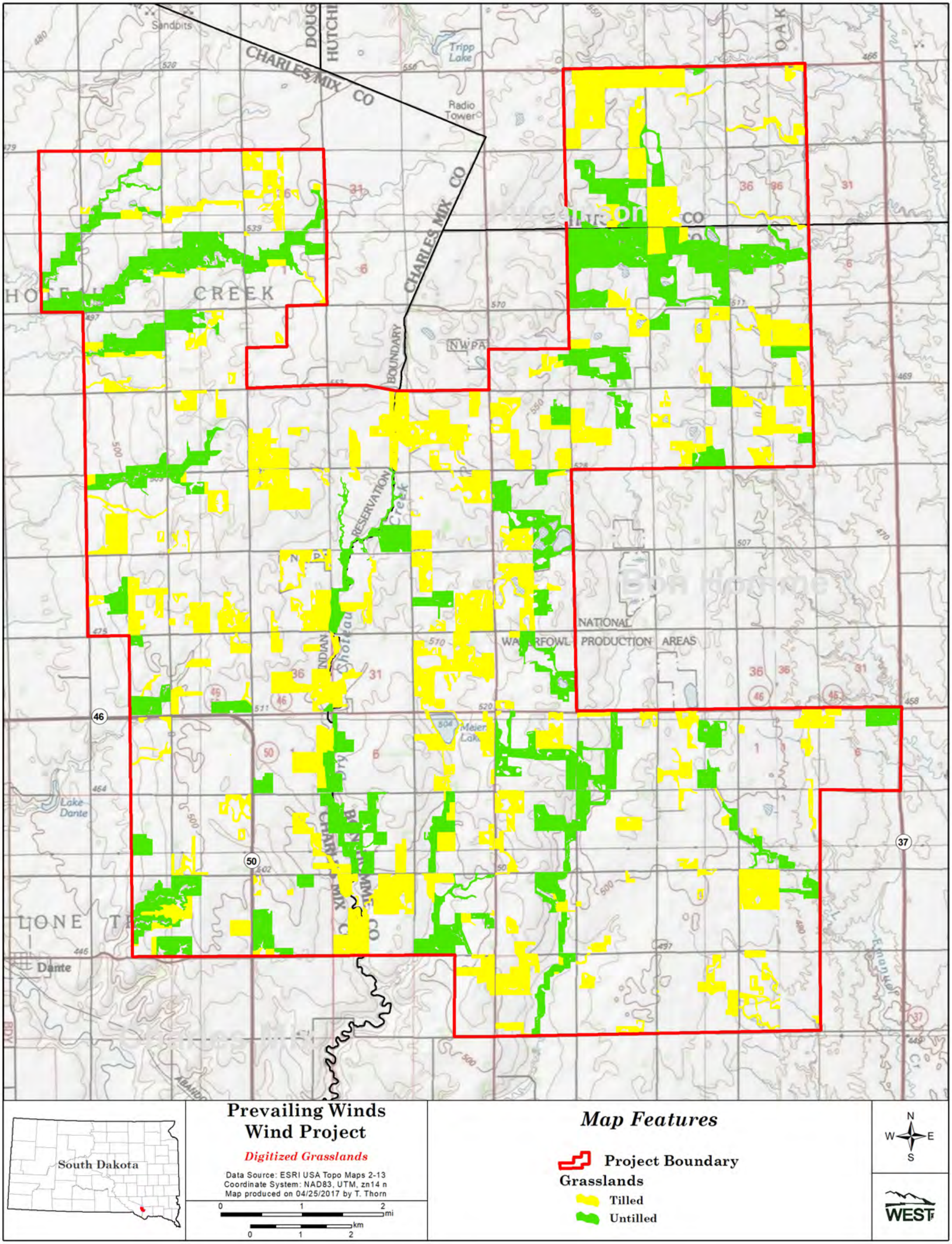
APPENDIX C - GRASSLAND ANALYSIS



Prevailing Winds Wind Project

Digitized Grasslands

Data Source: ESRI USA Topo Maps 2-13
Coordinate System: NAD83, UTM, zn14 n
Map produced on 04/25/2017 by T. Thorn

Map Features

🟥 **Project Boundary**

Grasslands

🟨 **Tilled**

🟩 **Untilled**

APPENDIX D - TIERS 1 AND 2 WILDLIFE REPORT

Tiers 1 and 2 Report for the Prevailing Winds Wind Project Bon Homme and Charles Mix Counties, South Dakota

Prepared for:

Prevailing Winds, LLC

101 Second Street West
P.O. Box 321
Chokio, Minnesota 56221

Prepared by:

Sarah Hamilton and Clayton Derby

Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, North Dakota 58503

June 1, 2016

EXECUTIVE SUMMARY

The Prevailing Winds Wind Project (Project) is located in Bonne Homme and Charles Mix counties, South Dakota. The purpose of this report is to: 1) characterize biological resources throughout the proposed Project as well as identify the needs and timing of recommended future studies based on the species of concern, and 2) to summarize the results of Tier 1 and Tier 2 studies. The Project area was evaluated during a February 2015 visit.

The majority of the Project is located in the Southern Missouri Coteau Slope, while a small portion is located in the Southern Missouri Coteau Level IV Ecoregions. Historically, the Project and surrounding area was mixed grass prairie consisting of grama, needlegrass, and wheatgrass species, with numerous wetlands scattered throughout. Today, the majority of the Project has been converted to agricultural use with crop production and livestock grazing as the main agricultural practices. There are trees and woodlands found mainly in planted shelter belts and within draws and on hillslopes. Wetlands are scattered throughout the Project.

One of the main concerns regarding impacts from wind energy facilities in South Dakota is development in native grasslands and other native prairie habitats and displacement of wildlife from these areas. Approximately 45% of the Project is categorized as grassland (grass/herbaceous/pasture/hay). Because the Project includes grasslands (native or planted), it is possible that some grassland-dependent wildlife species may be displaced. The magnitude and significance of the displacement will depend on the affected species and the plan for development of the site.

Based on National Wetland Inventory (NWI) data, there are approximately 1,305.8 acres (528.8 hectares) of wetlands found within the Project. Freshwater emergent wetlands (77.5%) accounted for the majority of the wetlands, followed by freshwater ponds (14.7%), lakes (4.4%), and freshwater forested/shrub wetlands (3.4%).

Seven animal species listed as threatened, endangered, or proposed endangered under the federal Endangered Species Act have been documented in Bonne Homme and/or Charles Mix counties, including: pallid sturgeon, Topeka shiner, interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. Five of these species have the potential to occur in the Project during some portion of the year: interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. The interior least tern, red knot, whooping crane, and piping plover could migrate through the Project area during the spring and fall, but are otherwise not expected to occur in the Project. The Project is located outside of the defined national whooping crane migration corridor, and there have been no confirmed whooping crane sightings within the Project as of fall 2010. The Project is with the defined range of the northern long-eared bat, and while unlikely, the species could be present during the summer breeding period. The pallid sturgeon and Topeka shiner are federally-listed fish species, but have not been found within the Project. There are no known occurrences of federally-listed plant species within the Project.

Western EcoSystems Technology, Inc. (WEST) conducted a preliminary review of the birds and bats listed as threatened or endangered by the state of South Dakota, as birds and bats are most likely impacted by wind facility development. WEST identified two bird species, bald eagle and osprey, that are listed as threatened by the state of South Dakota that may occur within the Project. Bald eagles are also protected under the Bald and Golden Eagle Protection Act.

The following diurnal raptor and vulture species could potentially breed in or near the Project: American kestrel, bald eagle, golden eagle, Cooper's hawk, northern harrier, red-tailed hawk, Swainson's hawk, ferruginous hawk, broad-winged hawk, peregrine falcon, osprey, and turkey vulture. Owls with the potential to breed in or near the Project include barn owl, burrowing owl, eastern screech owl, long-eared owl, short-eared owl, and great horned owl. Diurnal raptor species that may also occur within the Project outside of the breeding season (migration, winter, or post-breeding dispersal) include northern goshawk, Cooper's hawk, red-tailed hawk, golden eagle, bald eagle, merlin, peregrine falcon, prairie falcon, gyrfalcon, rough-legged hawk, and sharp-shinned hawk. Four red-tailed hawk and two unidentified raptor observations were recorded at the Project during the site visit in February 2015. Potential nest structures for above ground nesting species were present in the form of living and dead trees; grassland areas could also provide nesting habitats for ground-nesting raptors and owls, such as the northern harrier and burrowing owl.

Colonial rodents are known to attract feeding raptors but were not observed during the site visit. It is likely that some bird species migrate through the proposed Project, including passerines, raptors, and waterfowl. Harvested crop fields located in the Project could serve as feeding areas for migrating birds. During the site visit, approximately 70 mallards were seen throughout the area and feeding in crop fields.

Two US Geological Survey (USGS) Breeding Bird Survey (BBS) routes are located in the vicinity of the Project. The Tripp BBS route is approximately 13 miles (20.9 kilometers [km]) northeast of the Project, and the Sparta BBS route is approximately 21.5 miles (34.6 km) southeast of the Project. Seventy bird species have been recorded along the Tripp BBS route from 2011 to 2014, of which three are considered Species of Conservation Concern by the US Fish and Wildlife Service (USFWS): dickcissel, grasshopper sparrow, and red-headed woodpecker. Along the Sparta BBS route, 65 bird species were recorded in 2011 and 2013, of which four are considered Species of Conservation Concern by the USFWS: dickcissel, grasshopper sparrow, red-headed woodpecker, and upland sandpiper.

Seven bat species are potential residents and/or migrants in the Project, including big brown bat, eastern red bat, hoary bat, silver-haired bat, northern long-eared bat, little brown bat, and western small-footed bat. Potential roosting habitat within the Project is found in the form of scattered trees, wooded hillslopes, and abandoned buildings; no caves were observed during the site visit. No known caves were documented in a literature search; however, karst formations may be found within the Project. Although the operation of the proposed wind energy facility will likely result in the mortality of some bats, the magnitude of these fatalities and the degree to which bat species will be affected is difficult to predict.

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INTRODUCTION

The Prevailing Winds Wind Project (hereafter referred to as Project) is located in Bonne Homme and Charles Mix Counties, South Dakota (Figure 1). Identification of potential biological resource issues early in the development phase of wind energy facilities helps the industry identify, avoid, and minimize future problems. This Tier 1 and 2 report involved a desktop review of publicly available information gathered from a variety of data sources, including US Fish and Wildlife Service (USFWS) websites; South Dakota Game, Fish and Parks (SDGFP) websites; US Geological Survey (USGS) Gap Analysis datasets; and various field guides, maps, and aerial imagery; and non-governmental organization (NGO) websites (e.g., The Nature Conservancy, Audubon, American Wind Wildlife Institute). This report is intended to meet the requirements described in Chapters 2-3 of the USFWS Land-Based Wind Energy Guidelines (USFWS 2012b).

STUDY AREA

The proposed Project (37,016.6 acres [ac]; 14,980.1 hectares [ha]) is located in the southeastern South Dakota counties of Bon Homme and Charles Mix (Figure 1). The landscape of the Project is flat to rolling hills, with elevations ranging from 454.5 to 573.7 meters (m; 1,491.2 to 1,882.3 feet [ft]) above sea level (Figures 2).

The majority of the Project is located in the Southern Missouri Coteau Slope, with the rest of the Project in the Southern Missouri Coteau Level IV Ecoregions (US Environmental Protection Agency [USEPA] 2013). Historically, the Project and surrounding area was mixed grass prairie consisting of grama (*Bouteloua* spp.), needlegrass (*Stipa* spp.), and wheatgrass (*Agropyron* spp.) species with numerous wetlands scattered throughout. Today, the majority of the Project has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices (Figure 4; USGS National Land Cover Data [NLCD] 2011). There are trees and woodlands found mainly in planted shelter belts and within draws and on hillslopes. Wetlands are scattered throughout the Project.

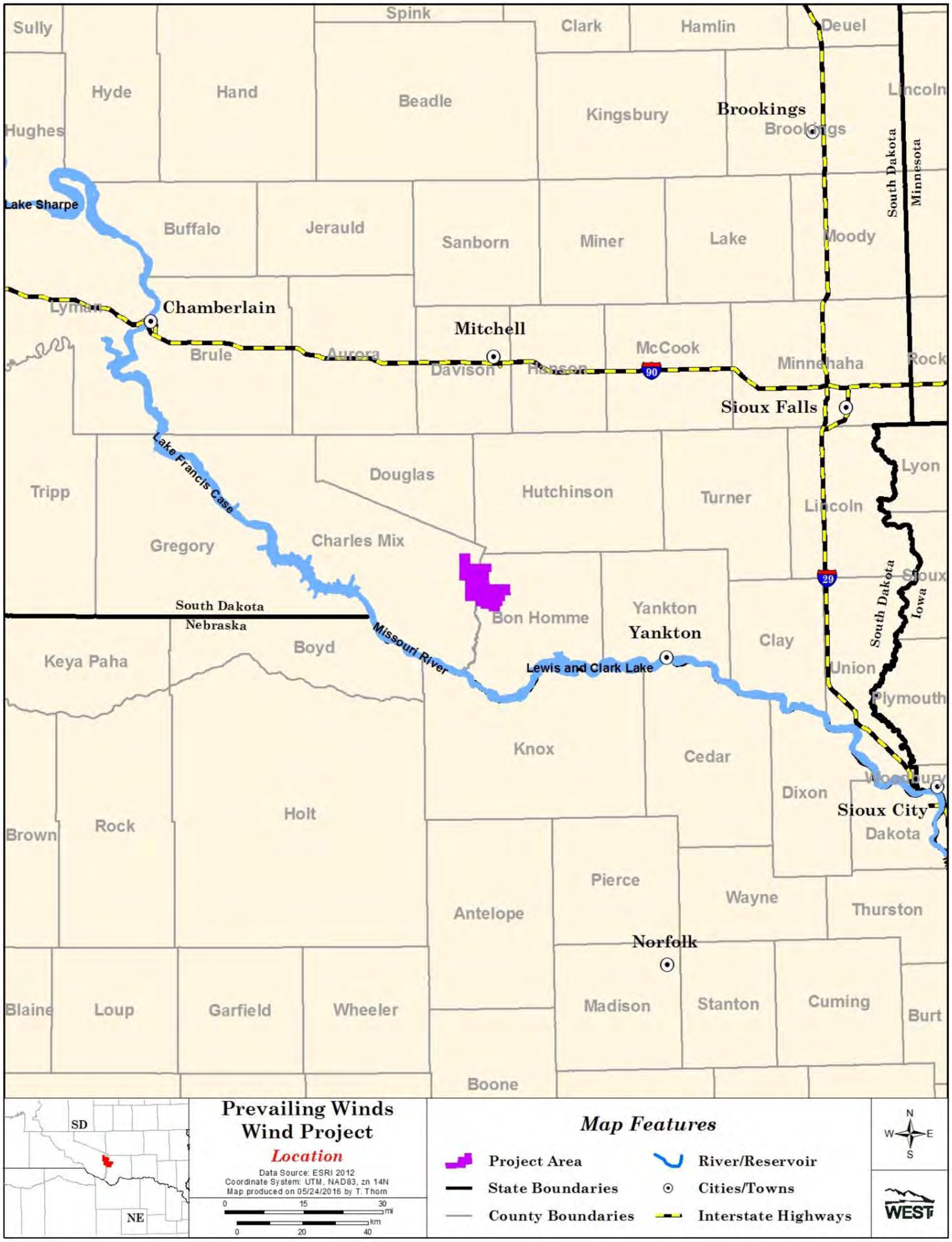

Figure 1. Location of the Prevailing Winds Wind Project.

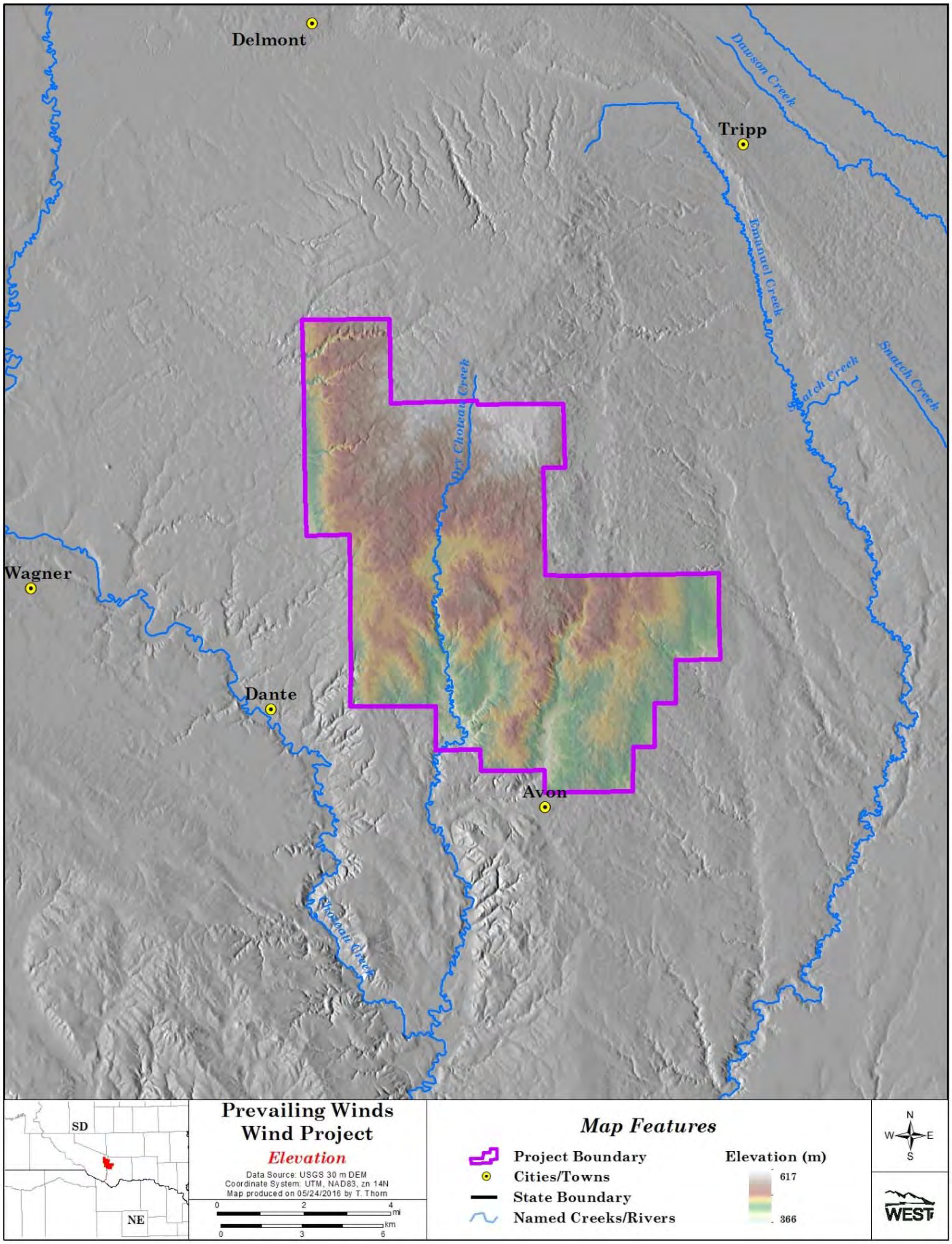

Figure 2. Elevation of the Prevailing Winds Wind Project.

METHODS

Tier 1 and 2 Study

Desktop review of publicly available information was gathered from a variety of data sources; including USFWS websites, SDGFP websites, USGS Gap Analysis datasets, various field guides, maps and aerial imagery, and NGO websites. In addition, biological resources within the Project were evaluated through a site reconnaissance visit conducted from public roads on February 25 and 26, 2015. Biological features and potential wildlife habitat, including plant communities, topographic features, and potential raptor nesting habitat and prey populations, were identified during the site visit. Photographs representative of the Project were also taken (Appendix A). All wildlife species observed were recorded (see Wildlife section below). Information about the presence and locations of sensitive species may be requested from the SDGFP and the USFWS.

Land Use/Land Cover

Approximately 47.5% of the Project is cultivated crops (Table 1, Figure 3; USGS NLCD 2011). The next most common land use is pasture/hay (37.6%). Grassland/herbaceous cover within the Project accounts for 6.7% of the land cover, followed by developed areas (4.3%) and wetlands/open water (2.7%). All other land cover types each account for less than 2% of the Project (Table 1).

Table 1. Land use/land cover within the Prevailing Winds Wind Project.

Land Use/Cover	Project Acres	% Total
Cultivated Crops	17,594.9	47.5
Pasture/Hay	13,901.8	37.6
Grassland/Herbaceous	2,479.6	6.7
Developed	1,575.1	4.3
Wetlands/Open Water	1,013.1	2.7
Deciduous Forest	368.3	1.0
Shrub/Scrub	67.5	0.2
Barren Land	14.7	<0.1
Evergreen Forest	1.1	<0.1
Total	**37,016.1**	**100**

Data Source: USGS NLCD 2011

For overall comparison of Land Use/Cover, the sole data source was USGS NLCD (2011). However, a more refined assessment was conducted by digitizing grasslands (pasture, hay, grassland, and herbaceous land cover) in ArcGIS 10.3 using 2014 National Agriculture Imagery Program (NAIP) aerial imagery. This method determined grassland acreage within the Project to be 9,949.97 acres (4,026.61 ha; 26.9%) in 2014, while USGS NLCD (2011) reported 16,381.40 acres (6,629.32 ha), indicating there has been a reduction in grassland in the Project since 2011.

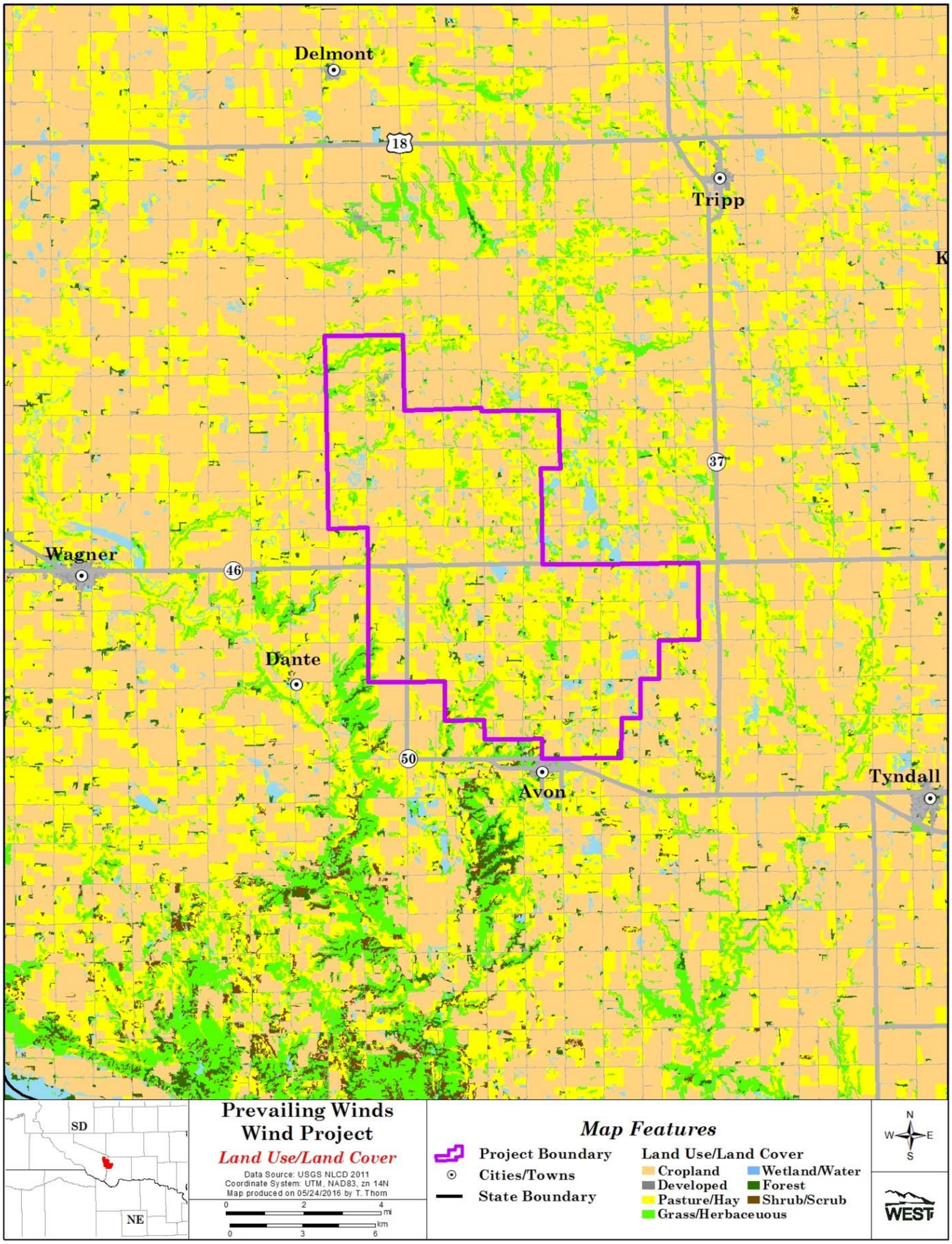

Figure 3. Land Use/Land Cover within and around the Prevailing Winds Wind Project.

Sensitive Habitats

Concern has been expressed by the USFWS and SDGFP on all projects in South Dakota regarding the potential impacts development of the Project may have on grasslands, particularly native grasslands and the impact to nesting grassland birds in these areas. Only 6.7% of the Project's area is categorized as grassland/herbaceous, but another 37.6% of the Project is considered pasture/hay, which may also contain native grass (Table 1, Figure 3; USGS NLCD 2011). If construction takes place within these areas, it is possible that some grassland and/or shrub-dependent species could be displaced (see the Breeding Bird section for more discussion on displacement). Project development is being planned to minimize impacts and disturbances to grasslands.

Wetlands and Riparian Areas

Based on National Wetland Inventory (NWI) data (USFWS NWI 2009), there are approximately 1,305.8 ac (528.8 ha) of wetlands within the Project. Freshwater emergent (77.5%) accounted for the majority of the wetlands, followed by freshwater ponds (14.7%), lakes (4.4%), and freshwater forested/shrub wetlands (3.4%; Table 2, Figure 4). A portion of Dry Choteau Creek is found within the Project. WEST did not conduct wetland delineations for the Project.

Table 2. National Wetland Inventory (NWI) wetlands present within the Prevailing Winds Wind Project (USFWS NWI 2009).

Wetland Type	Project Acres	Percent Total
Freshwater Emergent Wetland	1,011.7	77.5
Freshwater Pond	192.3	14.7
Lake	57.4	4.4
Freshwater Forested/Shrub Wetland	44.4	3.4
Total	**1,305.8**	**100**

Data Source: USFWS NWI 2009

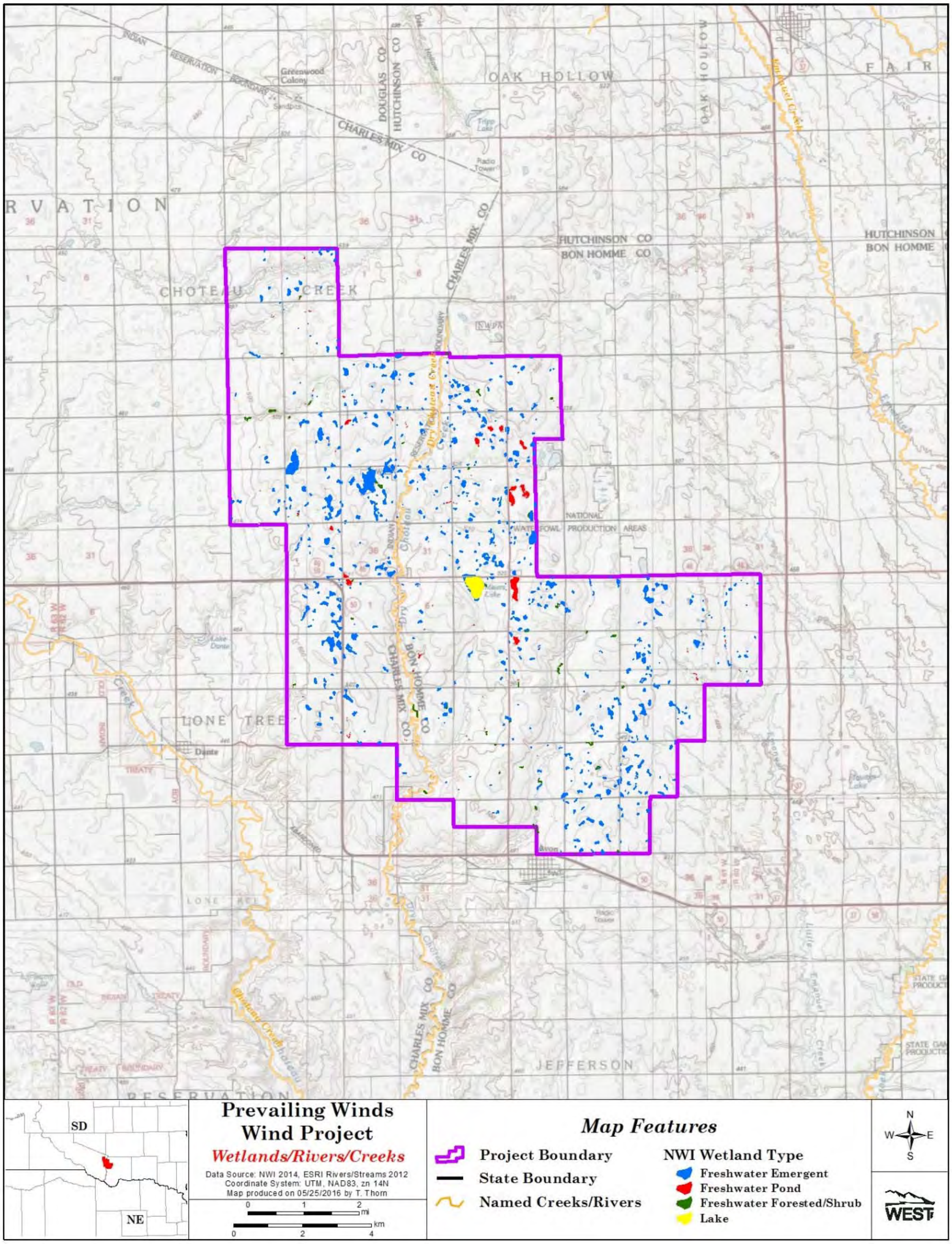

Figure 4. NWI wetlands within and around the Prevailing Winds Wind Project.

Wildlife

Wildlife species associated with croplands, grasslands, and shrublands are the most common types of species observed and expected to occur at the Project. A list of the species observed during the site visit on February 25 and 26, 2015, is provided in Table 3.

Table 3. Wildlife species observed at the Prevailing Winds Wind Project during a site visit on February 25 and 26, 2015.

Common Name	Scientific Name
Birds	
American robin	*Turdus migratorius*
European starling	*Sturnus vulgaris*
horned lark	*Eremophila alpestris*
mallard	*Anas platyrhynchos*
northern flicker	*Colaptes auratus*
red-tailed hawk	*Buteo jamaicensis*
ring-necked pheasant	*Phasianus colchicus*
rock pigeon	*Columba livia*
unidentified raptor	

Federally-Listed Species

A total of seven animal species listed as threatened, endangered, or proposed under the federal Endangered Species Act (ESA 1973) have been documented in Bonne Homme and/or Charles Mix counties (USFWS 2015c). Based on habitats found within the proposed Project during desktop evaluation and the site visit, five of the animal species have the potential to occur in the Project during some portion of the year, including: federally-endangered interior least tern (*Sterna antillarum athalassos*; USFWS 2013c) and whooping crane (*Grus americana*; USFWS 2013), federally-threatened piping plover (*Charadrius melodus*; USFWS 2013e), red knot (*Calidris canutus rufa*; USFWS 2014), and northern long-eared bat (*Myotis septentrionalis*; USFWS 2013b, 2015b). These species are discussed in further detail below.

The pallid sturgeon (*Scaphirhynchus albus*) is a federally-endangered fish species (USFWS 2013d) listed in all counties that are contiguous with the Missouri River. It can be found in the Missouri River, which is located approximately six miles (9.66 kilometers [km]) south of the Project. The federally-endangered Topeka shiner (*Notropis topeka*; USFWS 2013f) is a small minnow native to the streams of the prairie and prefers small, quiet streams with clean gravel or sand substrates and vegetated banks (Shearer 2003). The shiner can be found in the James River and tributaries, which is about 17.1 miles (27.5 km) to the northeast of the Project (SDGFP 2015c). It is unlikely that the pallid sturgeon or Topeka shiner will be affected by the development of and operations associated with a wind facility.

No federally-listed species were observed during the site visit.

Table 4. Species listed as endangered, threatened, or proposed endangered by the US Fish and Wildlife Service (USFWS) with the potential to occur within the Prevailing Winds Wind Project.

Common Name	Scientific Name	Federal Status
Birds		
interior least tern	*Sterna antillarum athalassos*	E
whooping crane	*Grus americana*	E
piping plover	*Charadrius melodus*	T
red knot	*Calidris canutus rufa*	T
Bats		
northern long-eared bat	*Myotis septentrionalis*	PE

E=endangered, T=threatened, PE=Proposed Endangered
Data Source: USFWS 2015c

Interior Least Tern

The interior least tern is a federally-endangered species (USFWS 2013c) that nests along sand and gravel bars within wide, unobstructed river channels and open flats along shorelines of lakes and reservoirs (TPWD 2015). Unnatural water fluctuations, permanent flooding or vegetation coverage of nesting habitat caused by water management may contribute to nest failure. No suitable nesting habitat was identified within the Project, but the least interior tern could potentially nest along the Missouri River or pass through the Project during spring and fall migration.

Whooping Crane

The federally-endangered whooping crane (USFWS 2013) migrates from its breeding grounds in Wood Buffalo National Park, Canada, to its wintering areas in Aransas National Wildlife Refuge, Texas (USFWS 2009). Threats to wild cranes include habitat destruction, chemical spills in its wintering habitat, lead poisoning, collisions with manmade objects such as fences and power lines, disease (e.g., avian cholera and parasites), and shooting (USFWS 2015d). Cranes typically utilize shallow wetlands and marshes, the edges and sandbars of shallow rivers, and agricultural fields near a water source during migration (USFWS 2015d). Thus, suitable whooping crane stopover habitat includes shallow livestock ponds surrounded by agricultural and grassland parcels and freshwater emergent wetlands. Some of these habitat features are scattered throughout the Project. Additionally, the Project is located 2.2 miles (3.5 km) east of the eastern edge of the 220-mile (354.1-km) wide whooping crane migration corridor, based on national flyway information (Figure 6), but it is within the 95% migration corridor when considered specific to South Dakota. Therefore, it is possible but unlikely that whooping cranes could occur in the Project.

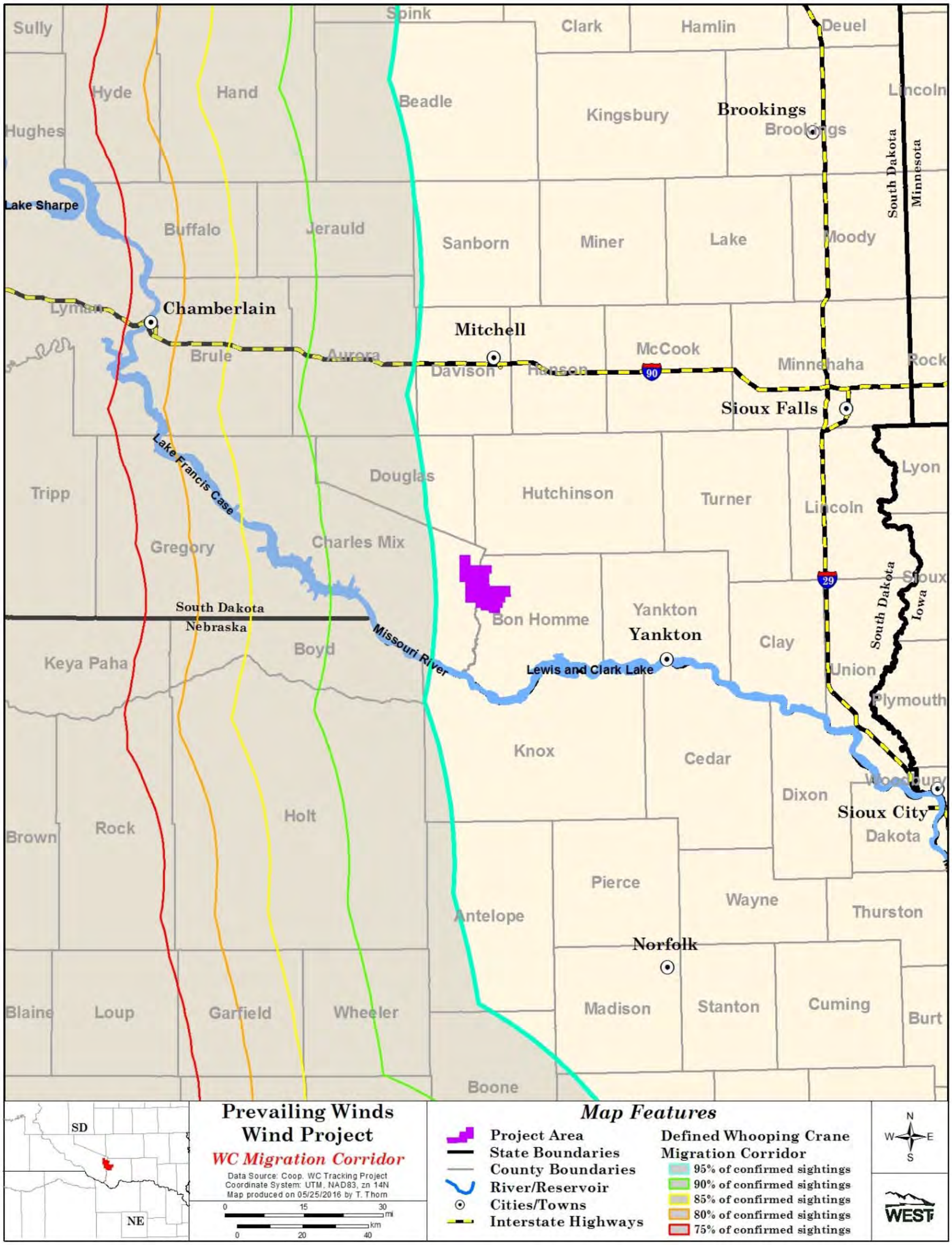

Figure 5. Designated Whooping Crane migration corridor.

Piping Plover

The federally-threatened piping plover (USFWS 2013e) is typically found on sandy beaches, mudflats, and exposed areas around wetlands and lakes. Suitable nesting habitat includes barren sandbars in large river systems and on alkaline lake shores (USFWS 2002). Piping plover populations are threatened by habitat loss due to vegetation encroachment, shoreline development, anthropogenic and animal disturbances, and water management activities, such as dam construction and channelization. Designated critical habitat for the piping plover is located approximately six miles (9.66 km) south of the Project along the Missouri River (Figure 6; USFWS 2015a). No suitable piping plover habitat was observed in the Project during the site visit. Piping plovers are unlikely to breed within the Project, but the species could potentially migrate through the Project.

Red Knot

The federally-threatened red knot is a medium-sized shorebird that migrates from its breeding grounds in Canada’s Arctic region to multiple wintering grounds, including the Northeast Gulf of Mexico, the Southeastern US, northern Brazil, and Tierra del Fuego at the southern point of South America. During the breeding season, red knots are typically found in sparsely vegetated, dry tundra areas (Harrington 2001, All About Birds 2015b). Outside of the breeding season, red knots are usually found along intertidal, marine beaches (Harrington 2001). During migration, some red knots can be found flying over inland areas, but these cases are rare (Sibley 2003). The red knot population is threatened by habitat loss in migration and wintering areas, reduction of quality and quantity of food resources, asynchronies in timing throughout its breeding and migration range, and high predation on the breeding grounds every three to four years (USFWS 2014). No suitable red knot habitat was observed in the Project during the site visit. Red knots are unlikely to breed within the Project, but the species could potentially migrate through the Project.

Figure 6. Designated Piping Plover critical habitat.

Northern Long-Eared Bat

The northern long-eared bat was listed as a threatened species on April 2, 2015. It is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through part of South Dakota (BCI 2015a). The Project is on the western fringe of the estimated range for the species (BCI 2015a). This species hibernates in caves and abandoned mines during winter (BCI 2015a); however, no known hibernacula exist in the Project, with the closes being in the Black Hills on the South Dakota/Wyoming border. During the summer, individuals may roost alone or in small colonies beneath exfoliating bark, or in cavities or crevices of both live and dead trees (BCI 2015a). Some of these habitat features are located in the Project. Although white-nose syndrome (WNS; caused by the fungus *Pseudogymnoascus destructans*) is the primary threat to northern long-eared bat populations (USFWS 2015b), there is concern about the impacts of wind facilities on bat species. However, under the final 4(d) rule published on January 14, 2016 (USFWS 2016), it was determined that wind-energy development has not led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species in the face of WNS. In other words, take of the species by a wind facility is not currently considered a violation of Section 9 of the ESA. This will change if the species becomes listed as endangered or if the 4(d) rule is rescinded. Bat acoustic surveys will be conducted to determine presence/absence of the northern long-eared bat within the Project.

State-Listed Species

Twelve species listed by the SDGFP as state-threatened or endangered have records of occurrence in the two counties in which the Project is located (SDGFP 2015b, Table 5). Eight of these species (northern river otter [*Lontra Canadensis*], false map turtle [*Graptemys pseudogeographica*], banded killifish [*Fundulus diaphanus*], blacknose shiner [*Notropis heterolepis*], northern redbelly dace [*Chrosomus eos*], pallid sturgeon [*Scaphihynchus albus*], sicklefin chub [*Macrhybopsis meeki*], and sturgeon chub [*Macrhybopsis gelida*]) are only associated with the Missouri River and would not occur in the Project. State-threatened or endangered species that have potential to occur in the Project are described below. Interior least tern, whooping crane, and piping plover, are both state- and federally-listed species and are only described in the Federally-Listed Species section of this report.

Table 5. Species listed as endangered or threatened by the state of South Dakota that occur in Bon Homme and Charles Mix Counties.

Common Name	*Scientific Name*	Status
Mammals		
northern river otter	*Lontra canadensis*	State-Threatened
Birds		
bald eagle	*Haliaeetus leucocephalus*	State-Threatened
interior least tern	*Sterna antillarum athalassos*	Federally-Endangered, State-Endangered
piping plover	*Charadrius melodus*	Federally-Threatened, State-Threatened
whooping crane	*Grus americana*	Federally-Endangered, State-Endangered
Reptiles		
false map turtle	*Graptemys pseudogeographica*	State-Threatened

Table 5. Species listed as endangered or threatened by the state of South Dakota that occur in Bon Homme and Charles Mix Counties.

Common Name	*Scientific Name*	Status
Fish		
banded killifish	*Fundulus diaphanus*	State-Endangered
blacknose shiner	*Notropis heterolepis*	State-Endangered
northern redbelly dace	*Chrosomus eos*	State-Threatened
pallid sturgeon	*Scaphihynchus albus*	Federally-Endangered, State-Endangered
sicklefin chub	*Macrhybopsis meeki*	State-Endangered
sturgeon chub	*Macrhybopsis gelida*	State-Threatened

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as a state-threatened species in South Dakota (SDGFP 2015b). Bald eagles are typically found near rivers, marshes, lakes, reservoirs, and coasts (Buehler 2000). They usually nest in forested places close to water bodies, avoiding heavily developed areas when possible (Buehler 2000). According to the SDGFP, and confirmed during the site visit, a bald eagle nest is located approximately 1.8 miles (2.9 km) north of the Project. Additionally, bald eagles could move through/over the Project year-round.

Grassland-Dependent Bird Species of Concern

Displacement of grassland nesting birds is often one of the primary concerns of wildlife agencies in regards to the siting of wind facilities in and near grasslands. Recent research has focused on the potential displacement of grassland passerines at wind energy facilities, and some uncertainty currently exists over the effects of wind energy facilities on the breeding success of these birds. In Minnesota, researchers found that breeding passerine density on Conservation Reserve Program (CRP) grasslands was reduced in the immediate vicinity of wind turbines (Leddy et al. 1999), but changes in density at broader scales was not detected (Johnson et al. 2000a). Erickson et al. (2004) documented a decrease in density of some native grassland passerines, such as grasshopper sparrow (*Ammodramus savannarum*), near wind turbines in Washington; however, it was not determined if the decreased density of grassland birds after the project was operating was the result of behavioral disturbance or habitat loss. Piorkowski (2006) conducted a displacement study at a wind energy facility in Oklahoma where, of the grassland species present in the wind resource area, only the western meadowlark (*Sturnella neglecta*) showed significantly lower densities near wind turbines. Piorkowski (2006) suggested that habitat characteristics were more important to determining passerine breeding densities than the presence of wind turbines. Shaffer and Buhl (2015) documented avoidance by grasshopper sparrows out to 300 m (984 ft) over time at wind projects in North and South Dakota.

Sharp-tailed grouse (*Tympanuchus phasianellus*), greater prairie chicken (*T. cupido*), Nelson’s sparrow (*Ammodramus nelsoni*), Le Conte’s sparrow (*A. leconteii*), chestnut-collared longspur (*Calcarius ornatus*), and bobolink (*Dolichonyx oryzivorus*) are dependent on grassland habitat, particularly large blocks of grassland (Johnson and Igl 2001), and may occur in the Project (Jennings et al. 2005). These species could be susceptible to adverse effects of grassland habitat fragmentation if this type of disturbance occurs as a result of facility construction. The Project has previously been subjected to fragmentation, primarily due to the conversion of grassland to areas of cultivated cropland (Table 1, Figure 4). Grassland areas that may support grassland birds are located throughout the Project, especially in the western portion of the Project where the landscape is more bisected by ravines. Facility development in the areas with less native grasslands, wetlands, and shrublands would likely have lower direct (e.g., habitat loss) and indirect impacts (e.g., displacement) to wildlife and plants, particularly to grassland-nesting bird species and native grassland plants. Limiting the footprint of any proposed developments, as well as utilizing previously developed roads and/or transmission corridors, could help to minimize any additional fragmentation.

Prairie Grouse

Sharp-tailed grouse and greater prairie chicken are prairie-obligate species that require relatively undisturbed or natural tallgrass prairie. These species tolerate some agricultural land interspersed with prairie, but both species generally become less numerous as the amount of agricultural land increases. Sharp-tailed grouse and greater prairie chicken are lekking species; leks are typically located on knolls or gentle rises. Male grouse and chickens may begin defending their territories on lekking grounds in late February, with peak hen attendance in early April.

Depending on findings during point counts and ultimately turbine placement, agencies may recommend that surveys for grouse species be conducted pre- and post-construction, with lek surveys for prairie grouse species conducted in the spring.

Birds of Conservation Concern

Although not protected under the ESA (1973), numerous bird species have been identified by the USFWS as Birds of Conservation Concern (BCC; USFWS 2008). These are “species, subspecies, and populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973” (USFWS 2008). The Project lies within Bird Conservation Region (BCR) 11 (Prairie Potholes), a landscape dotted with many small depressional wetlands called potholes.

Twenty-seven bird species are listed as BCC within BCR 11 (USFWS 2008, Appendix B), many of which would have potential for occurrence within the Project (Jennings et al. 2005). Four diurnal raptors are among the BCC within BCR 11 with potential to occur in the Project (bald eagle [also a state-threatened species], Swainson’s hawk [*Buteo swainsoni*], and peregrine falcon. In addition to bald eagles, golden eagles (*Aquila chrysaetos*) have the potential to occur in the Project during some time of the year. The bald and golden eagles are protected by the Migratory Bird Treaty Act (MBTA 1918) and the Bald and Golden Eagle Protection Act (BGEPA 1940). Swainson’s hawks may breed in the Project, and peregrine falcons potentially migrate through the Project (Jennings et al. 2005). The remaining BCC species are a mix of shorebirds, waterbirds, owls, woodpeckers, and passerines, all of which likely have some potential for impacts from wind energy development (Appendix B).

Raptors

Species Likely to Occur in the Area

The following diurnal raptor and vulture species could potentially breed in or near the Project: American kestrel (*Falco sparverius*), bald eagle, golden eagle, Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*B. regalis*), Swainson's hawk, broad-winged hawk (*B. platypterus*), peregrine falcon, osprey, and turkey vulture (*Cathartes aura;* Jennings et al. 2005). Owls with the potential to breed in or near the Project include barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), eastern screech owl (*Otus asio*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*) and great horned owl (*Bubo virginianus;* Jennings et al. 2005).

Diurnal raptor species that may also occur within the Project outside of the breeding season (migration, winter, or post-breeding dispersal), include northern goshawk (*Accipiter gentilis*), Cooper's hawk, golden eagle, bald eagle, merlin (*Falco columbarius*), peregrine falcon, prairie falcon (*F. mexicanus*), gyrfalcon (*F. rusticolus*), red-tailed hawk, rough-legged hawk (*Buteo lagopus*), and sharp-shinned hawk (*Accipiter striatus*; Jennings et al. 2005). Owls that may occur outside of the breeding season include the eastern screech owl, great horned owl, northern saw-whet owl (*Aegolius acadicus*), long-eared owl, and short-eared owl (Jennings et al. 2005). During the site visit, four red-tailed hawk observations and two unidentified diurnal raptor observations were recorded at the Project (Table 3).

Potential for Raptor Migration in the Area

Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features often used by raptors during migration are ridgelines and the shorelines of large bodies of water (Liguori 2005). Updrafts formed as the wind hits the ridges, and thermals, created over land and not water, make for energy-efficient travel over long distances (Liguori 2005). It is for this reason that raptors sometimes follow corridors or pathways, for example, along prominent ridges with defined edges, during migration.

It is likely that raptors migrate through the proposed Project in a broad front pattern with some potential for more localized use of ridge on the southwestern portion of the Project (Figure 3). Trees, shrubs, and water impoundments may provide some stopover habitat for migrating raptors; which are scattered throughout the Project and region (Figure 4).

Potential Raptor Nesting Habitat

During the site visit, small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides were observed that could provide raptor nesting habitat for species such as red-tailed hawk and Swainson's hawk. Grassland areas could provide nesting habitats for ground-nesting raptors and owls, such as the northern harrier and burrowing owl.

One known bald eagle nest is located approximately 1.8 mile north of the Project area. Additional surveys should focus on determining how or if eagles from this nest utilize the Project.

Potential Prey

Areas with colonial rodents or other prey species, such as rabbits and other birds, tend to attract foraging raptors. Small mammal colonies could potentially exist within the Project, but were not visible from public roads. No colonial rodents were observed during the site visit in February 2015. It is difficult to assess potential prey densities during a short-term site visit, and prey densities can fluctuate dramatically based on habitat and climatic factors. If roost sites and food resources are available, it is likely that raptors will use the area. However, it is not likely that raptors will use the area to a greater degree than the surrounding areas with similar habitat and resources.

Does the Topography of the Site Increase the Potential for Raptor Use?

At wind energy facilities located on prominent ridges with defined edges (e.g., rims of canyons, steep slopes), raptors often fly along the rim edges, using updrafts to maintain altitude while hunting, migrating or soaring (Johnson et al. 2000b, Hoover and Morrison 2005). Topography in the Project is relatively flat in the east but with slightly steep slopes in the western half of the Project Area (Figure 3). In addition, the Missouri River is approximately 6 miles south of the Project, which could increase overall raptor migration potential in the region.

Bird Migration

Although many species of passerines migrate at night and may collide with tall human-made structures, few large mortality events at wind energy facilities in North America have been documented on the same scale as those seen at communication towers (National Wind Coordinating Collaborative [NWCC] 2004). Large numbers of passerines have collided with lighted communication towers and buildings when foggy conditions occur at night during spring or fall migration. Birds appear to become confused by the lights during foggy or low cloud ceiling conditions, flying circles around lighted structures until they become exhausted or collide with the structure (Erickson et al. 2001). Most collisions at communication towers are attributed to the guy wires on these structures, which wind turbines do not have. Additionally, the large mortality events observed at communication towers have occurred at structures greater than 500 ft (152 m) in height (Erickson et al. 2001), likely because most small birds migrate at elevations of 500 to 1,000 ft (152.4 to 304.8 m) above the ground (USFWS 1998), which is higher than most modern turbines. Migrating passerines are likely more at risk of turbine collision when ascending and descending from stopover habitat, locations where migrating birds stop to rest or refuel, or during foggy conditions when they fly lower and may become confused by lights.

It is likely that birds such as passerines, raptors, and waterfowl may migrate through the proposed Project. Wetlands, woodlots, and grasslands, which are found throughout the Project, may provide stopover habitat for migrants or individuals during post-breeding dispersal. The combination of wetlands, ponds, lakes, and grasslands found in the Project may be attractive to a broader suite of bird species than when only one of these land cover types occurs. Harvested crop fields could also serve as feeding areas for migrating and wintering cranes and waterfowl.

These land cover types are found throughout the region, so use by these species should not be more concentrated in the Project than compared to adjacent areas.

Breeding Birds

Important Bird Areas

The National Audubon Society (Audubon) lists Important Bird Areas (IBAs) that are sites providing essential habitat for one or more species of birds (Audubon 2015). There are no Audubon IBAs or The Nature Conservancy (TNC) protected lands (USGS 2012) within the Project; however, there are two IBAs located south of the Project. The Missouri National Recreational River IBA is approximately 10 miles (16.1 km) south of the Project, while the Lower Missouri River Channel IBA is about 10.5 miles (16.9 km) south of the Project (Audubon 2013).

USGS Breeding Bird Survey

Two U.S. Geological Survey Breeding Bird Survey (BBS) routes are located in the vicinity of the Project (Figure 7; USGS 2013). The west end of the Tripp BBS route is approximately 13 miles (20.9 km) northeast of the northeast corner of the Project. The north end of the Sparta BBS route is south of the Missouri River, approximately 21.5 miles (34.6 km) southeast of the southeast corner of the Project. Each BBS route is about 25 miles (40.2 km) long, and all birds seen or heard are tallied for a 3-minute period every half-mile (0.8 km) along the route (USGS 1998).

A total of 70 bird species were recorded along the Tripp BBS route from 2011 to 2014 (Pardieck et al. 2014) and three of these species are listed as USFWS BCC (USFWS 2008; Appendix B). All three of these species were observed each year, from 2011-2014: red-headed woodpecker (*Melanerpes erythrocephalus*), grasshopper sparrow, and dickcissel (*Spiza americana*; Pardieck et al. 2014). In 2014, 915 individual bird observations of 56 species were made on the Tripp Route (Pardieck et al. 2014). The most abundant birds observed were the western meadowlark, brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), barn swallow (*Hirundo rustica*), and dickcissel. No federally- or state-listed threatened or endangered species have been recorded at the Tripp BBS route.

A total of 65 bird species have been recorded along the Sparta BBS route in 2011 and 2013 (Pardieck et al. 2014) and four of these species are listed as USFWS BCC (USFWS 2008; Appendix B). All four of these species were observed in 2011 and 2013: red-headed woodpecker, grasshopper sparrow, dickcissel, and upland sandpiper (*Bartramia longicauda*; Pardieck et al. 2014). In 2013, 1,392 individual bird observations of 56 species were made on the Sparta Route (Pardieck et al. 2014). The most abundant birds observed were the dickcissel, red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), mourning dove, and western meadowlark. No federally- or state-listed threatened or endangered species have been recorded at the Sparta BBS route.

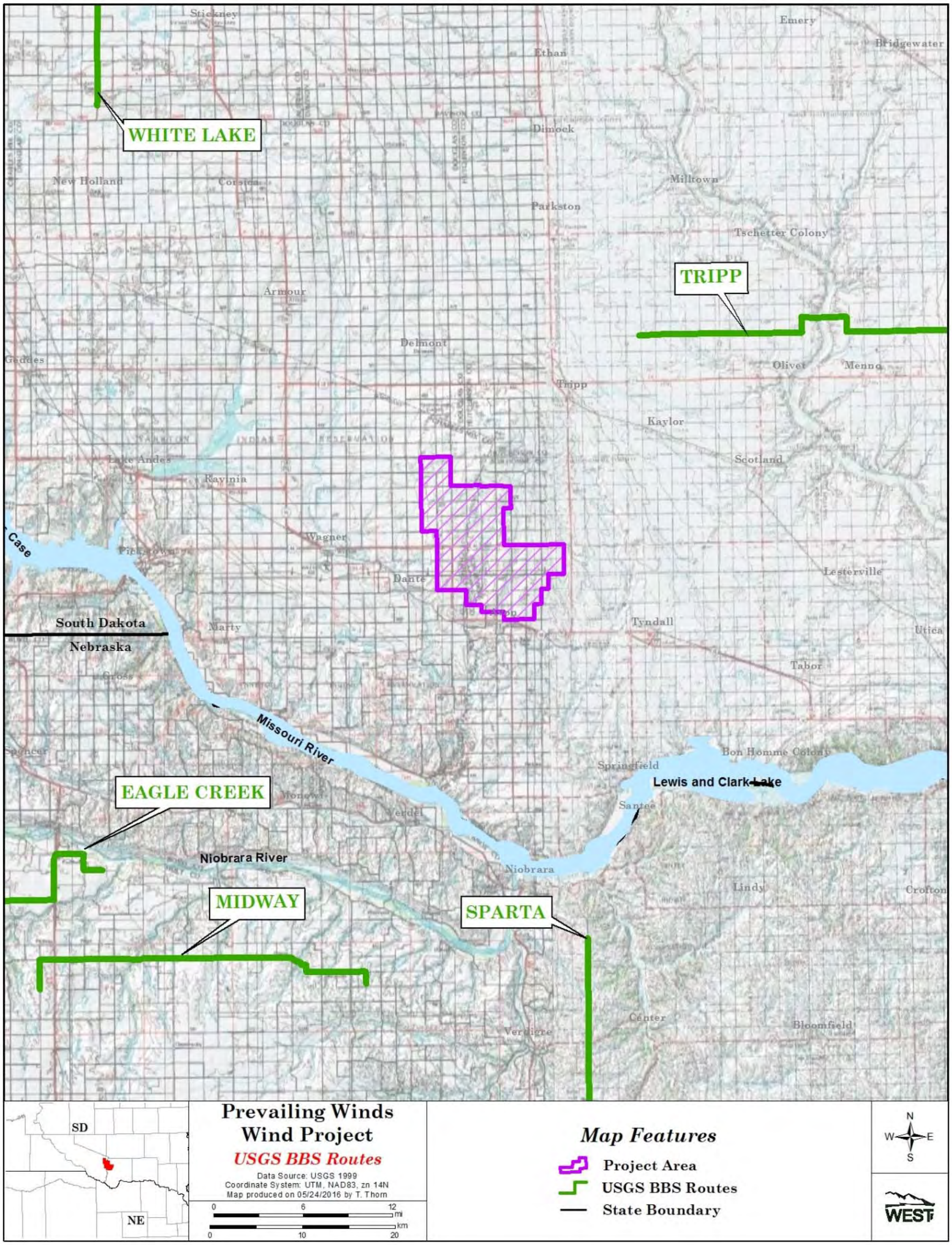

Figure 7. USGS Breeding Bird Survey routes.

Bats

At least 19 bat species have been documented as fatalities at wind energy facilities throughout the U.S. (Table 6). Up to 13 species of bats occur in South Dakota, and seven of these species are likely residents and/or migrants in the Project (Table 7, based on range maps [International Union for Conservation of Nature (IUCN) 2014]), including big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), northern long-eared bat (*Myotis septentrionalis*), little brown bat (*M. lucifugus*), and western small-footed bat (*M. ciliolabrum*).

Table 6. Summary of bat fatalities (by species) from wind energy facilities in North America.

Common Name	Scientific Name	# Fatalities[1]	% Composition
hoary bat[2]	*Lasiurus cinereus*	5,027	36.5
eastern red bat[2]	*Lasiurus borealis*	3,179	23.1
silver-haired bat[2]	*Lasionycteris noctivagans*	2,500	18.2
little brown bat[2]	*Myotis lucifugus*	1,121	8.1
tricolored bat	*Perimyotis subflavus*	625	4.5
big brown bat[2]	*Eptesicus fuscus*	517	3.8
Mexican free-tailed bat	*Tadarida brasiliensis*	377	2.7
unidentified bat		325	2.4
unidentified myotis	*Myotis* spp.	32	0.2
northern long-eared bat[2]	*Myotis septentrionalis*	15	0.1
Seminole bat	*Lasiurus seminolus*	12	0.1
western red bat	*Lasiurus blossevillii*	9	0.1
big free-tailed bat	*Nyctinomops macrotis*	5	<0.1
evening bat	*Nycticeius humeralis*	5	<0.1
western yellow bat	*Lasiurus xanthinus*	3	<0.1
eastern small-footed bat	*Myotis leibii*	2	<0.1
Indiana bat	*Myotis sodalis*	2	<0.1
pocketed free-tailed bat	*Nyctinomops femorosacca*	2	<0.1
canyon bat	*Pipistrellus hesperus*	1	<0.1
cave bat	*Myotis velifer*	1	<0.1
long-legged bat	*Myotis volans*	1	<0.1
unidentified free-tailed bat		1	<0.1
unidentified Lasiurus bat	*Lasiurus* spp.	1	<0.1
Total	**19 species***	**13,763**	**100**

[1] These are raw data and are not corrected for searcher efficiency or scavenging.

[2] Potential resident or migrant in the BWP (BCI 2003).

Cumulative fatalities and species from data compiled by Western EcoSystems Technology, Inc. from publicly available fatality documents (listed in Appendix C). Indiana bat fatalities are reported by USFWS (2010, 2011c). Three additional Indiana bat fatalities (USFWS 2011b, 2012a, 2012c) are not included in this total.

* One incidental long-eared bat (*Myotis evotis*) was recorded at Tehachapi, California (Anderson et al. 2004), but is not included in the total fatalities. An additional 677 bat fatalities (evening bat, eastern red bat, hoary bat, tricolored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species was not reported.

Canyon bat formerly known as western pipistrelle (*Pipistrellus hesperus*), and tricolored bat formerly known as eastern pipistrelle (*Pipistrellus subflavus*; BCI 2015b, 2015c).

Table 7. Bat species, based on International Union for Conservation of Nature (IUCN) 2014 range maps, with the potential to occur in the Prevailing Winds Wind Project.

Species	Scientific Name	State Status/ Federal Status	Habitat	Likelihood of Occurrence
northern long-eared bat	*Myotis septentrionalis*	PE[a]/FT	Associated with forests; chooses maternity roosts in buildings, under loose bark, and in the cavities of trees; caves and underground mines are their choice sites for hibernating. On western edge of range.	Unlikely
big brown bat	*Eptesicus fuscus*		Common in most habitats, abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark, tree cavities, buildings, barns, and bridges.	Likely
silver-haired bat	*Lasionycteris noctivagans*	S4[b]	Common bat in forested areas, particularly old growth; maternity colonies in tree cavities or hollows; hibernates in forests or cliff faces.	Likely
eastern red bat	*Lasiurus borealis*		Abundant tree bat; roosts in trees; solitary.	Likely
hoary bat	*Lasiurus cinereus*		Usually not found in man-made structures; roosts in trees; very wide-spread.	Likely
western small-footed bat	*Myotis ciliolabrum*		Found in mesic conifer forest, also riparian woodland; roosts in rock outcrops, clay banks, loose bark, buildings, bridges, caves, and mines.	Probable
little brown bat	*Myotis lucifugus*		Commonly forages over water; roosts in attics, barns, bridges, snags, and loose bark; hibernacula in caves and mines.	Probable

[a] Status from SDGFP 2015
PE = Proposed Endangered
[b] Status from SDGFP 2014
S4 = Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long term concern.
FT = Federally Endangered

Potential roosting habitat (i.e. trees and buildings) exists within the Project as there are many abandoned structures scattered throughout the area. No caves or mines have been reported in the literature, and none were observed by a WEST biologist during the site visit. However, karst formations (characterized by sinkholes, caves, and underground drainage systems; Encyclopædia Britannica 2015) have been found within the Project according to the USGS National Atlas of the US (Tobin and Weary 2004).

Bats generally forage over water and open spaces, such as agricultural fields, grasslands, streams, and wetlands/ponds. Bats may prey on insects that are likely to concentrate over water in wetlands and streams, thus these types of areas found in the Project are most likely to attract foraging bats. Bats may forage over the entire Project, although the extent of use is not known.

Bat casualties have been reported from most wind energy faculties where post-construction fatality data are publicly available. Reported estimates of bat mortality at wind energy facilities have ranged from 0.01 – 47.5 fatalities per turbine per year (0.9 – 43.2 bats per MW per year) in the US, with an average of 3.4 per turbine or 4.6 per MW (NWCC 2004). The majority of the bat casualties at wind energy facilities to date are migratory species that undertake long migrations between summer roosts and wintering areas. The species most commonly found as fatalities at wind energy facilities include hoary bats, silver-haired bats, and eastern red bats (Johnson 2005). The highest numbers of bat fatalities found at wind energy facilities to date have occurred in eastern North America on ridge tops dominated by deciduous forest (NWCC 2004). However, Gruver et al. (2009), BHE Environmental (2010, 2011), Barclay et al. (2007), and Jain (2005) reported relatively high fatality rates from facilities in Wisconsin, Iowa, and Canada that were located in grassland and agricultural habitats. Unlike the eastern US wind energy facilities that reported higher bat fatality rates, the Wisconsin, Alberta, and Iowa facilities are in open grasslands and crop fields.

Construction of the proposed Project will likely result in the mortality of some bats. The magnitude of these fatalities and the degree to which bat species will be affected is difficult to determine, but they should be within the average range of bat mortalities found throughout the US based on general vegetation and landscape characteristics.

CONCLUSIONS

A summary of the potential for wildlife and habitat conflicts in the proposed wind energy facility development area is presented in Table 8.

Table 8. A summary of the potential (VH=Very High, H=High, M=Medium, and L=Low) for wildlife and habitat conflicts at the Prevailing Winds Wind Project.

Issue	VH	H	M	L	Notes
Potential for raptor nest sites			✓		Few tree rows and woodlots exist on the Project; few very small forests
Concentrated raptor flight potential			✓		The slightly steep slopes in the western half of the Project Area increases the potential for raptor use along the north/south ridges in the western half of the Project Area.
Potential for migratory pathway		✓			The Project is close to the Missouri River, thereby increasing potential for migratory pathway. The Project is close to the whooping crane migration corridor.
Potential for raptor prey species			✓		Suitable habitat for small mammals exists.
Potential for protected species to occur		✓			Protected species may occur in the area (e.g., bald eagle); There is concern about grassland fragmentation for prairie grouse and grassland birds.
Potential for State Issues		✓			Protection of native grasslands; likely state species issues exist as well
Uniqueness of habitat at wind energy facility			✓		Grasslands and shrublands found in the region. Displacement of grassland animals and plants may occur.
Potential for rare plants to occur			✓		Grasslands make up a moderate proportion of the Project; there is some likelihood that rare plants are present in grasslands that occur in the Project Area but impacts would depend on turbine siting.
Potential for use by bats			✓		The Project has scattered trees, buildings, and wetlands.

Seven animal species listed as federally-endangered, threatened, or proposed species have the potential to occur in Bon Homme and/or Charles Mix counties. These include the federally-endangered pallid sturgeon, Topeka shiner, interior least tern, and whooping crane; federally-threatened piping plover, red knot; and northern long-eared bat. Five of the seven species (interior least tern, whooping crane, piping plover, red knot, and northern long-eared bat) could potentially occur in the Project.

WEST conducted a preliminary review of the birds listed as threatened or endangered by the state of South Dakota and found four bird species with the potential to occur in or near the Project: interior least tern, whooping crane, piping plover, and bald eagle. Additionally, the northern long-eared bat is listed as a Species of Concern by SDGFP.

In general, native land cover, including wetlands, in most of the Project is not unique in the region, but their presence raises concerns regarding loss of native prairie. As the land cover is not unique to the region, these characteristics are not likely to attract or concentrate bird or bat species compared to surrounding areas. Habitat suitability may decrease for grassland birds in terms of increased habitat fragmentation and behavior modification (avoidance) if areas of intact grassland are impacted by construction. Greater prairie chickens and sharp-tailed grouse are of particular conservation interest to SDGFP, may be found in the Project, and may be susceptible to grassland fragmentation. Large areas of intact grassland should be avoided to minimize impacts to grassland dependent species.

Several raptor and vulture species could potentially breed in or near the Project as well as occur outside of the breeding season (migration, winter, or post-breeding dispersal Small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides are present in the Project that could provide raptor nesting habitat for species such as the red-tailed hawk, bald eagle, and Swainson’s hawk. Grassland areas could provide nesting habitats for ground-nesting raptors, such as the northern harrier and burrowing owl.

Deciduous trees and buildings in the Project may provide potential roosting habitat and hibernacula for bats. Research to date on the impacts of wind energy facilities on bats has shown that species that conduct long distance migrations usually make up the vast majority of bat fatalities at wind energy facilities. Additionally, the timing of bat fatalities at wind energy facilities indicates that most bats are killed by turbines during the migration season (Johnson 2005, Arnett et al. 2008). Relatively few bat fatalities have been recorded at most wind energy facilities during spring or summer, although bat use at wind energy facilities has been recorded during those seasons. Risk of collision of resident bat species that may breed near wind energy facilities is not known. The Project is on the western edge of the range for the federally-threatened northern long-eared bat. Because it is possible that northern long-eared bat occupies the Project given the amount of trees, ponds, and lakes in the Project, acoustic surveys to investigate presence/absence are recommended. Further the northern long-eared bat is currently covered by a 4(d) rule determination as it pertains to wind energy development. An additional six bat species are likely to occur in the Project, including big brown bat, eastern red bat, hoary bat, silver-haired bat, little brown bat, and western small-footed bat (IUCN 2014).

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Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 27, 2010.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 12, 2010.

Young, D.P., Jr., W. P. Erickson, K. Bay, S. Nomani, and W. Tidhar. 2009b. Mount Storm Wind Energy Facility, Phase 1 Post-Construction Avian and Bat Monitoring, July - October 2008. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 17, 2009.

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Young, D.P., Jr., J. D. Jeffrey, K. Bay, and W. P. Erickson. 2009c. Puget Sound Energy Hopkins Ridge Wind Project, Phase 1, Columbia County, Washington. Post-Construction Avian and Bat Monitoring, Second Annual Report: January - December, 2008. Prepared for Puget Sound Energy, Dayton, Washington, and the Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. May 20, 2009.

Young, D.P., Jr., M. Lout, Z. Courage, S. Nomani, and K. Bay. 2012a. 2011 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland: April - November 2011. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. April 20, 2012. Revised November 25, 2013.

Young, D.P., Jr., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2012. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. January 15, 2013.

Young, D.P., Jr., S. Nomani, Z. Courage, and K. Bay. 2011a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 29, 2011.

Young, D.P., Jr., S. Nomani, Z. Courage, and K. Bay. 2012b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 27, 2012.

Young, D.P., Jr., S. Nomani, W. Tidhar, and K. Bay. 2011b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 10, 2011.

Appendix A. Photographs of the Prevailing Winds Wind Project

Photo 1. Typical cropland habitat with a small woodlot in the distance in the Prevailing Winds Wind Project.

Photo 2. Typical hay field and wooded draw within the Prevailing Winds Wind Project.

Photo 3. Typical wooded hillside in southwestern portion of the Prevailing Winds Wind Project.

Photo 4. Typical grassland with scattered deciduous trees in the Prevailing Winds Wind Project.

Photo 5. Typical grassland in the Prevailing Winds Wind Project.

Photo 6. Mixed species grassland in the Prevailing Winds Wind Project.

Appendix B. Bird Species of Conservation Concern within the Prairie Potholes Region

Appendix B. US Fish and Wildlife Service (USFWS) Birds Conservation Concern (BCC) within the Bird Conservation Region (BCR) 11 (Prairie Potholes) and their presence/absence in the vicinity of the Prevailing Winds Wind Project (Pardieck et al. 2014, USFWS 2008).

Species	Recorded from 2011 to 2014 on Tripp Breeding Bird Survey Route?	Recorded in 2011 and 2013 on Sparta Breeding Bird Survey Route?
horned grebe	No	No
American bittern	No	No
least bittern	No	No
bald eagle	No	No
Swainson's hawk	No	No
peregrine falcon	No	No
yellow rail	No	No
mountain plover	No	No
solitary sandpiper	No	No
upland sandpiper	No	Yes
long-billed curlew	No	No
Hudsonian godwit	No	No
marbled godwit	No	No
buff-breasted sandpiper	No	No
short-billed dowitcher	No	No
black tern	No	No
black-billed cuckoo	No	No
short-eared owl	No	No
red-headed woodpecker	Yes	Yes
Sprague's pipit	No	No
grasshopper sparrow	Yes	Yes
Baird's sparrow	No	No
Nelson's sharp-tailed sparrow	No	No
McCown's longspur	No	No
Smith's longspur	No	No
chestnut-collared longspur	No	No
dickcissel	Yes	Yes

Appendix C. Summary of Publicly Available Reports from North American Wind Energy Facilities that have Reported Bat Fatalities

Appendix C. Summary of publicly available reports from North American wind energy facilities that have reported bat fatalities (Table 6).

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Alite, CA (09-10)	Chatfield et al. 2010	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Lempster, NH (09)	Tidhar et al. 2010
Barton I & II, IA (10-11)	Derby et al. 2011a	Lempster, NH (10)	Tidhar et al. 2011
Barton Chapel, TX (09-10)	WEST 2011	Linden Ranch, WA (10-11)	Enz and Bay 2011
Beech Ridge, WV (12)	Tidhar et al. 2013b	Locust Ridge, PA (Phase II; 09)	Arnett et al. 2011
Big Horn, WA (06-07)	Kronner et al. 2008	Locust Ridge, PA (Phase II; 10)	Arnett et al. 2011
Big Smile, OK (12-13)	Derby et al. 2013b	Madison, NY (01-02)	Kerlinger 2002b
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Maple Ridge, NY (06)	Jain et al. 2007
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Maple Ridge, NY (07)	Jain et al. 2009a
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Maple Ridge, NY (07-08)	Jain et al. 2009d
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Maple Ridge, NY (12)	Tidhar et al. 2013a
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Marengo I, WA (09-10)	URS Corporation 2010b
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Marengo II, WA (09-10)	URS Corporation 2010c
Buena Vista, CA (08-09)	Insignia Environmental 2009	Mars Hill, ME (07)	Stantec 2008
Buffalo Gap I, TX (06)	Tierney 2007	Mars Hill, ME (08)	Stantec 2009a
Buffalo Gap II, TX (07-08)	Tierney 2009	McBride, Alb (04)	Brown and Hamilton 2004
Buffalo Mountain, TN (00-03)	Nicholson et al. 2005	Melancthon, Ont (Phase I; 07)	Stantec Ltd. 2008
Buffalo Mountain, TN (05)	Fiedler et al. 2007	Meyersdale, PA (04)	Arnett et al. 2005
Buffalo Ridge, MN (94-95)	Osborn et al. 1996, 2000	Moraine II, MN (09)	Derby et al. 2010d
Buffalo Ridge, MN (00)	Krenz and McMillan 2000	Mount Storm, WV (Fall 08)	Young et al. 2009b
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000a	Mount Storm, WV (09)	Young et al. 2009a, 2010b
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000a	Mount Storm, WV (10)	Young et al. 2010a, 2011b
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000a	Mount Storm, WV (11)	Young et al. 2011a, 2012b
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000a	Mountaineer, WV (03)	Kerns and Kerlinger 2004
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000a	Mountaineer, WV (04)	Arnett et al. 2005
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000a	Munnsville, NY (08)	Stantec 2009b
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Nine Canyon, WA (02-03)	Erickson et al. 2003
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Noble Altona, NY (10)	Jain et al. 2011b
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000a	Noble Bliss, NY (08)	Jain et al.2009e
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Noble Bliss, NY (09)	Jain et al. 2010a
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Noble Bliss/Wethersfield, NY (11)	Kerlinger et al. 2011
Buffalo Ridge I, SD (09-10)	Derby et al. 2010b	Noble Chateaugay, NY (10)	Jain et al. 2011c
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Noble Clinton, NY (08)	Jain et al. 2009c
Casselman, PA (08)	Arnett et al. 2009	Noble Clinton, NY (09)	Jain et al. 2010b
Casselman, PA (09)	Arnett et al. 2010	Noble Ellenburg, NY (08)	Jain et al. 2009b
Castle River, Alb. (01)	Brown and Hamilton 2006a	Noble Ellenburg, NY (09)	Jain et al. 2010c
Castle River, Alb. (02)	Brown and Hamilton 2006a	Noble Wethersfield, NY (10)	Jain et al. 2011a
Cedar Ridge, WI (09)	BHE Environmental 2010	NPPD Ainsworth, NE (06)	Derby et al. 2007
Cedar Ridge, WI (10)	BHE Environmental 2011	Oklahoma Wind Energy Center, OK (04; 05)	Piorkowski and O'Connell 2010
Cohocton/Dutch Hill, NY (09)	Stantec 2010	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Cohocton/Dutch Hills, NY (10)	Stantec 2011	PGC site 6-3 (07)	Capouillez and Librandi-Mumma 2008, Librandi-Mumma and Capouillez 2011
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pine Tree, CA (09-10)	BioResource Consultants 2010
Combine Hills, OR (11)	Enz et al. 2012	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Condon, OR	Fishman Ecological Services 2003	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011c
Crescent Ridge, IL (05-06)	Kerlinger et al. 2007	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012c
Criterion, MD (11)	Young et al. 2012a	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012d
Criterion, MD (12)	Young et al. 2013	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013a
Crystal Lake II, IA (09)	Derby et al. 2010a	Prince Wind Farm, Ont (06)	Natural Resource Solutions 2008
Diablo Winds, CA (05-07)	WEST 2006, 2008	Prince Wind Farm, Ont (07)	Natural Resource Solutions 2009
Dillon, CA (08-09)	Chatfield et al. 2009	Prince Wind Farm, Ont (08)	Natural Resource Solutions 2009
Dry Lake I, AZ (09-10)	Thompson et al. 2011	Red Canyon, TX (06-07)	Miller 2008
Dry Lake II, AZ (11-12)	Thompson and Bay 2012	Red Hills, OK (12-13)	Derby et al. 2013c
Elkhorn, OR (08)	Jeffrey et a. 2009b	Ripley, Ont (08)	Jacques Whitford 2009
Elkhorn, OR (10)	Enk et al. 2011b	Ripley, Ont (08-09)	Golder Associates 2010
Elm Creek, MN (09-10)	Derby et al. 2010c	Rugby, ND (10-11)	Derby et al. 2011b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Searsburg, VT (97)	Kerlinger 2002a

Appendix C. Summary of publicly available reports from North American wind energy facilities that have reported bat fatalities (Table 6).

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Foote Creek Rim, WY (Phase I; 99)	Young et al. 2003	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Foote Creek Rim, WY (Phase I; 00)	Young et al. 2003	Shiloh II, CA (09-10)	Kerlinger et al. 2010
Foote Creek Rim, WY (Phase I; 01-02)	Young et al. 2003	SMUD Solano, CA (04-05)	Erickson and Sharp 2005
Forward Energy Center, WI (08-10)	Grodsky and Drake 2011	Stateline, OR/WA (01-02)	Erickson et al. 2004
Fowler I, IN (09)	Johnson et al. 2010a	Stateline, OR/WA (03)	Erickson et al. 2004
Fowler III, IN (09)	Johnson et al. 2010b	Stateline, OR/WA (06)	Erickson et al. 2007
Fowler I, II, III, IN (10)	Good et al. 2011	Steel Winds I, NY (07)	Grehan 2008
Fowler I, II, III, IN (11)	Good et al. 2012	Stetson Mountain I, ME (09)	Stantec 2009c
Fowler I, II, III, IN (12)	Good et al. 2013	Stetson Mountain I, ME (11)	Normandeau Associates 2011
Goodnoe, WA (09-10)	URS Corporation 2010a	Stetson Mountain II, ME (10)	Normandeau Associates 2010
Grand Ridge I, IL (09-10)	Derby et al. 2010g	Summerview, Alb (05-06)	Brown and Hamilton 2006b
Harrow, Ont (10)	Natural Resource Solutions 2011	Summerview, Alb (06; 07)	Baerwald 2008
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Top of Iowa, IA (03)	Jain 2005
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Top of Iowa, IA (04)	Jain 2005
High Sheldon, NY (10)	Tidhar et al. 2012a	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
High Sheldon, NY (11)	Tidhar et al. 2012b	Vansycle, OR (99)	Erickson et al. 2000
High Winds, CA (03-04)	Kerlinger et al. 2006	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
High Winds, CA (04-05)	Kerlinger et al. 2006	Wessington Springs, SD (09)	Derby et al. 2010f
Hopkins Ridge, WA (06)	Young et al. 2007	Wessington Springs, SD (10)	Derby et al. 2011d
Hopkins Ridge, WA (08)	Young et al. 2009c	White Creek, WA (07-11)	Downes and Gritski 2012b
Jersey Atlantic, NJ (08)	NJAS 2008a, 2008b, 2009	Wild Horse, WA (07)	Erickson et al. 2008
Judith Gap, MT (06-07)	TRC 2008	Windy Flats, WA (10-11)	Enz et al. 2011
Judith Gap, MT (09)	Poulton and Erickson 2010	Winnebago, IA (09-10)	Derby et al. 2010e
Kewaunee County, WI (99-01)	Howe et al. 2002	Wolfe Island, Ont (May-June 09)	Stantec Ltd. 2010a
Kibby, ME (11)	Stantec 2012	Wolfe Island, Ont (July-December 09)	Stantec Ltd. 2010b
Kittitas Valley, WA (11-12)	Stantec Consulting 2012	Wolfe Island, Ont (January-June 10)	Stantec Ltd. 2011a
Klondike, OR (02-03)	Johnson et al. 2003	Wolfe Island, Ont (July-December 10)	Stantec Ltd. 2011b
Klondike II, OR (05-06)	NWC and WEST 2007	Wolfe Island, Ont (January-June 11)	Stantec Ltd. 2011c
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Wolfe Island, Ont (July-December 11)	Stantec Ltd. 2012

Two Indiana bat fatalities are reported by USFWS (2010, 2011c), among other reports. Three additional Indiana bat fatalities have been reported (2011b, 2012a, 2012c), but are not included in this list of public reports. One incidental long-eared bat (*Myotis evotis*) was recorded at Tehachapi, California (Anderson et al. 2004), but is not included in this list of public reports. Additional bat fatalities (evening bat, eastern red bat, hoary bat, tri-colored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species was not reported.

APPENDIX E - RAPTOR NEST SURVEY REPORT

WEST Inc.

ENVIRONMENTAL & STATISTICAL CONSULTANTS

4007 State Street, Suite 109, Bismarck, ND 58503
Phone: 701-250-1756 ◆ www.west-inc.com ◆ Fax: 701-250-1761

June 29, 2016

Roland Jurgens III
Prevailing Winds, LLC
101 Second Street West
P.O. Box 321
Chokio, Minnesota 56221

RE: Prevailing Winds Raptor Nest Survey

Dear Mr. Jurgens,

As part of agency approved baseline survey efforts, one aerial raptor nest survey was conducted by a biologist from Western EcoSystems Technology, Inc. (WEST) on April 21, 2016, at the Prevailing Winds Wind Energy Project (Project) near Avon, South Dakota. Surveys were completed from the air in a helicopter before trees had leaves and when most raptors would be actively tending to a nest or incubating eggs. Aerial surveys were conducted in accordance with the guidance provided in the U.S. Fish and Wildlife Service Inventory and Monitoring Protocols[1]. Raptors are defined here as kites, accipiters, buteos, harriers, eagles, falcons, and owls. Surveys focused on locating large, stick nest structures in suitable raptor nesting substrate (trees, cliffs, etc.) within the proposed Project and 10-mi buffer. All raptor nests were recorded within the Project boundary with only eagle or potential eagle nests located out to the 10-mi buffer.

Known historic eagle nests locations were surveyed for nest status and condition as well as a survey for new or unknown nest locations. In general, all potential eagle and raptor nest habitat was surveyed by flying meandering transects at speeds of 60 - 75 miles per hour (mph) throughout the proposed Project area and associated 10-mi buffer. To the greatest extent possible, care was taken to minimize disturbance to raptors at nest sites during surveys.

All potential and confirmed raptor nests detected during surveys, regardless of their activity status, were assigned a unique identification number and their locations were recorded using a hand-held Global Positioning System (GPS). Data on raptor species, nest type, nest status, nest condition, and substrate, were recorded at each nest location to the extent possible. To determine the status of a nest, the biologist relied on clues that included behavior of adults and presence of eggs, young, or whitewash. Unoccupied raptor nests, including old nests or nests that could become suitable for raptors, were

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[1] Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance. US Fish and Wildlife Service (USFWS). February 2010. Available online at: http://steinadlerschutz.lbv.de/fileadmin/www.steinadlerschutz.de/terimGoldenEagleTechnicalGuidanceProtocols25March2010_1_.pdf

documented in order to populate a nest database to ensure that future surveys include all potentially suitable nest sites. Photographs were taken of eagle nests and potential eagle nests and are available to you upon request.

Nest status was categorized consistent with definitions in the USFWS Eagle Conservation Plan Guidance.[2] Nests were classified as occupied if any of the following were observed at the nest structure: (1) an adult in an incubating position; (2) eggs; (3) nestlings or fledglings; (4) occurrence of a pair of adults (or, sometimes sub-adults); (5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor was observed or had been observed early in the breeding season; or (6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath. When possible, occupied nests were further classified as active if an egg or eggs had been laid or nestlings were observed, or inactive if no eggs or chicks were present. A nest that did not meet the above criteria for "occupied" was classified as "unoccupied.

A total of 50 occupied and/or unoccupied raptor nests representing three species were documented within the Project area and associated 10-mi buffer (Figures 1 and 2, Tables 1 and 2). Excluding eagles, 44 non-eagle raptor nests were documented within the Project area (Figure 1; Table 1). The identified raptor nests were categorized as follows: three occupied great horned owl (*Bubo virginianus*) nests; 10 occupied red-tailed hawk (*Buteo jamaicensis*) nests; and 31 unknown raptor nests (two occupied; 29 unoccupied). A total of six bald eagle (*Haliaeethus leucocephalus*) nests (three occupied; three unoccupied) were documented during the survey; with three occupied bald eagle nests corresponded to known historic nests (Figure 2; Table 2).

If you have any questions or require additional information, please call me at 701-250-1756.

Sincerely,

Clayton Derby
CSO/Senior Manager

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[2] US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance. Module 1 - Land-Based Wind Energy. Version 2. Division of Migratory Bird Management, USFWS. April 2013. Available online at: http://www.fws.gov/migratorybirds/Eagle_Conservation_Plan_Guidance-Module%201.pdf

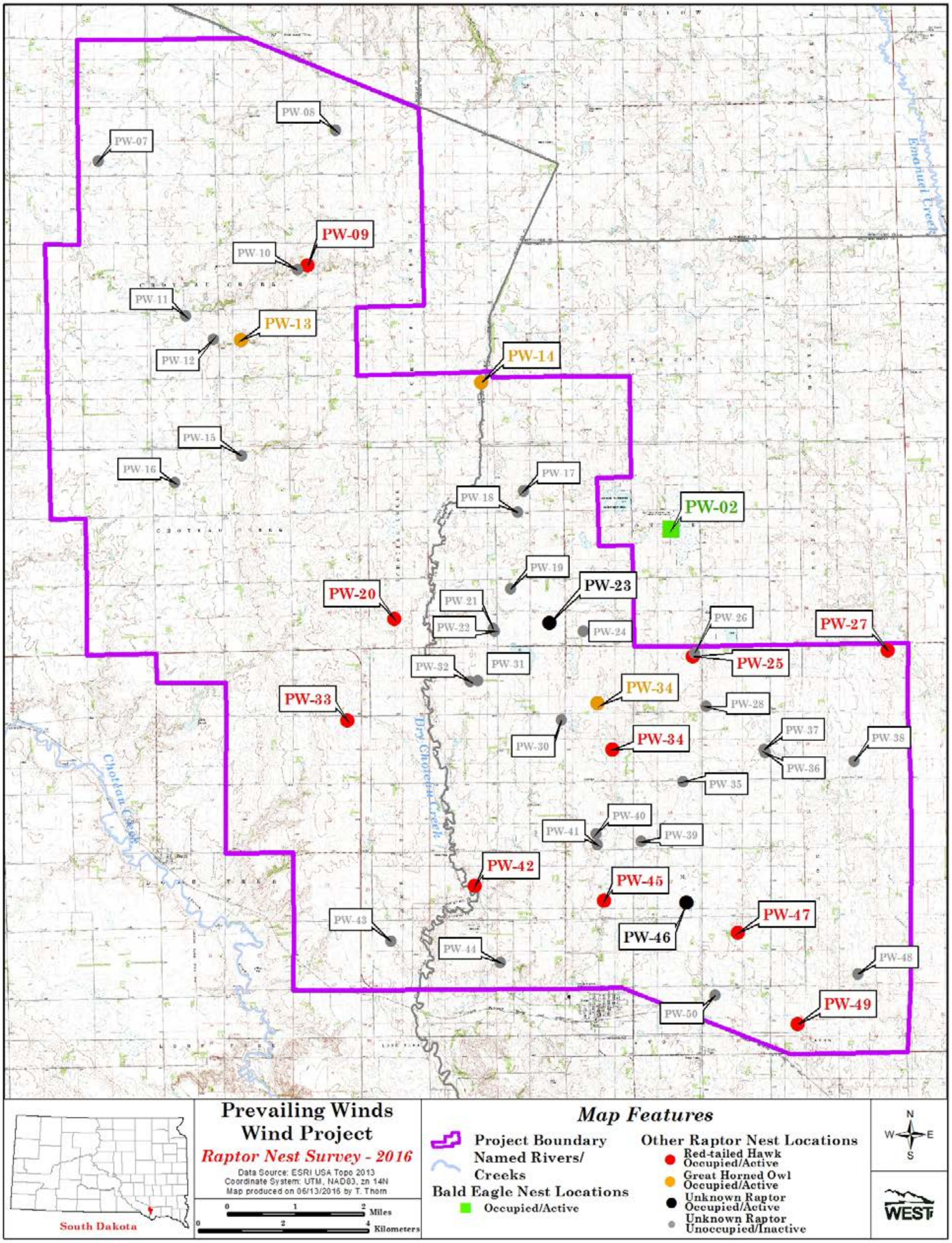

Figure 1. Locations of raptor nests (excluding eagles) recorded during the aerial survey conducted on April 21, 2016, within the Prevailing Winds Wind Energy Project, South Dakota.

Available upon request.

Table 1. Raptor nests (excluding eagle nests) identified during aerial surveys conducted on April 21, 2016, within the Prevailing Winds Wind Energy Project area, South Dakota. Raptor nest Unique ID (ID), locations (NAD83, Zone 14), and nest features are included.

ID	Species	Easting	Northing	Nest Type	Status at Time of Survey	Condition	Substrate
PW-07	UNKN	564811	4781827	stick/medium	unoccupied	good	tree
PW-08	UNKN	570395	4782547	stick/medium	unoccupied	fair	tree
PW-09	RTHA	569739	4779367	stick/medium	occupied	excellent	tree
PW-10	UNKN	569502	4779268	stick/medium	unoccupied	good	tree
PW-11	UNKN	566861	4778176	stick/medium	unoccupied	fair	tree
PW-12	UNKN	567520	4777624	stick/medium	unoccupied	good	tree
PW-13	GHOW	568181	4777616	stick/medium	occupied	excellent	tree
PW-14	GHOW	573826	4776621	stick/medium	occupied	excellent	tree
PW-15	UNKN	568182	4774885	stick/medium	unoccupied	fair	tree
PW-16	UNKN	566612	4774253	stick/medium	unoccupied	excellent	tree
PW-17	UNKN	574813	4774054	stick/medium	unoccupied	good	tree
PW-18	UNKN	574674	4773552	stick/medium	unoccupied	fair	tree
PW-19	UNKN	574516	4771760	stick/medium	unoccupied	good	tree
PW-20	RTHA	571792	4771048	stick/medium	occupied	excellent	tree
PW-21	UNKN	574105	4770818	stick/small	unoccupied	good	tree
PW-22	UNKN	574140	4770757	stick/small	unoccupied	good	tree
PW-23	UNKN	575444	4770951	stick/medium	occupied	excellent	tree
PW-24	UNKN	576219	4770748	stick/medium	unoccupied	fair	tree
PW-25	RTHA	578806	4770170	stick/medium	occupied	excellent	tree
PW-26	UNKN	578846	4770235	stick/medium	unoccupied	good	tree
PW-27	RTHA	583400	4770300	stick/medium	occupied	excellent	tree
PW-28	UNKN	579119	4768991	stick/medium	unoccupied	poor	tree
PW-29	GHOW	576574	4769059	stick/medium	occupied	excellent	tree
PW-30	UNKN	575714	4768671	stick/medium	unoccupied	dilapidated	tree
PW-31	UNKN	573746	4769595	stick/medium	unoccupied	poor	tree
PW-32	UNKN	573555	4769572	stick/medium	unoccupied	excellent	tree
PW-33	RTHA	570679	4768649	stick/medium	occupied	excellent	tree
PW-34	RTHA	576918	4767976	stick/medium	occupied	excellent	tree
PW-35	UNKN	578572	4767214	stick/medium	unoccupied	good	tree
PW-36	UNKN	580501	4767890	stick/medium	unoccupied	fair	tree
PW-37	UNKN	580485	4767967	stick/medium	unoccupied	fair	tree
PW-38	UNKN	582594	4767702	stick/medium	unoccupied	fair	tree
PW-39	UNKN	577594	4765802	stick/medium	unoccupied	poor	tree
PW-40	UNKN	576525	4765992	stick/medium	unoccupied	good	tree
PW-41	UNKN	576556	4765731	stick/medium	unoccupied	fair	tree
PW-42	RTHA	573679	4764757	stick/medium	occupied	excellent	tree
PW-43	UNKN	571701	4763454	stick/medium	unoccupied	fair	tree
PW-44	UNKN	574264	4762960	stick/medium	unoccupied	excellent	tree
PW-45	RTHA	576728	4764411	stick/medium	occupied	excellent	tree
PW-46	UNKN	578657	4764367	stick/medium	occupied	excellent	tree
PW-47	RTHA	579872	4763654	stick/medium	occupied	excellent	tree
PW-48	UNKN	582691	4762686	stick/medium	unoccupied	good	tree
PW-49	RTHA	581273	4761506	stick/medium	occupied	excellent	tree
PW-50	UNKN	579326	4762188	stick/medium	unoccupied	good	tree

GHOW = great-horned owl; RTHA = red-tailed hawk; UNKN = unknown.

Available upon request.

APPENDIX F - AVIAN USE SURVEYS, YEAR ONE

Avian Use Surveys for the Prevailing Winds Wind Project Bon Homme and Charles Mix Counties, South Dakota

Year One Final Draft Report

March 2015 – February 2016

Prepared for:

Prevailing Winds, LLC

Prepared by:

Clayton Derby, Sofia Agudelo, and Terri Thorn

Western EcoSystems Technology, Inc.
4007 State Street
Bismarck, North Dakota 58503

February 16, 2018

EXECUTIVE SUMMARY

Prevailing Winds, LLC. (Prevailing Winds), has proposed a wind energy facility in Bon Homme and Charles Mix counties, South Dakota, referred to as the Prevailing Winds Wind Project (Project). Prevailing Winds contracted Western EcoSystems Technology, Inc. (WEST) to conduct field surveys developed in coordination with the United States (US) Fish and Wildlife Service (USFWS) and South Dakota Game Fish and Parks (SDGFP). Surveys were designed to assess wildlife resources in the Project area and assess risk to special-status species by addressing the issues posed under Tier 3 of the USFWS Final Land-Based Wind Energy Guidelines. The following document contains results for the general fixed-point bird use surveys and incidental wildlife observations. A summary of all data collected is contained in the document, but the overall body of the report focuses on a smaller group of species – diurnal raptors, eagles, state/federally listed species, and South Dakota Sensitive Species (State Species of Concern [SSC] and State Species of Greatest Conservation Need [SGCN]).

The principal objectives of the fixed-point bird use surveys were to: 1) assess the relative abundance and spatial distribution of species in the Project area during all seasons, and 2) identify and assess the potential risk of adverse impacts to species or groups.

Fixed-point bird use surveys were conducted at 16 survey points from March 25, 2015 – February 21, 2016. Each survey plot was surveyed for 60 minutes (min). Every bird and/or unique bird species group observed during the first 20 min of each fixed-point bird use survey was recorded using two viewsheds: 800-meter (m; 2,625-feet [ft]) radius plot for large birds and 100-m (328-ft) radius plot for small birds, observations beyond the radius plots were excluded from analysis. Large birds included waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), and goatsuckers. Passerines (excluding large corvids), kingfishers, swifts/hummingbirds, woodpeckers, and most cuckoos were considered small birds. During the next 40 min of the survey period, only eagles and state/federally listed species were recorded out to the 800-m radius.

A total of 271 fixed-point bird use surveys were conducted during 18 visits. During all surveys and incidental observations, no federally or state-listed species were detected. Seven bird species (great blue heron, bald eagle, Cooper's hawk, ferruginous hawk, northern goshawk, sharp-shinned hawk, and Swainson's hawk) listed as South Dakota SGCN and/or SSC were observed during fixed-point surveys and incidentally.

Diurnal raptor use at the Project was low (was 0.31 raptors/800-m plot/20-min survey), compared to other US wind facilities and comparable to other wind energy facilities in the Midwest with publicly available data. Fatality monitoring data collected at wind projects in the Midwest suggest that some collision risk exists for individual raptors, but the level of impact is not likely to cause significant adverse impacts to overall species populations.

Significant adverse impacts to overall bird populations are not anticipated at the Project based on data collected at the site, review of available literature, and results of post-construction fatality monitoring at other wind energy facilities. Further post-construction survey effort should be determined in consultation with appropriate agencies to confirm the anticipated impacts.

STUDY PARTICIPANTS

Western EcoSystems Technology

Clayton Derby	Project Manager
Carmen Boyd	Data Manager
Wendy Bruso	Technical Editing Manager
Katie Wynne	Technical Editing Coordinator
Mandy Kauffman	Data Analyst
Terri Thorn	GIS Specialist
Sofia Agudelo	Report Writer/Technical Editor
Karen Seginak	Field Technician
Brenda Jarski-Weber	Field Technician
Cathy Clayton	Field Technician

REPORT REFERENCE

Derby, C., S. Agudelo, and T. Thorn. 2018. Avian Use Surveys for the Prevailing Winds Wind Project, Bon Homme and Charles Mix Counties, South Dakota. Year One Final Report: March 2015 – February 2016. Prepared for Prevailing Winds, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. 34 pages + appendices

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INTRODUCTION

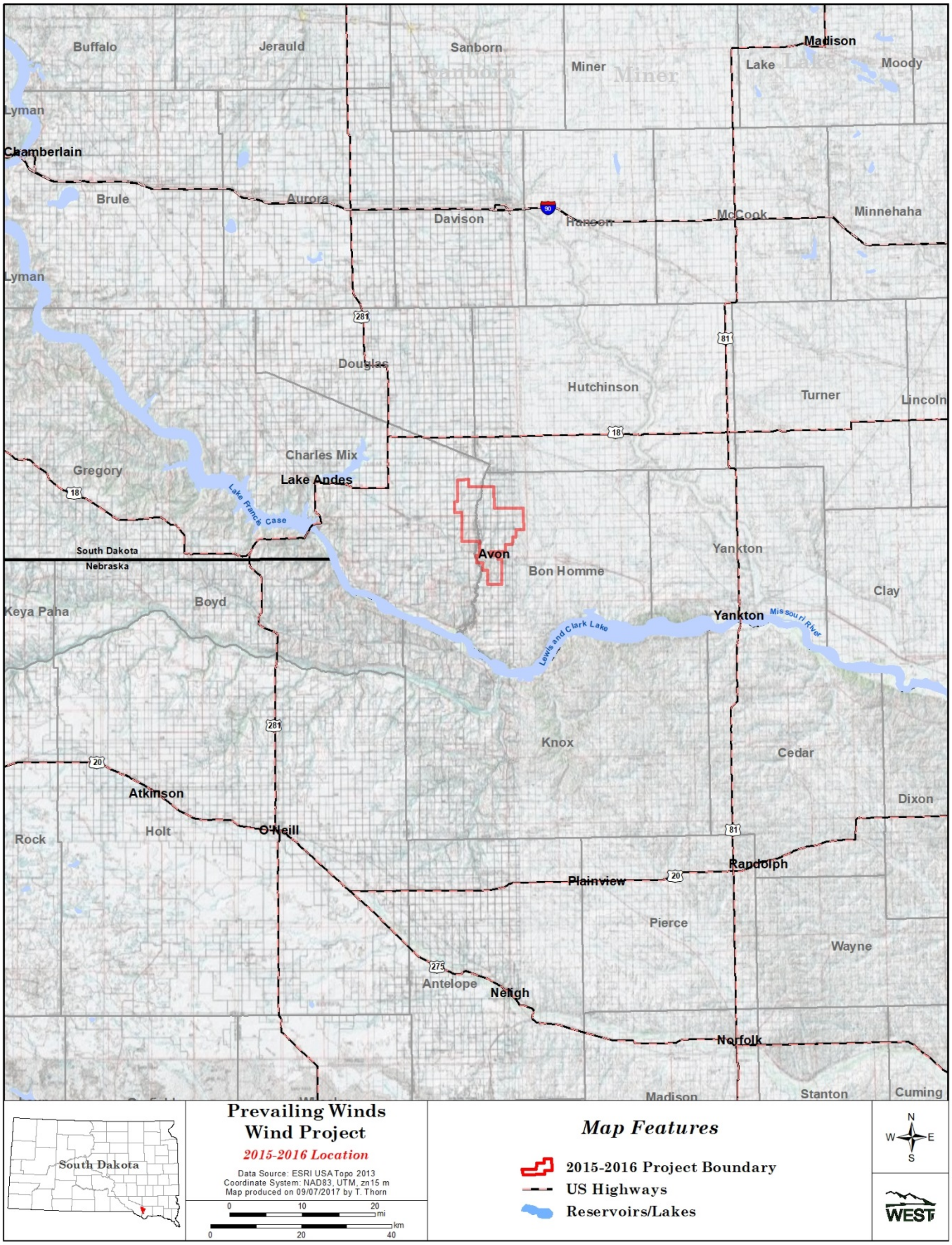
In 2015, Prevailing Winds LLC. (Prevailing Winds) contracted Western EcoSystems Technology, Inc. (WEST) to conduct field surveys in accordance with agency recommendations to quantify wildlife resources within the Prevailing Winds Wind Project (Project) in Bon Homme and Charles Mix counties, South Dakota. Year-round surveys were conducted by WEST in 2015 – 2016 to address the issues posed under Tier 3, following guidance in the United States (US) Fish and Wildlife Service (FWS) *Final Land-Based Wind Energy Guidelines* (Guidelines; USFWS 2012) and *Eagle Conservation Plan Guidance* (Guidance; USFWS 2013), within the Project area as delineated in 2015 (Figure 1).

Fixed-point bird use surveys were conducted to achieve these principal objectives: 1) assess the relative abundance and spatial distribution of species in the Project area during an entire year, with emphasis on eagles, non-eagle raptors, and state/federally listed species, and 2) identify and assess the potential risk of adverse impacts to special-status species or groups.

The following document contains results for the general fixed-point bird use surveys and incidental wildlife observations for the study period 2015 – 2016 (Year One), with focus on eagles, non-eagle diurnal raptors, state/federally listed species, and South Dakota special-status species (i.e., State Species of Greatest Conservation Need [SGCN] and State Species of Concern [SSC]). A second year of survey (Year Two) was conducted in 2016-2017 and is reported separately as the Project area changed.

STUDY AREA

The Project area used for surveys conducted in 2015 – 2016 encompassed approximately 18,139.5 hectares (ha; 44,823.7 acres [ac]) in Bon Homme and Charles Mix counties, adjacent to the town of Avon in southeastern South Dakota (Figure 1). The Project, located in a higher elevated area within the greater landscape, is characterized by a generally flat topography, with elevation ranging from 432.0 meters (m; 1,417.3 feet [ft]) – 573.7 m (1,882.2 ft; US Geological Survey [USGS] Digital Elevation Model 2017). The Project area, historically dominated by grasslands, has extensively been converted to agricultural use, with crop production and livestock grazing the primary practices (Bryce et al. 1998). Approximately 40% of the proposed Project area is cropland followed by pasture/hay land (37%); grassland/herbaceous cover represents approximately 8% of the Project area while all other land cover/land use types compose less than 5% each of the Project area (USGS National Land Cover Database 2011). As evidenced during the site visit conducted by WEST in 2015, trees and woodlands are found mainly in planted shelter belts and within draws and on hillslopes; wetlands are scattered throughout the Project area (Figure 2), with the USFWS National Wetland Inventory (NWI) indicating approximately 676 ha (1,670 ac) of wetlands (USFWS NWI 2015).



Data Source: ESRI USA Topo 2013
Coordinate System: NAD83, UTM, zn15 m
Map produced on 09/07/2017 by T. Thorn

Figure 1. Location of the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, for surveys conducted in 2015 – 2016.

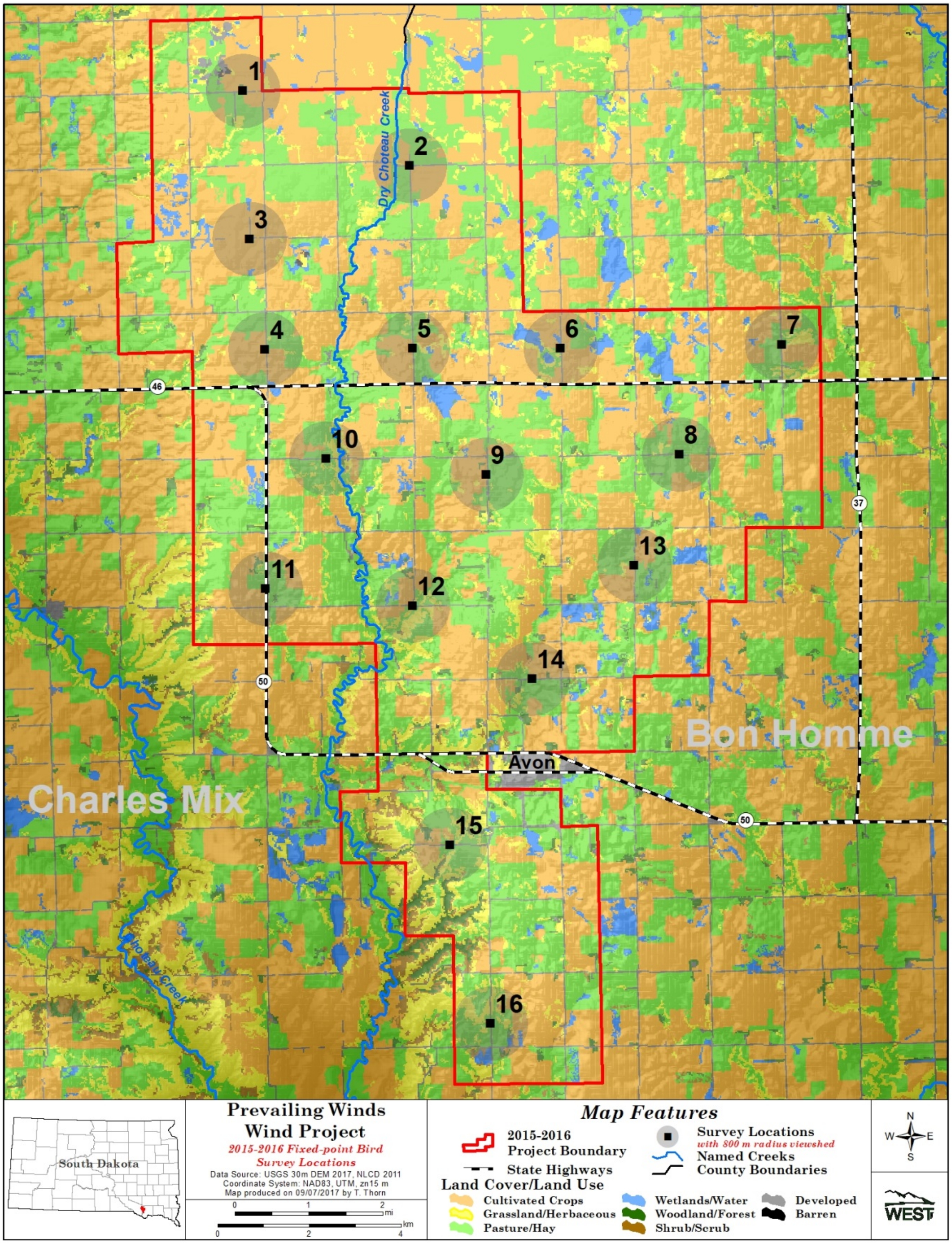


Figure 2. Land cover/Land use and location of the fixed-point plots selected for the Year One bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016 (USFWS NLCD 2011, Homer et al. 2015).

METHODS

Fixed-Point Bird Use Surveys

Fixed-point bird use surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980), to estimate the seasonal and spatial use of the study area by birds, particularly diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, and osprey [*Pandion haliaetus*]). Methodologies employed during avian use surveys conducted at the Project are generally comparable to those used at past wind energy facilities in South Dakota.

Survey Plots

Sixteen points were selected to survey representative habitats and topography of the Project, while achieving relatively even coverage of the study area (Figure 2). Each survey plot was an 800-m (2,625-ft) radius circle centered on the point; for analysis purposes, only birds within the 800-m radius plot were considered for analysis to allow comparison to other projects that used similar analyses.

Survey Methods

Each survey plot was surveyed for 60 minutes (min). Every bird and/or unique bird species group observed during the first 20 min of each fixed-point bird use survey was recorded by a unique observation number. During the next 40 min of the survey period, only eagles and state/federally listed species and state species of concern were recorded out to the 800-m radius. In some cases, the tally of observations may represent repeated sightings of the same individual. Observations of large birds beyond the 800-m radius were recorded but were not included in statistical analyses. For small birds, observations beyond the 100-m (328-ft) radius were excluded. Large birds included waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), and goatsuckers. Passerines (excluding large corvids), kingfishers, swifts/hummingbirds, woodpeckers, and most cuckoos were considered small birds.

The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval. Other information collected included whether the observation was auditory only and the 10-min interval of the survey in which the detection first occurred. Locations and flight paths, if applicable, of large birds were recorded during fixed-point bird use surveys on field maps by unique observation number. Data on eagle flight paths and habitat use (i.e., distance from observer, activity, and flight height) were recorded on a per min basis; comments were made when appropriate. Incidental wildlife observations were recorded while conducting all surveys, moving between fixed-point locations, and traveling within the Project. All raptors, state and federal special-status bird species were documented.

Observation Schedule

Survey intensity (i.e., number of fixed-point circular plots and frequency of monitoring) was designed to document year-round use and behavior of birds in the Project area. Fixed-point bird use surveys were conducted approximately twice per month in the spring (March 4 – May 20) and fall (September 9 – November 28), and monthly during winter (November 29 – March 3) and summer (May 21 – September 8). Surveys were carried out during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practicable, each point was surveyed roughly the same number of times.

Statistical Analysis

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once within the Project area. Under certain circumstances, such as extreme weather conditions, all plots may not have been surveyed during a visit. In these cases, a visit might not have constituted a survey of all plots.

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, and/or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Data Compilation and Storage

A Microsoft® MSSQL database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent QA/QC and data analysis. All data forms and electronic data files were retained for reference.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

Bird diversity was illustrated by the total number of unique species observed. Species lists and counts, with the number of observations and the number of groups, were generated by season and included all observations of birds detected, regardless of their distance from the observer. In some cases, the tally of observations may represent repeated sightings of the same individual. Species richness was calculated for each season by first averaging the total number of species observed within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within each season. Overall species richness was calculated as a weighted average of seasonal values by the number of days in each season.

Mean Use, Percent of Use, and Frequency of Occurrence

Large birds detected within the 800-m radius plot and small birds recorded within the 100-m radius plot were used to calculate mean use and frequency of occurrence. The metric used for mean bird use was number of birds per plot (100-m radius plot for small birds, 800-m radius plot for large birds) per 20-min survey. Seasonal mean use was calculated by first averaging the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within each season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Percent of use was calculated as the proportion of large or small bird use that was attributable to a particular bird type or species, and frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species was observed. Frequency of occurrence, calculated as the percent of surveys in which a particular bird type or species was observed, provides a relative measure of species exposure to the proposed Project.

Bird Flight Height and Behavior

Bird flight heights are important metrics to assess potential exposure. Flight height information was used to calculate the percentage of birds observed flying within the rotor-swept heights (RSH; estimated to be between 25 – 200 m [82 – 656 ft] above ground level). The flight height recorded during the initial observation was used to calculate the percentage of birds flying within the RSH and mean flight height. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight heights recorded. Auditory only observations were excluded from flight height calculations.

Spatial Use

Spatial use of the Project area was evaluated using mean use by survey point. For each species and bird group, the number of individuals observed at each point during the 20-min survey was divided by the total number of surveys at that point.

RESULTS

Year 1 Surveys were completed within the Project area from March 25, 2015 – February 21, 2016. Summary statistics for the full suite of species observed in the Project area are presented in Appendix A. Results related to eagles, non-eagle raptors, federally/state-listed species (Endangered Species Act [ESA] 1973, South Dakota Game, Fish and Parks [SDGFP] 2016, USFWS 2017), and State non-listed special-status species (SGCN [SDGFP 2014] and SSC [SDGFP 2017]), are more thoroughly covered in the body of this report.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

A total of 271 fixed-point bird use surveys were conducted during 18 visits to the Project area during Year One of surveys: 63 surveys in spring, 77 in summer, 78 in fall, and 53 in winter (Table 1). Seventy-two unique bird species were observed during the entire duration (60 min) of the fixed-point bird use surveys (Table 1). Bird diversity (the number of unique species observed for entire 60-min survey) was highest during the summer (43 species), followed by fall (38), spring (36), and winter (23). Overall species richness (mean number of species/plot/20-min survey) was higher for small birds (1.64) compared to large birds (1.20), being lowest in the winter compared to all other seasons, for both large and small birds (0.96 and 0.54 species/plot/20-min survey, respectively).

Table 1. Number of visits, surveys, bird diversity (number of unique species for entire 60-minute [min] survey), and species richness (species/plot[a]/20-min survey) by season and overall, observed during the Year One fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

Season	Number of Visits	Number of Surveys Conducted	Bird Diversity	Bird Species Richness	
				Large Birds	Small Birds
Spring	4	63	36	1.11	1.25
Summer	5	77	43	1.42	2.22
Fall	5	78	38	1.33	2.46
Winter	4	53	23	0.96	0.54
Overall	**18**	**271**	**72**	**1.20**	**1.64**

[a] 800-meter [m] radius plot for large birds and 100-m radius plot for small birds.

A total of 8,194 observations in 914 separate groups (defined as one or more individuals) were recorded during the first 20 min of the Year One of the fixed-point bird use surveys (Appendix A1). Regardless of bird size, six identified species (8.3% of all species) accounted for approximately half (52%) of all observations: Canada goose (*Branta canadensis*; 858 observations in 10 groups), European starling (*Sturnus vulgaris*; 787 observations in 13 groups), sandhill crane (*Antigone canadensis*; 735 observations in four groups), Franklin's gull (*Leucophaeus pipixcan*; 713 observations in five groups), snow goose (*Chen caerulescens*; 590 observations in four groups), and red-winged blackbird (*Agelaius phoeniceus*; 574 observations in 42 groups). All other species each accounted for less than 6% of the total observations.

Waterfowl accounted for the majority (2,145 observations within 44 groups) of large bird observations, with Canada goose being the most abundant waterfowl species; waterbirds composed 9% (736 observations) of the total bird observations, with only two waterbird species (sandhill cranes and great blue herons) being recorded during bird use surveys (Appendix A1). Passerines accounted for the majority (3,890 observations within 532 groups) of small bird observations, with European starling being the most abundant passerine species.

Eighty-nine diurnal raptor observations within 83 groups were recorded during the first 20 min of the Year One fixed-point bird use surveys conducted at the Project, representing eight unique species (Table 2; Appendix A1). Red-tailed hawk (*Buteo jamaicensis*; 55 observations in 51 groups) and northern harrier (*Circus cyaneus*; 11 observations within 11 groups) were the most commonly observed raptor species, accounting for 61.8% and 12.4% of all raptor observations, respectively. No federally (ESA 1973) or state-listed (SDGFP 2016) species were observed during Year One fixed-point bird use surveys conducted at the Project.

Table 2. Number of groups and individuals of diurnal raptors observed, regardless of distance from observer, during the first 20 minutes of the Year One fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

		Spring		**Summer**		**Fall**		**Winter**		**Total**	
Raptor Subtype/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Accipiters		*0*	*0*	*0*	*0*	*2*	*2*	*3*	*3*	*5*	*5*
Cooper's hawk[a]	*Accipiter cooperii*	0	0	0	0	2	2	2	2	4	4
northern goshawk[a,b]	*Accipiter gentilis*	0	0	0	0	0	0	1	1	1	1
Buteos		*6*	*7*	*8*	*8*	*30*	*34*	*13*	*14*	*57*	*63*
red-tailed hawk	*Buteo jamaicensis*	6	7	8	8	28	30	9	10	51	55
rough-legged hawk	*Buteo lagopus*	0	0	0	0	0	0	3	3	3	3
Swainson's hawk[a]	*Buteo swainsoni*	0	0	0	0	2	4	0	0	2	4
unidentified buteo	*Buteo spp*	0	0	0	0	0	0	1	1	1	1
Northern Harrier		*2*	*2*	*4*	*4*	*5*	*5*	*0*	*0*	*11*	*11*
northern harrier	*Circus cyaneus*	2	2	4	4	5	5	0	0	11	11
Eagles		*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*
bald eagle[a,b]	*Haliaeetus leucocephalus*	0	0	0	0	0	0	1	1	1	1
Falcons		*0*	*0*	*0*	*0*	*0*	*0*	*2*	*2*	*2*	*2*
American kestrel	*Falco sparverius*	0	0	0	0	0	0	2	2	2	2
Other Raptors		*1*	*1*	*2*	*2*	*4*	*4*	*0*	*0*	*7*	*7*
unidentified hawk		1	1	1	1	2	2	0	0	4	4
unidentified raptor		0	0	1	1	2	2	0	0	3	3
Overall Diurnal Raptors		**9**	**10**	**14**	**14**	**41**	**45**	**19**	**20**	**83**	**89**

Grps = Number of groups, # Obs = Number of observations

[a.] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b.] State Species of Greatest Conservation Need (SDGFP 2014)

Mean Use, Percent of Use, and Frequency of Occurrence

Mean bird use, percent of use, and frequency of occurrence by season for all bird types and species observed during the first 20 min of surveys are shown in Appendix A2; Table 3 shows a summary of mean use and frequency of occurrence by major bird type and species of concern. The highest overall large bird use occurred during spring (30.43 birds/800-m plot/20-min survey), followed by winter (14.56), fall (8.43), and summer (2.40; Appendix A2). In general, seasonal use by large bird use was primarily driven by waterfowl use (Appendix A2). Small bird use was highest in the fall and winter (15.71 and 11.53 birds/100-m plot/20-min survey, respectively), compared to summer and spring (6.90 and 6.01, respectively); seasonal small bird use was largely driven by passerine use (Appendix A3).

Waterbird use was restricted to the migration periods (10.17 and 0.44 birds/800-m plot/20-min survey for spring and fall surveys, respectively; Table 3), with two species (sandhill crane and great blue heron [*Ardea herodias*]) comprising the totality of observations recorded during the study period (Appendix A2). Great blue heron, a SSC, was observed in spring only (0.02 birds/800-m plot/20-min survey); sandhill cranes were observed in both spring (10.16 birds/800-m plot/20-min survey) and fall (0.44). Waterbirds were observed more frequently during the spring (3.2%) compared to fall (1.2%; Table 3).

Diurnal raptor use was highest in the fall at 0.52 raptors/800-m plot/20-min survey, followed by winter (0.45), summer (0.18), and spring (0.10; Table 3). Higher raptor use during the fall was primarily due to relatively high use of the Project area by red-tailed hawks (0.36). Red-tailed hawks were observed year round and had the highest use of any other diurnal raptor species during all seasons (0.05, 0.10, and 0.21 during spring, summer, and winter, respectively); northern harrier use was observed in all seasons but winter, ranging from 0.03 – 0.06 birds/800-m plot/20-min survey; Table 3).

Use by Cooper's hawk (*Accipiter cooperii*; a SSC) was observed during fall (0.03 birds/800-m plot/20-min survey) and winter (0.06). Use by American kestrel (*Falco sparverius*), rough-legged hawk (*Buteo lagopus*), northern goshawk (*Accipiter gentilis*; SSC and SGCN), and bald eagle (*Haliaeetus leucocephalus*; SGCN), was observed exclusively during the winter during the first 20 min of fixed-point bird use surveys, ranging from 0.02 – 0.07 birds/800-m plot/20-min survey (Table 3). Bald eagle was the only eagle observed during surveys conducted at the Project (Appendix A1 and A2). Bald eagles were observed during 1.6% of winter surveys (Table 3). Diurnal raptors were observed during 37.4% of winter and 35.9% of fall surveys compared to 13.9% of summer and 7.9% of spring surveys (Table 3; Appendix A2).

Passerine use was higher during the fall and winter (15.59 and 11.48 birds/100-m plot/20-min survey, respectively), compared to the summer and spring (6.83 and 5.88, respectively; Table3). Brown-headed cowbird (*Molothrus ater*) had the highest passerine use during the spring (1.52 birds/100-m plot/20-min survey; Appendix A3); red-winged blackbird (*Agelaius phoeniceus*) had the highest use (1.54) of passerine species observed in summer; unidentified blackbirds had the highest use in the fall (5.50); and horned lark (*Eremophila alpestris*) had the highest use in the winter (7.15; Appendix A3).

Passerines were observed during 90.6% of the surveys during spring, 90.0% during summer, 65.0% during fall, and 39.6% during winter (Table 3).

Table 3. Seasonal bird mean use and frequency of occurrence for waterbirds, waterfowl, passerines, diurnal raptor species, and special-status species observed during the first 20 minutes of Year One fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use[1]				**Frequency of Occurrence (%)**			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Waterbirds	**10.17**	**0**	**0.44**	**0**	**3.2**	**0**	**1.2**	**0**
great blue heron[a]	0.02	0	0	0	1.7	0	0	0
Waterfowl	**8.21**	**0.18**	**4.01**	**11.66**	**22.1**	**5.5**	**5.2**	**7.8**
Diurnal Raptors	**0.10**	**0.18**	**0.52**	**0.45**	**7.9**	**13.9**	**35.9**	**37.4**
Accipiters	*0*	*0*	*0.03*	*0.1*	*0*	*0*	*2.7*	*10*
Cooper's hawk[a]	0	0	0.03	0.06	0	0	2.7	5.8
northern goshawk[a,b]	0	0	0	0.04	0	0	0	4.2
Buteos	*0.05*	*0.10*	*0.41*	*0.3*	*4.7*	*8.9*	*32*	*24.2*
red-tailed hawk	0.05	0.10	0.36	0.21	4.7	8.9	29.3	15.2
rough-legged hawk	0	0	0	0.07	0	0	0	7.4
Swainson's hawk[a]	0	0	0.06	0	0	0	2.7	0
unidentified buteo	0	0	0	0.02	0	0	0	1.6
Northern Harrier	*0.03*	*0.05*	*0.06*	*0*	*3.2*	*5*	*6.4*	*0*
northern harrier	0.03	0.05	0.06	0	3.2	5	6.4	0
Eagles	*0*	*0*	*0*	*0.02*	*0*	*0*	*0*	*1.6*
bald eagle[a,b]	0	0	0	0.02	0	0	0	1.6
Falcons	*0*	*0*	*0*	*0.03*	*0*	*0*	*0*	*3.3*
American kestrel	0	0	0	0.03	0	0	0	3.3
Other Raptors	*0.02*	*0.02*	*0.01*	*0*	*1.7*	*2.5*	*1.4*	*0*
unidentified hawk	0.02	0.01	0.01	0	1.7	1.2	1.4	0
unidentified raptor	0	0.01	0	0	0	1.2	0	0
Passerines	**5.88**	**6.83**	**15.59**	**11.48**	**90.6**	**90.0**	**65.0**	**39.6**

Note: Totals by bird type and overall might not correspond to the sum of individual species due to rounding

[1] 800-meter (m; 2,625-foot [ft]) radius plot for large birds; 100-m (328-ft) radius plot for small birds

[a] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b] State Species of Greatest Conservation Need (SDGFP 2014)

State and Federal Special-status Species Observations

No federally (ESA 1973) or state-listed (SDGFP 2016) species were observed during Year One of bird use surveys conducted in the Project area from March 25, 2015 – February 21, 2016 (Table 4). Seven non-listed special-status species were recorded during fixed-point bird use surveys and incidentally, including seven bald eagles within six groups (Table 4). The bald eagle, a State SGCN and SSC, is further protected under the Bald and Golden Eagle Protection Act (1940). Two additional South Dakota SGCN were observed, both of which were raptors (one incidental ferruginous hawk [*Buteo regalis*] observation, and one northern goshawk observation during fixed-point surveys). The other five non-listed special-status species were three SSC raptors (five Cooper’s hawk observations [one incidental, four during fixed-point surveys], one incidental sharp-shinned hawk [*Accipiter striatus*] observation, and six Swainson's hawk [*Buteo swainsoni*] observations [two incidental, four during fixed-point surveys]), and one SSC waterbird (one great blue heron observation during fixed-point surveys); see Species Specific Summaries section for a detailed discussion of these species..

Table 4. Non-listed special-status species observed during fixed-point bird use surveys (FP)[a] and Incidentally (Inc.) within the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

			FP		Inc.		Total	
Species	**Scientific Name**	**Status**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
great blue heron	*Ardea herodias*	SSC	1	1	0	0	1	1
bald eagle	*Haliaeetus leucocephalus*	SGCN, SSC, BGEPA	4	4	2	3	6	7
Cooper's hawk	*Accipiter cooperii*	SSC	4	4	1	1	5	5
ferruginous hawk	*Buteo regalis*	SGCN	0	0	1	1	1	1
northern goshawk	*Accipiter gentilis*	SGCN; SSC	1	1	0	0	1	1
sharp-shinned hawk	*Accipiter striatus*	SSC	0	0	1	1	1	1
Swainson's hawk	*Buteo swainsoni*	SSC	2	4	2	2	4	6

Grps = Number of groups, # Obs = Number of observations

[a.] Within 60-minute (min) survey for large birds and 20-min survey for small birds

BGEPA = Bald and Eagle Protection Act (1940)

SGCN = State Species of Greatest Conservation Need (SDGFP 2014)

SSC = State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

Bird Flight Height and Behavior

Flight height characteristics, based on initial flight height observations (i.e., only observations with the first activity not equal to perched were included) and estimated use, were estimated for both bird types and species (Tables 5 and 6). During the 60-min fixed-point bird use surveys, 182 groups of large birds were observed flying within the 800-m radius plot, totaling 2,313 individuals. Overall, 53.8% of flying large birds were recorded within the RSH, 18.1% were below the RSH, and 28.1% were flying above the RSH for collision with turbine blades of 25 – 200 m (82 – 656 ft) above ground level. The majority (94.8%) of waterbirds observed were recorded flying above the estimated RSH, while most (96.4%) of the waterfowl observations were recorded flying within the estimated RSH (Table 5). More than half (58.2%) of flying diurnal raptors were observed below the RSH, while 41.8% were within the RSH and none were above the RSH (Table 5). Eagles and other raptors represented the highest percentage of flying diurnal raptors recorded within the RSH (66.7%), followed by buteos (51.4%).

During the first 20 min of the fixed-point bird use surveys, 218 groups of small birds were observed flying within the 100-m radius plot, totaling 1,660 individuals, mostly passerines (Table 5). Overall, 91.9% of flying small birds were recorded below the RSH (Table 5).

Table 5. Flight height (meters [m] above ground level), based on initial observation, characteristics by bird types and raptor subtypes observed during Year One of the fixed-point bird use surveys[a] conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

Bird Type/Subtype	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% Within Flight Height Categories < 25 m	25 - 200 m[b]	> 200 m
Waterbirds	4	686	476.00	100	5.20	0	94.80
Waterfowl	30	1,075	45.27	67.0	3.60	96.40	0
Shorebirds	28	108	8.39	66.7	77.80	22.20	0
Gulls/Terns	4	184	43.75	25.0	33.70	66.30	0
Diurnal Raptors	50	55	29.90	66.3	58.20	41.80	0
Accipiters	3	3	10.67	60.0	100.00	0	0
Buteos	30	35	34.00	61.4	48.60	51.40	0
Northern Harrier	11	11	8.73	100	90.90	9.10	0
Eagles	3	3	43.33	75.0	33.30	66.70	0
Falcons	0	0	0.00	0	0	0	0
Unidentified Raptors	3	3	72.33	75.0	33.30	66.70	0
Vultures	8	17	68.12	89.5	5.90	94.10	0
Upland Game Birds	1	1	1.00	1.4	100.00	0	0
Doves/Pigeons	46	141	8.35	59.0	90.80	9.20	0
Large Corvids	9	44	15.78	64.7	81.80	18.20	0
Goatsuckers	2	2	25.00	66.7	0	100.00	0
Large Birds Overall	182	2,313	34.55	63.0	18.10	53.80	28.10
Passerines[c]	212	1,653	5.58	62.0	91.80	8.20	0
Woodpeckers	6	7	4.00	28.0	100.00	0	0
Small Birds Overall	218	1,660	5.54	61.7	91.90	8.10	0

Obs = Observations

[a] 800-meter (m; 2,625-foot [ft]) radius plot and 60-minute (min) survey for large birds; 100-m (328-ft) radius plot and 20 min survey for small birds

[b] The likely rotor-swept height for potential collision with a turbine blade, or 25 – 200 m (82 – 656 ft) above ground level

[c] Excluding large corvids

Three of four total bald eagles observed were first observed in flight. Based on initial observation, the majority (66.7%) of bald eagle groups observed during the full 60-min survey were observed within the RSH. No other special-status species were observed flying within the RSH at any time (Table 6).

Table 6. Flight characteristics for special-status species observed[a] during Year One of the fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH[b] Based on Initial Observation	% Within RSH at Anytime
bald eagle	3	0.01	75.0	66.7	66.7
Cooper's hawk	3	0.02	75.0	0	0
great blue heron	1	<0.01	100	0	0
northern goshawk	0	0.01	0	0	0
Swainson's hawk	1	0.01	75.0	0	0

[a] 800-meter (m; 2,625-foot [ft]) radius plot and 60-minute (min) survey for large birds; 100-m (328-ft) radius plot and 20 min survey for small birds

[b] The likely rotor-swept height (RSH) for potential collision with a turbine blade, or 25 – 200 m (82-656 ft) above ground level

Spatial Use

For all large bird species combined, use (focused within 800 m) was highest at Point 1 (73.35 birds/20-min survey) largely due to high waterbird use at this point (38.24 birds/20-min survey); waterbirds were observed at two other points, with use ranging from 0.06 – 1.94 (Table 7). Large bird use at other points ranged from 1.41 – 34.11 birds/20-min survey. Diurnal raptors were observed at all points with use largely driven by buteos and harriers (Table 7). Waterfowl use was recorded at all but two points, ranging from 0.06 – 29.88 birds/20-min survey, and shorebird use was recorded at all points, ranging from 0.06 – 2.28 birds/20-min survey. Diurnal raptor use was highest at Point 10 (0.50 birds/20-min survey), and ranged from 0.12 – 0.47 birds/20-min survey at other points. Eagle use (for the observations included in the overall avian analysis that includes just the first 20-min of survey at each point) occurred at Point 2 only (0.06 birds/20-min survey), while falcons were only observed at Points 11 and 16 (0.06 birds/20-min survey at each point). Small bird use (focused within 100 m), was highest at Point 6 (28.28 birds/20-min survey), and ranged from 4 – 14.71 birds/20-min surveys at all other points; small bird use at all points was largely due to use by passerines (Table 7).

Table 7. Mean use recorded at each survey point during the first 20 minutes of Year One fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use (number of birds/20-minute survey)[a] by Survey Point															
Bird Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Waterbirds	**38.24**	**0**	**0**	**0**	**0**	**1.94**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.06**	**0**	**0**
Waterfowl	**0.12**	**11.78**	**0.12**	**0.28**	**0.12**	**28.61**	**2.00**	**29.88**	**0**	**0.17**	**0.35**	**0.06**	**0.27**	**18.06**	**0**	**1.11**
Shorebirds	**0.47**	**0.17**	**0.59**	**0.39**	**0.29**	**2.28**	**0.20**	**0.31**	**0.71**	**0.28**	**0.29**	**0.38**	**0.60**	**1.61**	**0.06**	**0.72**
Gulls/Terns	**33.65**	**0**	**0**	**0**	**3.65**	**0**	**0**	**0**	**0.06**	**0**	**0**	**1.25**	**0**	**0**	**5**	**0**
Diurnal Raptors	**0.18**	**0.22**	**0.12**	**0.39**	**0.12**	**0.22**	**0.33**	**0.38**	**0.12**	**0.50**	**0.24**	**0.38**	**0.47**	**0.33**	**0.38**	**0.39**
Accipiters	*0*	*0*	*0*	*0*	*0.06*	*0*	*0.07*	*0*	*0*	*0.06*	*0*	*0*	*0*	*0.06*	*0*	*0.06*
Buteos	*0.12*	*0.17*	*0*	*0.28*	*0*	*0.22*	*0.27*	*0.19*	*0.12*	*0.39*	*0.18*	*0.38*	*0.47*	*0.22*	*0.25*	*0.17*
Northern Harrier	*0.06*	*0*	*0.06*	*0.11*	*0.06*	*0*	*0*	*0.12*	*0*	*0.06*	*0*	*0*	*0*	*0.06*	*0*	*0.11*
Eagles	*0*	*0.06*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Falcons	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.06*	*0*	*0*	*0*	*0*	*0.06*
Other Raptors	*0*	*0*	*0.06*	*0*	*0*	*0*	*0*	*0.06*	*0*	*0*	*0*	*0*	*0*	*0*	*0.12*	*0*
Vultures	**0**	**0.11**	**0**	**0.17**	**0.06**	**0.17**	**0**	**0**	**0.06**	**0.06**	**0**	**0.25**	**0**	**0.06**	**0**	**0.17**
Upland Game Birds	**0.29**	**0.11**	**0.18**	**0.17**	**0.12**	**0.06**	**0.07**	**0.12**	**0.18**	**0.33**	**0**	**0.06**	**0.07**	**0.67**	**1.69**	**0**
Doves/Pigeons	**0.41**	**0.06**	**0.06**	**0.61**	**1**	**0.83**	**0.47**	**0.81**	**0.29**	**3.78**	**0.53**	**0.81**	**0.6**	**1.28**	**0.19**	**2.06**
Large Corvids	**0**	**0**	**0.35**	**0.06**	**0.47**	**0**	**0.13**	**0**	**0.18**	**0**	**0.06**	**0.06**	**0.07**	**0.11**	**1.75**	**0.83**
Goatsuckers	**0**	**0**	**0**	**0**	**0.06**	**0**	**0.07**	**0.06**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Overall large birds	**73.35**	**12.44**	**1.41**	**2.06**	**5.88**	**34.11**	**3.27**	**31.56**	**1.59**	**5.11**	**1.47**	**3.25**	**2.07**	**22.17**	**9.06**	**5.28**
Passerines	**14.71**	**10.39**	**5.35**	**12.28**	**6.06**	**28**	**7.93**	**4.94**	**11.47**	**8.44**	**4**	**7.81**	**7.4**	**3.17**	**10.19**	**13.44**
Woodpeckers	**0.06**	**0.06**	**0**	**0.06**	**0.06**	**0.28**	**0.07**	**0**	**0.35**	**0.06**	**0**	**0.12**	**0**	**0.22**	**0.06**	**0.06**
Overall small birds	**14.76**	**10.44**	**5.35**	**12.33**	**6.12**	**28.28**	**8.00**	**4.94**	**11.82**	**8.50**	**4.00**	**7.94**	**7.40**	**3.39**	**10.25**	**13.50**

[a] 800-m (m; 2,625-foot [ft]) radius plot for large birds; 100-m (328-ft) radius plot for small birds

Eagle Use and Flight Paths

Overall, there were 271 hours (16,260 min) of eagle fixed-point use surveys (60-min surveys) conducted at the Project (Table 8). During this time, four bald eagles (only eagle species recorded) were visible for 15 min regardless of behavior (e.g., perching, flying, etc); 11 of those total minutes were risk minutes (i.e., within 800 m and below 200 m; Table 8). The bald eagles recorded at points 6 and 14 were observed after the initial 20-min survey period. The individual recorded at Point 14 was perched when first observed, and then flew within 800 m and below 200 m (Figure 4); this individual was not included in Tables 5 and 6 due to its behavior when first observed, but was included in the eagle risk minutes analysis (Table 8). Of the two bald eagles recorded at Point 2, one was observed after the initial 20-min survey period. The few flight paths for bald eagles at the Project showed no apparent pattern (Figure 3).

Table 8. Survey effort, number of bald eagle observations and groups, total eagle minutes, risk minutes, and eagle use by season, observed during the Year One of the 60-min bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

Season	Survey Effort (hours)	Number of Eagle Observations	Number of Groups	Total Eagle Minutes	Risk Minutes[a]	Eagle Use[b]
Spring	63	0	0	0	0	0
Summer	77	1	1	5	5	0.01
Fall	78	2	2	8	5	0.02
Winter	53	1	1	2	1	0.02
Overall	**271**	**4**	**4**	**15**	**11**	

[a] Where eagles flew below 200 meters (m) above ground level and within 800 m of the observer

[b] Eagles/800-m plot/60 minutes

Available upon request.

Incidental Observations

Sixteen unique bird species and two unidentified species were observed incidentally at the Project, totaling 2,153 birds within 73 separate groups (Table 9). Sandhill crane (1,054 birds within eight groups) and snow goose (950 birds within three groups) were the most abundant incidental species observed at the Project (Table 9). Eight unique and two unidentified diurnal raptor species were recorded incidentally, totaling 51 observations within 47 groups. Red-tailed hawk was the most abundant raptor species observed incidentally at the Project (29 birds within 27 groups); ferruginous hawk, sharp-shinned hawk, great horned owl (*Bubo virginianus*), and snowy owl (*Bubo scandiacus*) were only observed incidentally within the Project area.

Table 9. Incidental wildlife observed while conducting all surveys at the at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

Species	Scientific Name	#Groups	# Individuals
sandhill crane	*Antigone canadensis*	8	1,054
snow goose	*Chen caerulescens*	3	950
Franklin's gull	*Leucophaeus pipixcan*	1	75
bald eagle	*Haliaeetus leucocephalus*	2	3
Cooper's hawk	*Accipiter cooperii*	1	1
ferruginous hawk[a]	*Buteo regalis*	1	1
northern harrier	*Circus cyaneus*	7	8
rough-legged hawk	*Buteo lagopus*	1	1
red-tailed hawk	*Buteo jamaicensis*	27	29
sharp-shinned hawk[a]	*Accipiter striatus*	1	1
Swainson's hawk	*Buteo swainsoni*	2	2
unidentified buteo	*Buteo spp*	1	1
unidentified hawk		4	4
great horned owl[a]	*Bubo virginianus*	1	1
snowy owl[a]	*Bubo scandiacus*	1	1
turkey vulture	*Cathartes aura*	8	13
wild turkey	*Meleagris gallopavo*	2	5
American crow	*Corvus brachyrhynchos*	2	3
Total		**73**	**2,153**

[a] Observed incidentally only

DISCUSSION

The Guidelines use a tiered approach to assess impacts to species and their habitats, and avian use surveys are one of a suite of Tier 3 studies used to inform risk at the Project. Tier 3 studies were targeted to address questions regarding impact that could not be sufficiently addressed using available literature (i.e., Tiers 1 and 2 desktop analyses). These studies provide additional data that, when combined with available literature reviewed in previous Tiers, allow for a confident assessment of the risk of significant population-level adverse impacts to special-status species; identify measures to mitigate significant adverse impacts, if necessary; and/or identify a need for more field studies, if the current survey effort did not provide sufficient data to adequately characterize the potential for significant adverse impacts to such species. While the avian use surveys reported herein were conducted across all species observed, the report focuses on a smaller group of species – diurnal raptors, eagles, listed species, and State non-listed special-status species.

The impact of wind energy development on birds can be direct or indirect. Direct impacts include fatalities or injury associated with facility infrastructure and the loss of habitat where infrastructure is placed. Indirect impacts include the displacement of wildlife and rendering habitat unsuitable through fragmentation of the landscape.

The focus of this study was mainly to document large bird use with an emphasis on eagles and diurnal raptors. Approximately two thirds of all bird observations during this study were waterfowl or passerine species. The most common waterfowl species were snow and Canada geese, while the most common passerine species were European starling and red-winged blackbird. Waterbirds composed a small percentage of the total bird observations, with only two waterbird species (sandhill cranes and great blue herons) being recorded during bird use surveys. Relatively few (89 observations) diurnal raptors were observed during standardized surveys and 51 were recorded incidentally. The most common diurnal raptor species recorded was red-tailed hawk, documented both incidentally and during scheduled surveys; bald eagle was the only eagle species documented during surveys conducted at the Project. Diurnal raptors and non-listed special-status species are discussed in more detail below; no federally or state-listed species were documented during the Year One survey period.

Diurnal Raptors

Annual mean diurnal raptor use at the Project was 0.31 raptors/800-m plot/20-min survey, with highest use in the fall, likely from an influx of migrating raptors. Mean raptor use was compared with other wind energy facilities that implemented similar protocols and had data covering similar seasons, ranking 34th from the highest use compared to the 47 other wind energy facilities in North America (Figure 4).

Publicly available data containing both mean raptor use and raptor fatality information in the Midwest is scarce, while data having this information for four seasons is even rarer (Table 10). The Beethoven Project, immediately adjacent to the Project, had a mean raptor use of 0.103 raptors/800-m plot/20-min survey (Derby and Thorn 2014) and a raptor fatality rate of 0.07 fatalities/MW/year (WEST 2016; Table 10). The Wessington Springs Project, approximately 80 miles north of the project, in South Dakota had a mean raptor use of 0.23 raptors/800-m plot/20-min survey and raptor fatality rates of 0.06 and 0.07 fatalities/MW/year during two separate years of fatality monitoring (Derby et al. 2010f, 2011d). Raptor fatality rates reported at other South Dakota wind energy facilities have ranged from 0 – 0.20 fatalities/MW/year (Table 10). Raptor fatality rates throughout the Midwest have ranged from zero at numerous facilities to 0.47 fatalities/MW/year at Buffalo Ridge, Phase I (Johnson et al. 2000a).

In the Midwest states, 55 diurnal raptor fatalities representing seven species have been documented at wind energy facilities in publicly available fatality studies. Red-tailed hawks represented most of the fatalities (38 fatalities; 69.1% of raptor fatalities), followed by American kestrel (five fatalities; 9.1% of raptor fatalities), sharp-shinned hawk (four fatalities; 7.3% of raptor fatalities), rough-legged hawk (three fatalities; 5.5% of raptor fatalities), and Cooper's hawk (two fatalities; 3.6% of raptor fatalities). Each of the remaining species (merlin [*Falco columbarius*], Swainson's hawk, and unidentified raptor) accounted for one fatality each. These are unadjusted, raw data. Cumulative fatalities and species are from data compiled by WEST from publicly available fatality studies (a list of facilities and references are available from WEST). Based on the currently available data, raptor fatality rates in the Project will likely be similar to other wind energy facilities in the Midwest that also have low raptor use and are likely to consist of the relatively common and widespread species documented in this survey.

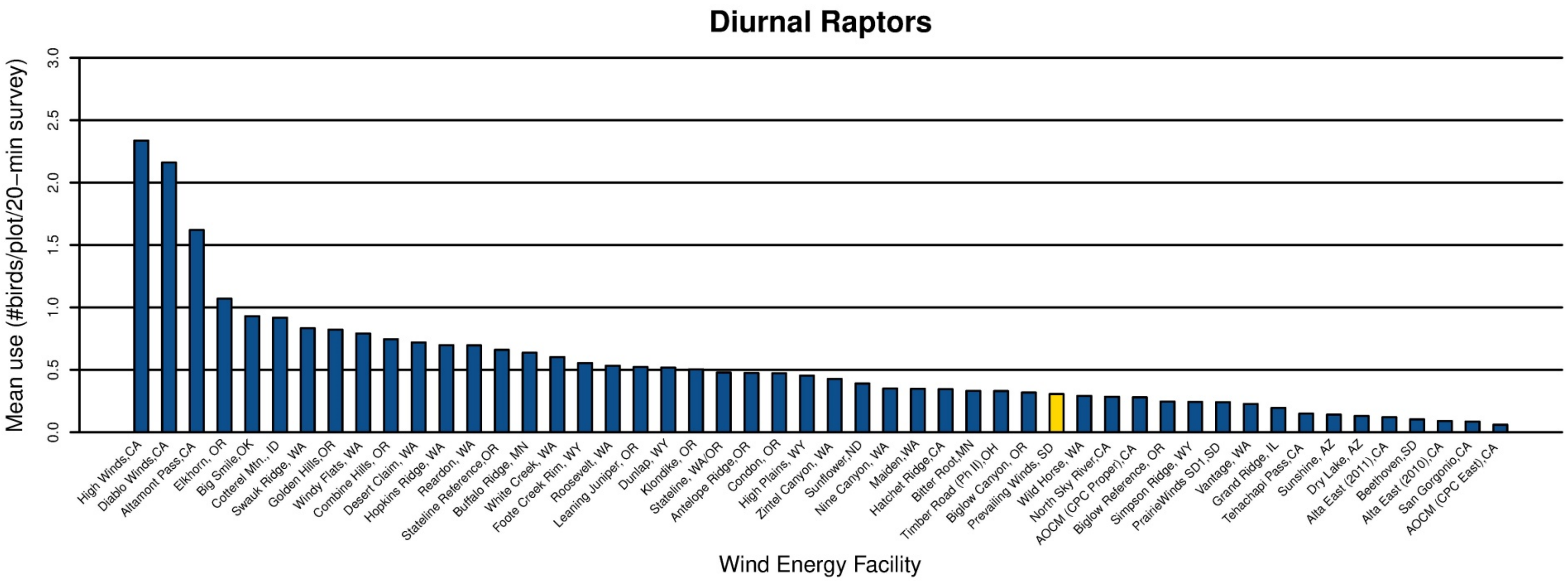


Figure 4. Comparison of estimated annual diurnal raptor use during the Year One fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016, and diurnal raptor use at other US wind resource areas with comparable raptor use data.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Prevailing Winds, SD	This study.				
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Wild Horse, WA	Erickson et al. 2003d
Diablo Winds, CA	WEST 2006	Roosevelt, WA	NWC and WEST 2004	North Sky River, CA	Erickson et al. 2011
Altamont Pass, CA	Orloff and Flannery 1992	Leaning Juniper, OR	Kronner et al. 2005	AOCM (CPC Proper), CA	Chatfield et al. 2010
Elkhorn, OR	WEST 2005a	Dunlap, WY	Johnson et al. 2009a	Biglow Reference, OR	WEST 2005c
Big Smile (Dempsey), OK	Derby et al. 2010a	Klondike, OR	Johnson et al. 2002	Simpson Ridge, WY	Johnson et al. 2000b
Cotterel Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003a	Vantage, WA	Jeffrey et al. 2007
Swauk Ridge, WA	Erickson et al. 2003b	Antelope Ridge, OR	WEST 2009	Grand Ridge, IL	Derby et al. 2009
Golden Hills, OR	Jeffrey et al. 2008	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Flats, WA	Johnson et al. 2007	High Plains, WY	Johnson et al. 2009b	Sunshine, AZ	WEST and the CPRS 2006
Combine Hills, OR	Young et al. 2003c	Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Dry Lake, AZ	Young et al. 2007b
Desert Claim, WA	Young et al. 2003b	Nine Canyon, WA	Erickson et al. 2001	Alta East (2011), CA	Chatfield et al. 2011
Hopkins Ridge, WA	Young et al. 2003a	Maiden, WA	Young et al. 2002	Alta East (2010), CA	Chatfield et al. 2011
Reardon, WA	WEST 2005b	Hatchet Ridge, CA	Young et al. 2007a	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Stateline Reference, OR	URS et al. 2001	Bitter Root. MN	Derby and Dahl 2009	AOCM (CPC East), CA	Chatfield et al. 2010
Buffalo Ridge, MN	Johnson et al. 2000a	Timber Road (Phase II), OH	Good et al. 2010	Beethoven, SD	Derby and Thorn 2014
White Creek, WA	NWC and WEST 2005	Biglow Canyon, OR	WEST 2005c		

Table 10. Raptor use (number of raptors/plot/20-minute survey) and fatality (number of bird fatalities/megawatt/year) estimates for wind-energy facilities in the Midwest with publicly available data.

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total #of Turbines	Total MW	Use Reference	Fatality Reference
Barton I & II, IA (2010-2011)	NA	0	80	160.0		Derby et al. 2011a
Beethoven (2016-2016)	0.103	0.07	43	80.0	Derby and Thorn 2014	WEST 2016
Big Blue, MN (2013)	NA	0	18	36.0		Fagen Engineering 2014
Big Blue, MN (2014)	NA	0	18	36.0		Fagen Engineering 2015
Blue Sky Green Field, WI (2008; 2009)	NA	0	88	145.0		Gruver et al. 2009
Buffalo Ridge I, SD (2009-2010)	NA	0.20	24	50.4		Derby et al. 2010b
Buffalo Ridge II, SD (2011-2012)	NA	0	105	210.0		Derby et al. 2012a
Buffalo Ridge, MN (Phase I; 1996)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1997)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1998)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1999)	NA	0.47	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1998)	NA	0	143	107.3		Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1999)	NA	0	143	107.3		Johnson et al. 2000a
Buffalo Ridge, MN (Phase III; 1999)	NA	0	138	103.5		Johnson et al. 2000a
Cedar Ridge, WI (2009)	NA	0.18	41	67.6		BHE Environmental 2010
Cedar Ridge, WI (2010)	NA	0.13	41	68.0		BHE Environmental 2011
Elm Creek II, MN (2009-2010)	NA	0	67	100.0		Derby et al. 2010c
Elm Creek, MN (20011-2012)	NA	0	62	148.8		Derby et al. 2012b
Fowler I, IN (2009)	NA	0	162	301.0		Johnson et al. 2010
Grand Ridge I, IL (2009-2010)	0.2	0	66	99.0	Derby et al. 2009	Derby et al. 2010g
Kewaunee County, WI (1999-2001)	NA	0	31	20.5		Howe et al. 2002
Moraine II, MN (2009)	NA	0.37	33	49.5		Derby et al. 2010d
NPPD Ainsworth, NE (2006)	NA	0.06	36	20.5		Derby et al. 2007
Pioneer Prairie II, IA (2011-2012)	NA	0	62	102.3		Chodachek et al. 2012
PrairieWinds ND1 (Minot), ND (2010)	NA	0.05	80	115.5		Derby et al. 2011c
PrairieWinds ND1 (Minot), ND (2011)	NA	0.05	80	115.5		Derby et al. 2012c
PrairieWinds SD1, SD (2011-2012)	NA	0	108	162.0		Derby et al. 2012d
PrairieWinds SD1, SD (2012-2013)	NA	0.03	108	162.0		Derby et al. 2013
PrairieWinds SD1, SD (2013-2014)	NA	0.17	108	162.0		Derby et al. 2014
Rail Splitter, IL (2012-2013)	NA	0	67	100.5		Good et al. 2013
Ripley, Ont (2008)	NA	0.10	38	76.0		Jacques Whitford 2009
Rugby, ND (2010-2011)	NA	0.06	71	149.0		Derby et al. 2011b
Top of Iowa, IA (2003)	NA	0	89	80.0		Jain 2005
Top of Iowa, IA (2004)	NA	0.17	89	80.0		Jain 2005
Wessington Springs, SD (2009)	0.23	0.06	34	51.0	Derby et al. 2008	Derby et al. 2010f

Table 10. Raptor use (number of raptors/plot/20-minute survey) and fatality (number of bird fatalities/megawatt/year) estimates for wind-energy facilities in the Midwest with publicly available data.

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total #of Turbines	Total MW	Use Reference	Fatality Reference
Wessington Springs, SD (2010)	0.23	0.07	34	51.0	Derby et al. 2008	Derby et al. 2011d
Winnebago, IA (2009-2010)	NA	0.27	10	20.0		Derby et al. 2010e

This fixed-point bird use survey was designed to provide a relative index of use by raptors during all seasons at the Project. While mean diurnal raptor use was higher during the fall (0.52 raptors/800-m plot/20-min survey), probably due to an influx of migrant birds, the Project is not located within a known raptor migration corridor, and there are no features unique to the Project area, compared to adjacent areas, that would appear to attract large numbers of diurnal raptors. Furthermore, raptor fatality rates reported from studies in the Midwest are typically low. Site-specific and regional data suggest there is some potential for raptor mortality, but these potential impacts to individuals are unlikely to cause significant adverse impacts to raptor populations. Likewise, there is some potential for habitat loss and displacement of individuals, but the resources available within the Project area are widely available at the local landscape level; therefore, any diurnal raptor habitat loss and displacement attributable to the Project is unlikely to result in significant adverse population-level impacts to raptors.

While abundance is intuitively connected to raptor fatality risk to some degree, risk is likely influenced by other factors as well, such as species-specific flight behaviors. More than half (58.2%) of all diurnal raptors at the Project were observed below the RSH. A higher proportion of unidentified raptors, buteos, and eagles flew within the RSH compared to other raptor types, potentially indicating that some species may have a higher risk for collision; however, many of these are based on a few individual observations.

Species Specific Summaries

Great blue heron

One great blue heron, a common summer resident and migrant in South Dakota, was recorded during the surveys conducted at the Project. Site-specific data indicate that use of the Project area by this species is low and population-level effects from Project development are unlikely.

Bald Eagle

A total of seven bald eagle observations (four during 60-min surveys and regardless of distance from observer, and three incidentally) were recorded within the Project area during Year One surveys conducted from March 25, 2015 – February 21, 2016 (Table 4). The majority (66.7%) of flying bald eagles recorded during fixed-point bird use surveys were observed within the RSH (Table 5). Bald eagles are generally uncommon during migration, summer, and winter throughout South Dakota; however, they are locally common below the Missouri River dams in winter and nesting within the State is increasingly reported (South Dakota Birds, Birding, and Nature 2017). An April 2015 raptor nest survey conducted by WEST found one occupied/active bald eagle nest recorded within one mi (1.6 km) of the Project boundary. There were also five occupied/active bald eagle nests, one occupied/active eagle nest (species unknown), and one unoccupied eagle nest (species unknown) recorded within or next to the 10-mi (16-km) buffer during the April 2015 raptor nest survey.

The limited eagle observations during this bird use survey and the raptor nest survey conducted in 2015 suggest that the Project does not fall within a major bald eagle migration route, wintering area, or breeding home range of current nests, but the presence of active bald eagle nests in the vicinity of the Project indicates bald eagles are present in the general area for an extended period of time (breeding season). Thus, development of the Project may influence individuals moving through or using the Project area, but potential impact to bald eagle populations appears minimal.

Swainson's and Ferruginous Hawk

There were four observations of Swainson's and one ferruginous hawk were recorded during the study period (Table 4). Seventy-five percent of the Swainson's hawk observations were of flying individuals, but none of those hawks were observed flying within the RSH (Table 6). Swainson's hawks are common in South Dakota and utilize a variety of habitats, including open grasslands with occasional trees and shrubs, wetland edges, and agriculture fields, nesting in trees, shrubs, or occasionally on the ground (South Dakota Birds, Birding, and Nature 2017). The one ferruginous hawk was not observed flying. Ferruginous hawk, an uncommon migrant and summer resident, is rarely observed in winter, and inhabits grasslands and open areas (South Dakota Birds, Birding, and Nature 2017).

The potential for individual mortality does exist for both species; however, the low number of fatalities reported throughout projects in the Midwest (one Swainson's hawk and no ferruginous hawk fatalities out of 55 total reported fatalities) suggests that these species are not particularly susceptible to turbine collisions. Collision mortality may affect a few individuals, but are unlikely to cause significant adverse impacts to either populations of the species.

Goshawk and Sharp-shinned and Cooper's Hawk

One goshawk, one sharp-shinned hawk and four Cooper's hawks were recorded during the study period. All are an uncommon migrant in South Dakota, generally preferring wooded areas (South Dakota Birds, Birding, and Nature 2017). Only two Cooper's hawks and no sharp-shinned or goshawks have been found as fatalities through projects in the Midwest. Collision mortality may affect a few individuals of these species, but significant population-level impacts are unlikely.

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Appendix A. Descriptive Statistics for Bird Species Recorded during Year One of Fixed-Point Bird Use Surveys Conducted at the Prairie Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year One fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Waterbirds		**4**	**701**	**0**	**0**	**1**	**35**	**0**	**0**	**5**	**736**
great blue heron[a]	*Ardea herodias*	1	1	0	0	0	0	0	0	1	1
sandhill crane	*Antigone canadensis*	3	700	0	0	1	35	0	0	4	735
Waterfowl		**21**	**725**	**6**	**53**	**4**	**321**	**13**	**1,046**	**44**	**2,145**
Canada goose	*Branta canadensis*	3	402	2	41	0	0	5	415	10	858
greater white-fronted goose	*Anser albifrons*	1	50	0	0	0	0	1	6	2	56
lesser scaup	*Aythya affinis*	1	6	0	0	0	0	0	0	1	6
mallard	*Anas platyrhynchos*	11	59	3	8	2	4	3	35	19	106
northern shoveler	*Anas clypeata*	1	2	0	0	1	17	0	0	2	19
snow goose	*Chen caerulescens*	0	0	0	0	0	0	4	590	4	590
unidentified duck		4	206	0	0	0	0	0	0	4	206
unidentified goose		0	0	0	0	1	300	0	0	1	300
wood duck	*Aix sponsa*	0	0	1	4	0	0	0	0	1	4
Shorebirds		**31**	**34**	**32**	**76**	**11**	**52**	**0**	**0**	**74**	**162**
killdeer	*Charadrius vociferus*	24	27	13	23	6	10	0	0	43	60
unidentified shorebird		0	0	4	36	5	42	0	0	9	78
upland sandpiper	*Bartramia longicauda*	7	7	15	17	0	0	0	0	22	24
Gulls/Terns		**4**	**693**	**0**	**0**	**2**	**42**	**0**	**0**	**6**	**735**
Franklin's gull	*Leucophaeus pipixcan*	4	693	0	0	1	20	0	0	5	713
unidentified gull		0	0	0	0	1	22	0	0	1	22
Diurnal Raptors		**9**	**10**	**14**	**14**	**41**	**45**	**19**	**20**	**83**	**89**
Accipiters		*0*	*0*	*0*	*0*	*2*	*2*	*3*	*3*	*5*	*5*
Cooper's hawk[a]	*Accipiter cooperii*	0	0	0	0	2	2	2	2	4	4
northern goshawk[a,b]	*Accipiter gentilis*	0	0	0	0	0	0	1	1	1	1
Buteos		*6*	*7*	*8*	*8*	*30*	*34*	*13*	*14*	*57*	*63*
red-tailed hawk	*Buteo jamaicensis*	6	7	8	8	28	30	9	10	51	55
rough-legged hawk	*Buteo lagopus*	0	0	0	0	0	0	3	3	3	3
Swainson's hawk[a]	*Buteo swainsoni*	0	0	0	0	2	4	0	0	2	4
unidentified buteo	*Buteo spp*	0	0	0	0	0	0	1	1	1	1
Northern Harrier		*2*	*2*	*4*	*4*	*5*	*5*	*0*	*0*	*11*	*11*
northern harrier	*Circus cyaneus*	2	2	4	4	5	5	0	0	11	11
Eagles		*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*
bald eagle[a,b,c]	*Haliaeetus leucocephalus*	0	0	0	0	0	0	1	1	1	1

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year One fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

		Spring		**Summer**		**Fall**		**Winter**		**Total**	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Falcons		*0*	*0*	*0*	*0*	*0*	*0*	*2*	*2*	*2*	*2*
American kestrel	*Falco sparverius*	0	0	0	0	0	0	2	2	2	2
Other Raptors		*1*	*1*	*2*	*2*	*4*	*4*	*0*	*0*	*7*	*7*
unidentified hawk		1	1	1	1	2	2	0	0	4	4
unidentified raptor		0	0	1	1	2	2	0	0	3	3
Vultures		**2**	**2**	**3**	**9**	**5**	**8**	**0**	**0**	**10**	**19**
turkey vulture	*Cathartes aura*	2	2	3	9	5	8	0	0	10	19
Upland Game Birds		**12**	**14**	**13**	**13**	**4**	**26**	**4**	**16**	**33**	**69**
gray partridge	*Perdix perdix*	0	0	0	0	0	0	1	5	1	5
ring-necked pheasant	*Phasianus colchicus*	11	13	12	12	3	3	2	2	28	30
sharp-tailed grouse	*Tympanuchus phasianellus*	1	1	0	0	0	0	0	0	1	1
wild turkey	*Meleagris gallopavo*	0	0	1	1	1	23	1	9	3	33
Doves/Pigeons		**12**	**16**	**37**	**55**	**17**	**105**	**8**	**63**	**74**	**239**
Eurasian collared-dove	*Streptopelia decaocto*	0	0	1	1	0	0	0	0	1	1
mourning dove	*Zenaida macroura*	10	13	35	53	14	80	0	0	59	146
rock pigeon	*Columba livia*	2	3	1	1	3	25	8	63	14	92
Large Corvids		**6**	**6**	**1**	**2**	**12**	**33**	**6**	**27**	**25**	**68**
American crow	*Corvus brachyrhynchos*	6	6	1	2	12	33	6	27	25	68
Passerines		**158**	**370**	**217**	**623**	**129**	**2,116**	**28**	**781**	**532**	**3,890**
American goldfinch	*Spinus tristis*	1	1	5	5	1	1	0	0	7	7
American robin	*Turdus migratorius*	22	47	10	15	10	75	0	0	42	137
Baltimore oriole	*Icterus galbula*	0	0	1	1	0	0	0	0	1	1
bank swallow	*Riparia riparia*	0	0	0	0	1	4	0	0	1	4
barn swallow	*Hirundo rustica*	3	10	39	98	10	61	0	0	52	169
blue jay	*Cyanocitta cristata*	0	0	0	0	2	3	0	0	2	3
bobolink	*Dolichonyx oryzivorus*	1	1	4	4	0	0	0	0	5	5
Brewer's blackbird	*Euphagus cyanocephalus*	0	0	0	0	1	150	0	0	1	150
brown-headed cowbird	*Molothrus ater*	20	96	19	47	3	23	0	0	42	166
brown thrasher	*Toxostoma rufum*	1	1	1	1	0	0	0	0	2	2
chipping sparrow	*Spizella passerina*	1	1	0	0	0	0	0	0	1	1
cliff swallow	*Petrochelidon pyrrhonota*	0	0	4	16	0	0	0	0	4	16
common grackle	*Quiscalus quiscula*	11	22	6	7	3	14	0	0	20	43
common yellowthroat	*Geothlypis trichas*	0	0	2	2	0	0	0	0	2	2
dark-eyed junco	*Junco hyemalis*	0	0	0	0	0	0	1	30	1	30

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year One fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
dickcissel	*Spiza americana*	0	0	15	18	0	0	0	0	15	18
eastern bluebird	*Sialia sialis*	1	1	0	0	1	4	0	0	2	5
eastern kingbird	*Tyrannus tyrannus*	0	0	23	34	0	0	0	0	23	34
European starling	*Sturnus vulgaris*	2	2	1	19	8	553	2	213	13	787
field sparrow	*Spizella pusilla*	0	0	0	0	0	0	3	11	3	11
grasshopper sparrow	*Ammodramus savannarum*	1	2	0	0	0	0	0	0	1	2
Harris' sparrow	*Zonotrichia querula*	0	0	0	0	1	1	0	0	1	1
horned lark	*Eremophila alpestris*	9	14	1	2	5	69	15	402	30	487
house wren	*Troglodytes aedon*	0	0	0	0	1	1	0	0	1	1
Lapland longspur	*Calcarius lapponicus*	0	0	0	0	0	0	2	40	2	40
loggerhead shrike	*Lanius ludovicianus*	1	2	0	0	0	0	0	0	1	2
northern rough-winged swallow	*Stelgidopteryx serripennis*	0	0	1	2	0	0	0	0	1	2
orchard oriole	*Icterus spurius*	0	0	1	2	0	0	0	0	1	2
red-winged blackbird	*Agelaius phoeniceus*	16	85	15	138	11	351	0	0	42	574
Savannah sparrow	*Passerculus sandwichensis*	0	0	7	9	3	5	0	0	10	14
snow bunting	*Plectrophenax nivalis*	0	0	0	0	0	0	2	23	2	23
song sparrow	*Melospiza melodia*	0	0	1	1	3	13	0	0	4	14
tree swallow	*Tachycineta bicolor*	0	0	5	6	0	0	0	0	5	6
unidentified blackbird		0	0	1	1	5	659	0	0	6	660
unidentified passerine		2	3	2	24	8	15	1	7	13	49
unidentified sparrow		0	0	0	0	8	20	0	0	8	20
unidentified swallow		1	1	2	45	0	0	0	0	3	46
vesper sparrow	*Pooecetes gramineus*	3	3	1	1	0	0	0	0	4	4
western kingbird	*Tyrannus verticalis*	0	0	4	6	0	0	0	0	4	6
western meadowlark	*Sturnella neglecta*	62	78	44	68	43	93	2	55	151	294
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	0	0	2	51	0	0	0	0	2	51
yellow warbler	*Setophaga petechia*	0	0	0	0	1	1	0	0	1	1
Goatsuckers		**0**	**0**	**3**	**3**	**0**	**0**	**0**	**0**	**3**	**3**
common nighthawk	*Chordeiles minor*	0	0	3	3	0	0	0	0	3	3
Woodpeckers		**8**	**8**	**6**	**7**	**6**	**9**	**4**	**7**	**24**	**31**
hairy woodpecker	*Picoides villosus*	1	1	0	0	0	0	0	0	1	1
northern flicker	*Colaptes auratus*	7	7	4	4	5	8	4	7	20	26

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year One fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
red-headed woodpecker	*Melanerpes erythrocephalus*	0	0	2	3	1	1	0	0	3	4
Unidentified Birds		**0**	**0**	**0**	**0**	**0**	**0**	**1**	**8**	**1**	**8**
unidentified bird (small)		0	0	0	0	0	0	1	8	1	8
Overall		**267**	**2579**	**332**	**855**	**232**	**2,792**	**83**	**1,968**	**914**	**8,194**

Grps = Number of groups, # Obs = Number of observations

[a.] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b.] State Species of Greatest Conservation Need (SDGFP 2014)

[c.] Bald and Golden Eagle Protection Act (1940)

Appendix A2. Mean large bird use (number of large birds/800-meter radius plot/20-minute survey), percent of total use, and frequency of occurrence for each large bird type and species by season during Year One of the fixed-point bird use surveys conducted at the Prairie Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use				Percent of Use (%)				Frequency of Occurrence (%)			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Waterbirds	**10.17**	**0**	**0.44**	**0**	**33.4**	**0**	**5.2**	**0**	**3.2**	**0**	**1.2**	**0**
great blue heron[a]	0.02	0	0	0	<0.1	0	0	0	1.7	0	0	0
sandhill crane	10.16	0	0.44	0	33.4	0	5.2	0	1.6	0	1.2	0
Waterfowl	**8.21**	**0.18**	**4.01**	**11.66**	**27**	**7.6**	**47.6**	**80.1**	**22.1**	**5.5**	**5.2**	**7.8**
Canada goose	6.28	0.01	0	3.36	20.6	0.5	0	23.1	3.1	1.2	0	6.2
greater white-fronted goose	0.78	0	0	0.09	2.6	0	0	0.6	1.6	0	0	1.6
lesser scaup	0.09	0	0	0	0.3	0	0	0	1.6	0	0	0
mallard	0.92	0.11	0.05	0.55	3	4.8	0.6	3.8	17.2	4.3	2.7	4.7
northern shoveler	0.03	0	0.21	0	0.1	0	2.5	0	1.7	0	1.2	0
snow goose	0	0	0	7.66	0	0	0	52.6	0	0	0	3.1
unidentified duck	0.09	0	0	0	0.3	0	0	0	4.8	0	0	0
unidentified goose	0	0	3.75	0	0	0	44.5	0	0	0	1.2	0
wood duck	0	0.06	0	0	0	2.4	0	0	0	1.4	0	0
Shorebirds	**0.54**	**0.98**	**0.65**	**0**	**1.8**	**40.7**	**7.7**	**0**	**41**	**35.5**	**12.5**	**0**
killdeer	0.43	0.3	0.12	0	1.4	12.6	1.5	0	34.8	16	7.5	0
unidentified shorebird	0	0.45	0.52	0	0	18.7	6.2	0	0	3.8	5	0
upland sandpiper	0.11	0.22	0	0	0.4	9.3	0	0	9.4	18.7	0	0
Gulls/Terns	**10.83**	**0**	**0.56**	**0**	**35.6**	**0**	**6.7**	**0**	**6.2**	**0**	**2.7**	**0**
Franklin's gull	10.83	0	0.25	0	35.6	0	3	0	6.2	0	1.2	0
unidentified gull	0	0	0.31	0	0	0	3.7	0	0	0	1.4	0
Diurnal Raptors	**0.10**	**0.18**	**0.52**	**0.45**	**0.3**	**7.4**	**6.1**	**3.1**	**7.9**	**13.9**	**35.9**	**37.4**
Accipiters	*0*	*0*	*0.03*	*0.10*	*0*	*0*	*0.3*	*0.7*	*0*	*0*	*2.7*	*10*
Cooper's hawk[a]	0	0	0.03	0.06	0	0	0.3	0.4	0	0	2.7	5.8
northern goshawk[a,b]	0	0	0	0.04	0	0	0	0.3	0	0	0	4.2
Buteos	*0.05*	*0.10*	*0.41*	*0.30*	*0.2*	*4.2*	*4.9*	*2.1*	*4.7*	*8.9*	*32*	*24.2*
red-tailed hawk	0.05	0.10	0.36	0.21	0.2	4.2	4.2	1.4	4.7	8.9	29.3	15.2
rough-legged hawk	0	0	0	0.07	0	0	0	0.5	0	0	0	7.4
Swainson's hawk[a]	0	0	0.06	0	0	0	0.7	0	0	0	2.7	0
unidentified buteo	0	0	0	0.02	0	0	0	0.1	0	0	0	1.6
Northern Harrier	*0.03*	*0.05*	*0.06*	*0*	*0.1*	*2.1*	*0.8*	*0*	*3.2*	*5*	*6.4*	*0*
northern harrier	0.03	0.05	0.06	0	0.1	2.1	0.8	0	3.2	5	6.4	0
Eagles	*0*	*0*	*0*	*0.02*	*0*	*0*	*0*	*0.1*	*0*	*0*	*0*	*1.6*
bald eagle[a,b,c]	0	0	0	0.02	0	0	0	0.1	0	0	0	1.6
Falcons	*0*	*0*	*0*	*0.03*	*0*	*0*	*0*	*0.2*	*0*	*0*	*0*	*3.3*

Appendix A2. Mean large bird use (number of large birds/800-meter radius plot/20-minute survey), percent of total use, and frequency of occurrence for each large bird type and species by season during Year One of the fixed-point bird use surveys conducted at the Prairie Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use				**Percent of Use (%)**				**Frequency of Occurrence (%)**			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
American kestrel	0	0	0	0.03	0	0	0	0.2	0	0	0	3.3
Other Raptors	*0.02*	*0.02*	*0.01*	*0*	*<0.1*	*1*	*0.2*	*0*	*1.7*	*2.5*	*1.4*	*0*
unidentified hawk	0.02	0.01	0.01	0	<0.1	0.5	0.2	0	1.7	1.2	1.4	0
unidentified raptor	0	0.01	0	0	0	0.5	0	0	0	1.2	0	0
Vultures	**0.03**	**0.12**	**0.10**	**0**	**0.1**	**5.1**	**1.2**	**0**	**3.1**	**4.1**	**6.4**	**0**
turkey vulture	0.03	0.12	0.10	0	0.1	5.1	1.2	0	3.1	4.1	6.4	0
Upland Game Birds	**0.22**	**0.17**	**0.33**	**0.64**	**0.7**	**7.2**	**3.9**	**4.4**	**17.4**	**17.4**	**5.2**	**10.0**
gray partridge	0	0	0	0.21	0	0	0	1.4	0	0	0	4.2
ring-necked pheasant	0.21	0.16	0.04	0.06	0.7	6.6	0.5	0.4	17.4	16	3.9	5.8
sharp-tailed grouse	0.02	0	0	0	<0.1	0	0	0	1.6	0	0	0
wild turkey	0	0.01	0.29	0.38	0	0.6	3.4	2.6	0	1.4	1.2	4.2
Doves/Pigeons	**0.25**	**0.70**	**1.41**	**1.37**	**0.8**	**29.3**	**16.7**	**9.4**	**17.2**	**41.0**	**17.3**	**17.8**
Eurasian collared-dove	0	0.01	0	0	0	0.5	0	0	0	1.2	0	0
mourning dove	0.20	0.68	1.09	0	0.7	28.2	13	0	14.1	41	16.1	0
rock pigeon	0.05	0.01	0.31	1.37	0.2	0.5	3.7	9.4	3.1	1.2	3.8	17.8
Large Corvids	**0.09**	**0.02**	**0.41**	**0.44**	**0.3**	**1**	**4.9**	**3**	**9.4**	**1.2**	**12.5**	**9.7**
American crow	0.09	0.02	0.41	0.44	0.3	1	4.9	3	9.4	1.2	12.5	9.7
Goatsuckers	**0**	**0.04**	**0**	**0**	**0**	**1.7**	**0**	**0**	**0**	**4**	**0**	**0**
common nighthawk	0	0.04	0	0	0	1.7	0	0	0	4	0	0
Overall	**30.43**	**2.40**	**8.43**	**14.56**	**100**	**100**	**100**	**100**				

Note: Totals by bird type and overall might not correspond to the sum of individual species due to rounding

[a] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b] State Species of Greatest Conservation Need (SDGFP 2014)

[c] Bald and Golden Eagle Protection Act (1940)

Appendix A3. Mean small bird use (number of large birds/100-meter plot/20-minute survey), percent of total use, and frequency of occurrence for each small bird type and species by season during Year One of the fixed-point bird use surveys conducted at the Prairie Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use				Percent of Use (%)				Frequency of Occurrence (%)			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Passerines	**5.88**	**6.83**	**15.59**	**11.48**	**97.9**	**99.1**	**99.2**	**99.6**	**90.6**	**90.0**	**65.0**	**39.6**
American goldfinch	0.02	0.07	0.01	0	0.3	1	<0.1	0	1.6	6.6	1.2	0
American robin	0.76	0.2	0.91	0	12.6	2.9	5.8	0	31.9	12	7.7	0
Baltimore oriole	0	0.01	0	0	0	0.2	0	0	0	1.4	0	0
bank swallow	0	0	0.05	0	0	0	0.3	0	0	0	1.2	0
barn swallow	0.16	1.06	0.79	0	2.6	15.4	5	0	4.7	34	10.7	0
blue jay	0	0	0.04	0	0	0	0.2	0	0	0	2.5	0
bobolink	0.02	0.06	0	0	0.3	0.8	0	0	1.6	5.5	0	0
Brewer's blackbird	0	0	1.88	0	0	0	11.9	0	0	0	1.2	0
brown-headed cowbird	1.52	0.61	0.16	0	25.4	8.9	1	0	28.8	23.3	2.7	0
brown thrasher	0.02	0.01	0	0	0.3	0.2	0	0	1.6	1.4	0	0
chipping sparrow	0.02	0	0	0	0.3	0	0	0	1.6	0	0	0
cliff swallow	0	0.20	0	0	0	2.9	0	0	0	5	0	0
common grackle	0.35	0.10	0.18	0	5.8	1.4	1.1	0	12.6	8.3	3.8	0
common yellowthroat	0	0.03	0	0	0	0.4	0	0	0	2.7	0	0
dark-eyed junco	0	0	0	1.25	0	0	0	10.8	0	0	0	4.2
dickcissel	0	0.23	0	0	0	3.4	0	0	0	19.6	0	0
eastern bluebird	0.02	0	0.05	0	0.3	0	0.3	0	1.6	0	1.2	0
eastern kingbird	0	0.38	0	0	0	5.5	0	0	0	23.5	0	0
European starling	0.03	0.24	1.07	0	0.5	3.4	6.8	0	1.6	1.2	3.9	0
field sparrow	0	0	0	0.17	0	0	0	1.5	0	0	0	4.7
grasshopper sparrow	0.03	0	0	0	0.5	0	0	0	1.6	0	0	0
Harris' sparrow	0	0	0.01	0	0	0	<0.1	0	0	0	1.2	0
horned lark	0.22	0.03	0.87	7.15	3.7	0.4	5.5	62	14.2	1.3	5.4	27.5
house wren	0	0	0.01	0	0	0	<0.1	0	0	0	1.4	0
Lapland longspur	0	0	0	1.17	0	0	0	10.1	0	0	0	5.8
loggerhead shrike	0.03	0	0	0	0.6	0	0	0	1.7	0	0	0
northern rough-winged swallow	0	0.03	0	0	0	0.4	0	0	0	1.3	0	0
orchard oriole	0	0.03	0	0	0	0.4	0	0	0	1.4	0	0
red-winged blackbird	1.37	1.54	2.31	0	22.9	22.3	14.7	0	22.1	17.7	9.3	0
Savannah sparrow	0	0.12	0.06	0	0	1.7	0.4	0	0	9.5	2.7	0

Appendix A3. Mean small bird use (number of large birds/100-meter plot/20-minute survey), percent of total use, and frequency of occurrence for each small bird type and species by season during Year One of the fixed-point bird use surveys conducted at the Prairie Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from March 25, 2015 – February 21, 2016.

	Mean Use				Percent of Use (%)				Frequency of Occurrence (%)			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
snow bunting	0	0	0	0.88	0	0	0	7.7	0	0	0	5.8
song sparrow	0	0.01	0.16	0	0	0.2	1	0	0	1.2	3.9	0
tree swallow	0	0.06	0	0	0	0.9	0	0	0	3.8	0	0
unidentified blackbird	0	0.01	5.5	0	0	0.2	35	0	0	1.2	2.5	0
unidentified passerine	0.05	0.3	0.2	0	0.8	4.4	1.3	0	3.2	2.6	9.3	0
unidentified sparrow	0	0	0.17	0	0	0	1.1	0	0	0	6.6	0
unidentified swallow	0.02	0	0	0	0.3	0	0	0	1.7	0	0	0
vesper sparrow	0.05	0.01	0	0	0.8	0.2	0	0	3.1	1.4	0	0
western kingbird	0	0.04	0	0	0	0.6	0	0	0	2.6	0	0
western meadowlark	1.22	0.68	1	0.86	20.3	9.8	6.4	7.5	74.6	44.7	35	3.1
yellow-headed blackbird	0	0.68	0	0	0	9.9	0	0	0	2.8	0	0
yellow warbler	0	0	0.01	0	0	0	<0.1	0	0	0	1.4	0
Woodpeckers	**0.12**	**0.07**	**0.12**	**0.05**	**2.1**	**0.9**	**0.8**	**0.4**	**10.9**	**5.3**	**6.6**	**3.3**
hairy woodpecker	0.02	0	0	0	0.3	0	0	0	1.6	0	0	0
northern flicker	0.11	0.05	0.11	0.05	1.8	0.8	0.7	0.4	10.9	5.3	5.4	3.3
red-headed woodpecker	0	0.01	0.01	0	0	0.2	<0.1	0	0	1.2	1.2	0
Overall	**6.01**	**6.90**	**15.71**	**11.53**	**100**	**100**	**100**	**100**				

[a] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

APPENDIX G - AVIAN USE SURVEYS, YEAR TWO

Avian Use Surveys for the Prevailing Winds Wind Project Bon Homme and Charles Mix Counties, South Dakota

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Year Two Final Draft Report

May 2016 – April 2017

Prepared for:

Prevailing Winds, LLC

Prepared by:

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February 16, 2018

EXECUTIVE SUMMARY

Prevailing Winds, LLC. (Prevailing Winds), has proposed a wind energy facility in Bon Homme and Charles Mix counties, South Dakota, referred to as the Prevailing Winds Wind Project (Project). Prevailing Winds contracted Western EcoSystems Technology, Inc. (WEST) to conduct field surveys developed in coordination with the US Fish and Wildlife Service (USFWS) and South Dakota Game Fish and Parks (SDGFP). Surveys were designed to assess wildlife resources in the Project area and assess risk to sensitive species by addressing the issues posed under Tier 3 of the USFWS Final Land-Based Wind Energy Guidelines. The following document contains results for the general fixed-point bird use surveys and incidental wildlife observations. A summary of all data collected is contained in the document, but the overall body of the report focuses on a smaller group of species – diurnal raptors, eagles, state/federally listed species, and South Dakota Sensitive Species (State Species of Concern [SSC] and State Species of Greatest Conservation Need [SGCN]).

The principal objectives of the fixed-point bird use surveys were to: 1) assess the relative abundance and spatial distribution of species in the Project area during all seasons, and 2) identify and assess the potential risk of adverse impacts to species or groups.

Fixed-point bird use surveys were conducted at 16 survey points from March 3, 2016 – April 19, 2017. This was the second year of surveys at the Project, but the survey area between Year One (March 25, 2015 – February 21, 2016) and Year Two changed significantly and thus the point count locations were modified in Year Two. Each survey plot was surveyed for 60 minutes (min). Every bird and/or unique bird species group observed during the first 20 min of each fixed-point bird use survey was recorded using two viewsheds: 800-meter (m; 2,625-feet [ft]) radius plot for large birds and 100-m (328-ft) radius plot for small birds, observations beyond the radius plots were excluded from analysis. Large birds included waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), and goatsuckers. Passerines (excluding large corvids), kingfishers, swifts/hummingbirds, woodpeckers, and most cuckoos were considered small birds. During the next 40 min of the survey period, only eagles and state/federally listed species were recorded out to the 800-m radius.

A total of 205 fixed-point bird use surveys were conducted during 13 visits. During all surveys and incidental observations, no federally listed species were recorded but one state-listed species (peregrine falcon) was recorded. Thirteen bird species (great blue heron, bald eagle, Cooper's hawk, ferruginous hawk, sharp-shinned hawk, Swainson's hawk, American pelican, white-faced ibis, bufflehead, common merganser, golden eagle, merlin, and peregrine falcon]) listed as South Dakota SGCN and/or SSC were observed during fixed-point surveys and incidentally.

Diurnal raptor use at the Project during Year Two (0.33 raptors/800-m plot/20-min survey) was low compared to other US wind facilities and comparable to other wind energy facilities in the

Midwest with publicly available data and similar to Year One at the Project (0.31 raptors/800-m plot/20-min survey). Fatality monitoring data collected at wind projects in the Midwest suggest that some collision risk exists for individual raptors, but the level of impact is not likely to cause significant adverse impacts to overall species populations.

Significant adverse impacts to overall bird populations are not anticipated at the Project based on data collected at the site, review of available literature, and results of post-construction fatality monitoring at other wind energy facilities. Further post-construction survey effort should be determined in consultation with appropriate agencies to confirm the anticipated impacts.

STUDY PARTICIPANTS

Western EcoSystems Technology

Clayton Derby	Project Manager
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REPORT REFERENCE

Derby, C., S. Agudelo, and T. Thorn. 2018. Avian Use Surveys for the Prevailing Winds Wind Project, Bon Homme and Charles Mix Counties, South Dakota. Year Two Final Report: March 3, 2016 – April 19, 2017. Prepared for Prevailing Winds, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. 36 pages + appendices

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INTRODUCTION

In 2015, Prevailing Winds LLC originally contracted Western EcoSystems Technology, Inc. (WEST) to conduct field surveys in accordance with agency recommendations to quantify wildlife resources within the Prevailing Winds Wind Project (Project) in South Dakota. Year-round surveys were conducted by WEST in 2015 – 2016 within an initial assessment area of approximately 18,139.5 hectares (ha; 44,823.7 acres [ac]). A second year of biological surveys was conducted by WEST to address the issues posed under Tier 3, following guidance in the United States (US) Fish and Wildlife Service (FWS) *Final Land-Based Wind Energy Guidelines* (Guidelines; USFWS 2012) and *Eagle Conservation Plan Guidance* (Guidance; USFWS 2013), within a revised Project area being considered in 2016 (Figure 1). This report includes a summary for the Year Two survey efforts.

Fixed-point bird use surveys were conducted to achieve these principal objectives: 1) assess the relative abundance and spatial distribution of species in the Project area during an entire year, with emphasis on eagles, non-eagle raptors, and state/federally listed species, and 2) identify and assess the potential risk of adverse impacts to sensitive species or groups.

The following document contains results for the general fixed-point bird use surveys and incidental wildlife observations for the study period 2016 – 2017 (Year Two), with focus on eagles, non-eagle diurnal raptors, state/federally listed species, and State non-listed special-status species (i.e., State Species of Greatest Conservation Need [SGCN] and State Species of Concern [SSC]). A summary of the data collected during the 2015 – 2016 study period (Year One) is also included in this report.

STUDY AREA

The revised Project area used for surveys conducted in 2016 – 2017 encompassed approximately 14,981.40 ha (37,019.85 ac) in Bon Homme and Charles Mix counties, north of the town of Avon in southeastern South Dakota (Figure 1). The Project, located in a higher elevated area within the greater landscape, is characterized by a generally flat topography, with elevation ranging from 454.46 meters (m; 1,491.01 feet [ft]) – 573.72 m (1,882.28 ft; US Geological Survey [USGS] Digital Elevation Model 2017). The Project area, historically dominated by grasslands, has extensively been converted to agricultural use, with crop production and livestock grazing the primary practices (Bryce et al. 1998). Approximately half (47.5) % of the proposed Project area is cultivated crops followed by pasture/hay land (37.5%); grassland/herbaceous cover represent 6.7% of the Project area while all other land cover/land use types compose 4% or less of the Project area each (USGS National Land Cover Database 2011). As evidenced during the site visit conducted by WEST in 2015 of the general area, trees and woodlands are found mainly in planted shelter belts and within draws and on hillslopes; wetlands are scattered throughout the Project area (Figure 2), with the USFWS National Wetland Inventory (NWI) indicating approximately 528.08 ha (1,304.91 ac) of wetlands (USFWS NWI 2015).

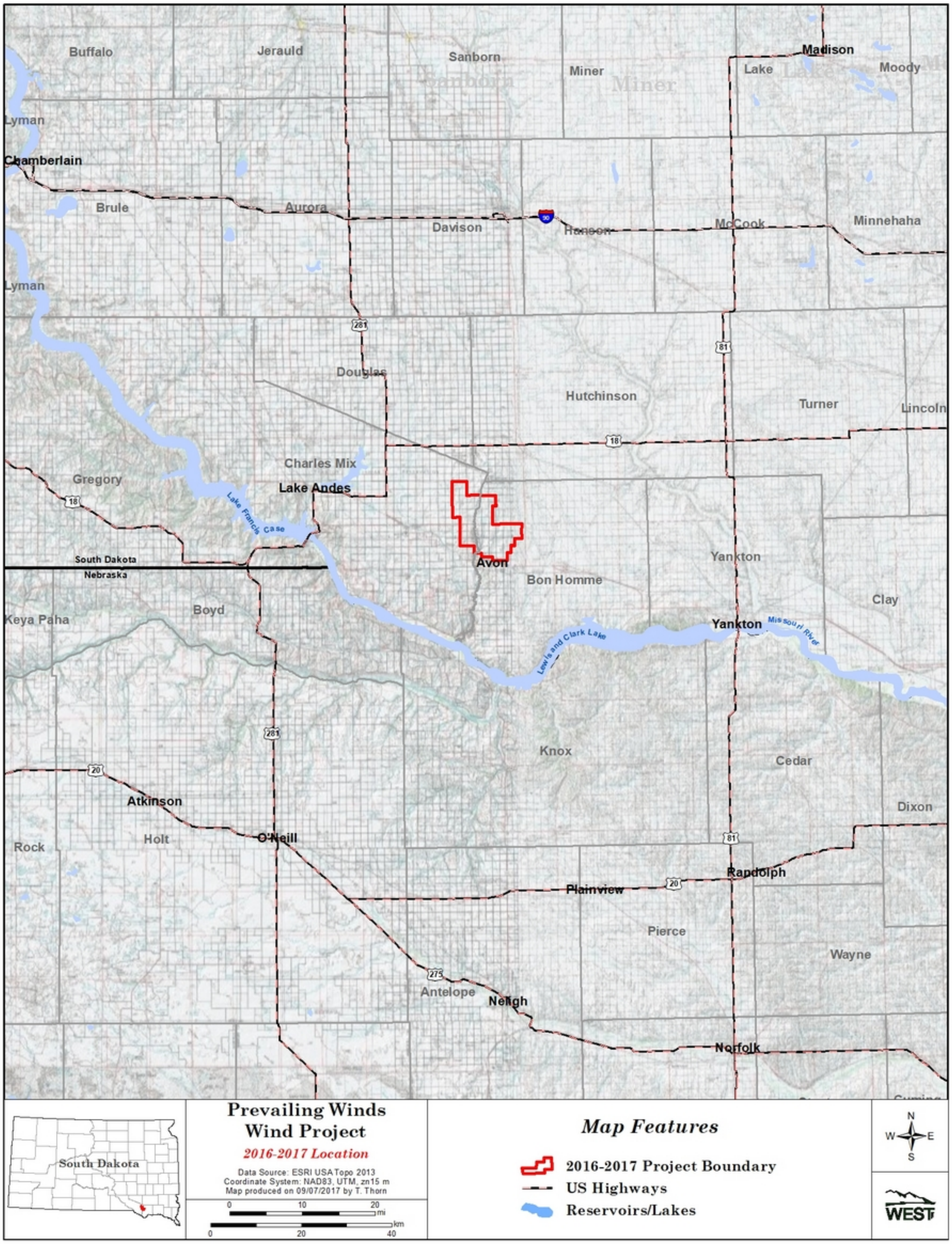

Figure 1. Location of the revised Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, for surveys conducted in 2016 – 2017.

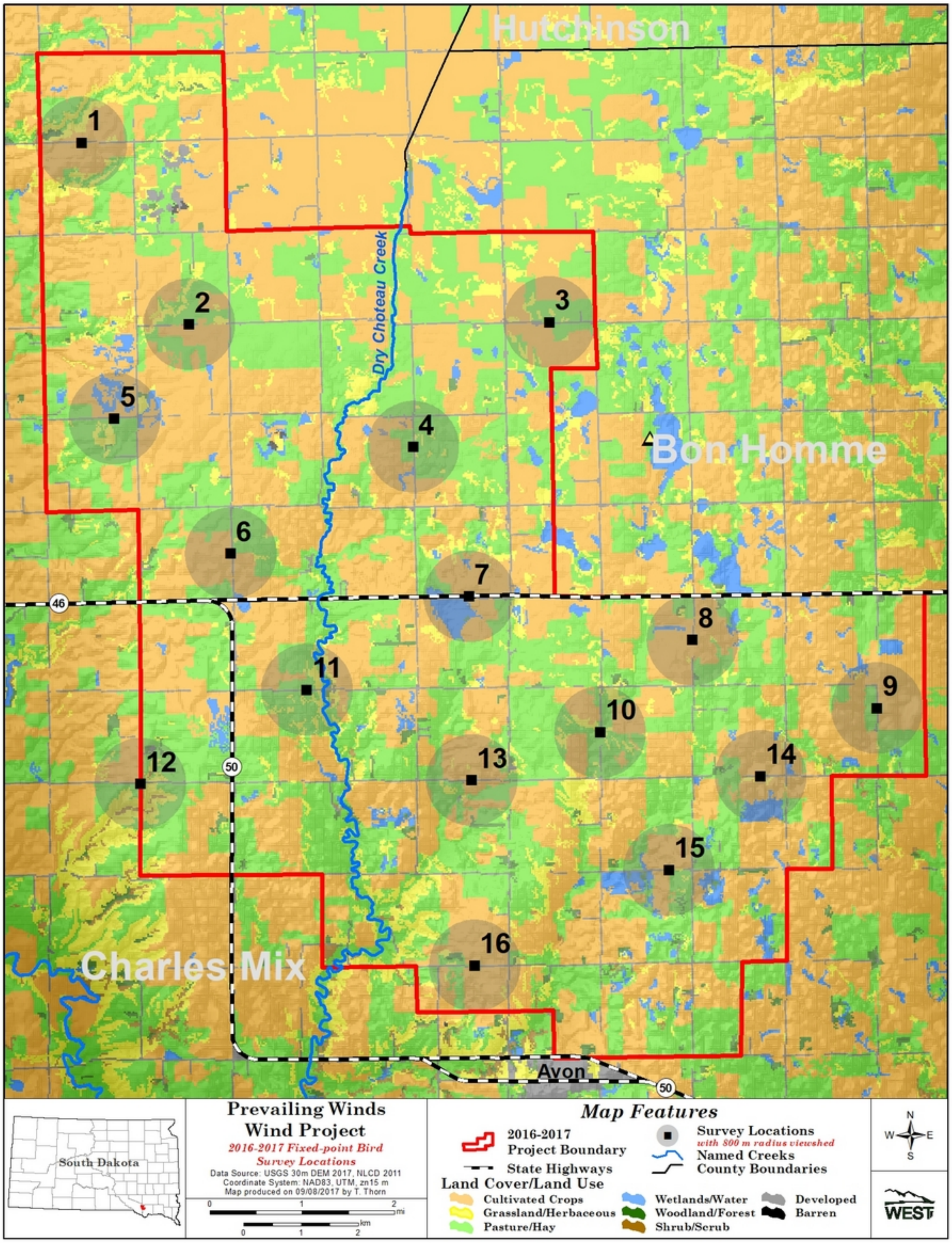

Figure 2. Land cover/Land use and location of the fixed-point plots selected for the Year Two bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017 (USFWS NLCD 2011, Homer et al. 2015).

METHODS

Fixed-Point Bird Use Surveys

Fixed-point bird use surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980), to estimate the seasonal and spatial use of the study area by birds, particularly diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, and osprey [*Pandion haliaetus*]). Methodologies employed during avian use surveys conducted at the Project are generally comparable to those used at past wind energy facilities in South Dakota.

Survey Plots

Sixteen points were selected to survey representative habitats and topography of the Project, while achieving relatively even coverage of the study area (Figure 2). Each survey plot was an 800-m (2,625-ft) radius circle centered on the point; for analysis purposes, only birds within the 800-m radius were considered for analysis to allow comparison to other projects that used similar analyses.

Survey Methods

Each survey plot was surveyed for 60 minutes (min). Every bird and/or unique bird species group observed during the first 20 min of each fixed-point bird use survey was recorded by a unique observation number. During the next 40 min of the survey period, only eagles and state/federally listed species and state species of concern were recorded out to the 800-m radius. In some cases, the tally of observations may represent repeated sightings of the same individual. Observations of large birds beyond the 800-m radius were recorded but were not included in statistical analyses. For small birds, observations beyond the 100-m (328-ft) radius were excluded. Large birds included waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), and goatsuckers. Passerines (excluding large corvids), kingfishers, swifts/hummingbirds, woodpeckers, and most cuckoos were considered small birds.

The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval. Other information collected included whether the observation was auditory only and the 10-min interval of the survey in which the detection first occurred. Locations and flight paths, if applicable, of large birds were recorded during fixed-point bird use surveys on field maps by unique observation number. Data on eagle flight paths and habitat use (i.e., distance from observer, activity, and flight height) were recorded on a per min basis; comments were made when appropriate. Incidental wildlife observations were recorded while conducting all surveys, moving between fixed-point locations, and traveling within the Project. All raptors, listed species, and State sensitive bird species were documented.

Observation Schedule

Survey intensity (i.e., number of fixed-point circular plots and frequency of monitoring) was designed to document year-round use and behavior of birds in the Project area. Fixed-point bird use surveys were conducted approximately monthly for the year. The schedule was generally conducting even numbered points on one visit and then odd numbered points two week later. Surveys were carried out during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practicable, each point was surveyed roughly the same number of times.

Statistical Analysis

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once within the Project area. Under certain circumstances, such as extreme weather conditions, all plots may not have been surveyed during a visit. In these cases, a visit might not have constituted a survey of all plots.

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, and/or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Data Compilation and Storage

A Microsoft® MSSQL database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent QA/QC and data analysis. All data forms and electronic data files were retained for reference.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

Bird diversity was illustrated by the total number of unique species observed. Species lists and counts, with the number of observations and the number of groups, were generated by season and included all observations of birds detected, regardless of their distance from the observer. In some cases, the tally of observations may represent repeated sightings of the same individual. Species richness was calculated for each season by first averaging the total number of species observed within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within each season. Overall species richness was calculated as a weighted average of seasonal values by the number of days in each season.

Mean Use, Percent of Use, and Frequency of Occurrence

Large birds detected within the 800-m radius plot and small birds recorded within the 100-m radius plot were used to calculate mean use and frequency of occurrence. The metric used for mean bird use was number of birds per plot (100-m radius plot for small birds, 800-m radius plot for large birds) per 20-min survey. Seasonal mean use was calculated by first averaging the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within each season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Percent of use was calculated as the proportion of large or small bird use that was attributable to a particular bird type or species, and frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species was observed. Frequency of occurrence, calculated as the percent of surveys in which a particular bird type or species was observed, provides a relative measure of species exposure to the proposed Project.

Bird Flight Height and Behavior

Bird flight heights are important metrics to assess potential exposure. Flight height information was used to calculate the percentage of birds observed flying within the rotor-swept heights (RSH; estimated to be between 25 – 200 m [82 –656 ft] above ground level). The flight height recorded when the bird was first observed was used to calculate the percentage of birds flying within the RSH and mean flight height. The percentage of birds flying within the RSH at any time (e.g., first 20-min for all birds, entire 60-min for eagles) was calculated using the lowest and highest flight heights recorded. Auditory only observations were excluded from flight height calculations.

Spatial Use

Spatial use of the Project area was evaluated using mean use by survey point. For each species and bird group, the number of individuals observed at each point during the 20-min survey was divided by the total number of surveys at that point.

RESULTS

Surveys were completed within the Project area from May 3, 2016 – April 19, 2017. Summary statistics for the full suite of species observed in the Project area are presented in Appendix A. Results related to eagles, non-eagle raptors, federally/state-listed species (Endangered Species Act [ESA] 1973, South Dakota Game, Fish and Parks [SDGFP] 2016, USFWS 2017), and State sensitive species (SGCN [SDGFP 2014] and SSC [SDGFP 2017]), are more thoroughly covered in the body of this report.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

A total of 205 fixed-point bird use surveys were conducted during 13 visits to the Project area during Year Two surveys: 47 surveys in spring, 63 in summer, 47 in fall, and 48 in winter (Table 1). Ninety unique bird species were observed during the entire duration (60 min) of the fixed-point bird use surveys (Table 1). Bird diversity (the number of unique species observed for entire 60-min survey) was highest during the summer (60 species), followed by spring and fall (46 and 43, respectively), and was lowest in winter (18). Overall species richness (mean number of species/plot/20-min survey) was higher for small birds (2.64) compared to large birds (1.49), being lowest in the winter compared to all other seasons, for both large and small birds (0.38 and 0.94 species/plot/20-min survey, respectively).

Table 1. Number of visits, surveys, bird diversity (number of unique species for entire 60-minute [min] survey), and bird species richness (species/plot[a]/20-min survey) by season and overall, observed during the Year Two fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Season	Number of Visits	Number of Surveys Conducted	Bird Diversity	Bird Species Richness Large Birds	Bird Species Richness Small Birds
Spring	3	47	46	2.86	2.50
Summer	4	63	60	1.48	4.43
Fall	3	47	43	1.48	2.32
Winter	3	48	18	0.38	0.94
Overall	**13**	**205**	**90**	**1.49**	**2.64**

[a] 800-meter (m; 2,625-foot [ft]) radius plot for large birds; 100-m (328-ft) radius plot for small birds

A total of 9,276 observations in 1,090 separate groups (defined as one or more individuals) were recorded during the first 20 min of the Year Two fixed-point bird use surveys (Appendix A1). Regardless of bird size, two identified species (2.2% of all species) accounted for approximately one-third (29%) of all observations: common grackle (*Quiscalus quiscula*; 1,590 observations in 30 groups) and red-winged blackbird (*Agelaius phoeniceus*; 1,105 observations in 84 groups). All other species each accounted for less than 6% of the total observations.

Waterfowl accounted for the majority (2,095 observations within 79 groups) of large bird observations, with snow goose (*Chen caerulescens*) being the most abundant waterfowl species (499 observations within eight groups). Waterbirds composed 1.5% (140 observations) of the total bird observations, with sandhill cranes (111 observations in five groups) being the most abundant waterbird species recorded during bird use surveys. Passerines accounted for the majority (5,855 observations within 681 groups) of small bird observations, with common grackle accounting for the majority of those observations (Appendix A1).

Sixty-nine diurnal raptor observations within 61 groups were recorded during the first 20 min of the Year Two fixed-point bird use surveys conducted at the Project, representing five unique species (Table 2; Appendix A1). Red-tailed hawk (*Buteo jamaicensis*; 34 observations in 32 groups) and northern harrier (*Circus cyaneus*; 11 observations in 10 groups) were the most commonly observed raptor species, accounting for 49.3% and 15.9% of all raptor observations, respectively. One state-listed (SDGFP 2016) species (peregrine falcon [*Falco peregrinus*]) was recorded during Year Two of 60-min fixed-point bird use surveys conducted at the Project; no federally listed (ESA 1973) species were observed during the study period.

Table 2. Number of groups and individuals of diurnal raptors observed, regardless of distance from observer, during the first 20 minutes of the Year Two fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

		Spring		Summer		Fall		Winter		Total	
Raptor Subtype/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Diurnal Raptors		**19**	**24**	**11**	**13**	**25**	**26**	**6**	**6**	**61**	**69**
Accipiters		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
Cooper's hawk[a]	*Accipiter cooperii*	0	0	1	1	0	0	0	0	1	1
Buteos		*13*	*13*	*10*	*12*	*13*	*13*	*3*	*3*	*39*	*41*
red-tailed hawk	*Buteo jamaicensis*	12	12	9	11	11	11	0	0	32	34
rough-legged hawk	*Buteo lagopus*	0	0	0	0	2	2	3	3	5	5
unidentified buteo	*Buteo spp*	1	1	1	1	0	0	0	0	2	2
Northern Harrier		*3*	*4*	*0*	*0*	*7*	*7*	*0*	*0*	*10*	*11*
northern harrier	*Circus cyaneus*	3	4	0	0	7	7	0	0	10	11
Eagles		*1*	*4*	*0*	*0*	*1*	*1*	*2*	*2*	*4*	*7*
bald eagle[a,b]	*Haliaeetus leucocephalus*	1	4	0	0	1	1	2	2	4	7
Other Raptors		*2*	*3*	*0*	*0*	*4*	*5*	*1*	*1*	*7*	*9*
unidentified raptor		2	3	0	0	4	5	1	1	7	9
Overall Diurnal Raptors		**19**	**24**	**11**	**13**	**25**	**26**	**6**	**6**	**61**	**69**

Grps = Number of groups, # Obs = Number of observations

[a.] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b.] State Species of Greatest Conservation Need (SDGFP 2014)

Mean Use, Percent of Use, and Frequency of Occurrence

Mean bird use, percent of use, and frequency of occurrence by season for all bird types and species observed during the first 20 min of surveys are shown in Appendix A2; Table 3 shows a summary of mean use and frequency of occurrence by major bird type and species of concern. The highest overall large bird use occurred during spring (36.38 birds/800-m plot/20-min survey), followed by fall (20.11), winter (9.12), and summer (3.65; Appendix A2). Seasonal large bird use was largely driven by waterfowl in the spring and winter, and by shorebirds and waterbirds in the fall and summer, respectively (Appendix A2). Small bird use was lowest in the winter (6.79 birds/100-m plot/20-min survey) compared to any other season, and was largely driven by passerine use across seasons (Appendix A3).

Waterbird use ranged from 0.42 – 1.23 birds/800-m plot/20-min survey in the fall, spring and summer, with no waterbirds being recorded in the winter (Table 3). Of the four waterbird species observed, sandhill cranes (*Antigone canadensis*) were observed only in spring and summer (0.85 and 1.17 birds/800-m plot/20-min survey, respectively) and composed the majority of observations during those seasons; use by great blue heron (*Ardea herodias*), a SSC, was recorded in all seasons but winter, ranging from 0.02 – 0.06 birds/800-m plot/20-min survey (Appendix A2). Waterbirds were observed more frequently during the spring (10.6%) compared to fall (6.4%) and summer (4.8%; Table 3).

Diurnal raptor use was highest in the fall and spring (0.55 and 0.51 raptors/800-m plot/20-min survey, respectively), followed by summer (0.21), and winter (0.12; Table 3). Higher raptor use during the fall and spring was primarily due to use of the Project area by red-tailed hawks (0.23 and 0.25, respectively). Diurnal raptor use in the winter consisted of rough legged hawks (*Buteo lagopus*), bald eagles (*Haliaeetus leucocephalus*; a SGCN), and one unidentified raptor (Table 3, Appendices A1 and A2). Diurnal raptors were observed during 38.2% of fall and 33.9% of spring surveys compared to 15.9% of summer and 8.3% of winter surveys (Table 3).

Use by Cooper's hawk (*Accipiter cooperii*; a SSC) was observed exclusively during the summer (0.02 birds/800-m plot/20-min survey) and use by northern harriers was observed exclusively during fall and spring migration (0.15 and 0.09 birds/800-m plot/20-min survey, respectively). Bald eagles were observed in all seasons but summer during the first 20 min of fixed-point bird use surveys, and were the only eagle species observed during fixed-point bird use surveys conducted at the Project (Appendix A1). Use by bald eagles ranged from 0.02 – 0.08 birds/800-m plot/20-min survey (Appendix A2) and they were observed during 2.1% of spring, fall, and winter surveys (Table 3).

Passerine use was lowest during the winter (6.58 birds/100-m plot/20-min survey), compared to any other season (Table 3), and was largely due to use by horned larks (*Eremophila alperstris*; 5.54 birds/100-m plot/20-min survey; Appendix A3). Red-winged blackbird (*Agelaius phoeniceus*) had the highest use (13.19 birds/100-m plot/20-min survey) of passerine species observed in spring, while common grackle (*Quiscalus quiscula*) had the highest passerine use during the summer and fall (16.14 and 12.00, respectively; Appendix A3). Passerines were observed during 97.9% of spring surveys, 96.9% of summer surveys, 75.0% of fall surveys, and 62.5% of winter surveys (Appendix A3).

Table 3. Seasonal bird mean use and frequency of occurrence for waterbirds, waterfowl, passerines, diurnal raptor species, and sensitive species observed during the first 20 minutes of Year Two fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use[1]				**Frequency of Occurrence (%)**			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Waterbirds	**0.96**	**1.23**	**0.42**	**0**	**10.6**	**4.8**	**6.4**	**0**
great blue heron[a]	0.02	0.02	0.06	0	2.1	1.6	6.4	0
Waterfowl	**29.2**	**0.48**	**5.12**	**8.71**	**44.7**	**7.8**	**6.2**	**8.3**
bufflehead	0	0	0.25	0	0	0	2.1	0
Common merganser	0	0	0	0.02	0	0	0	2.1
Diurnal Raptors	**0.51**	**0.21**	**0.55**	**0.12**	**33.9**	**15.9**	**38.2**	**8.3**
Accipiters	*0*	*0.02*	*0*	*0*	*0*	*1.7*	*0*	*0*
Cooper's hawk[a]	0	0.02	0	0	0	1.7	0	0
Buteos	*0.28*	*0.19*	*0.28*	*0.06*	*23.3*	*14.3*	*25.4*	*6.2*
red-tailed hawk	0.25	0.17	0.23	0	21.1	12.7	21.2	0
rough-legged hawk	0	0	0.04	0.06	0	0	4.2	6.2
unidentified buteo	0.02	0.02	0	0	2.2	1.6	0	0
Northern Harrier	*0.09*	*0*	*0.15*	*0*	*6.4*	*0*	*14.9*	*0*
northern harrier	0.09	0	0.15	0	6.4	0	14.9	0
Eagles	*0.08*	*0*	*0.02*	*0.04*	*2.1*	*0*	*2.1*	*2.1*
bald eagle[a,b]	0.08	0	0.02	0.04	2.1	0	2.1	2.1
Other Raptors	*0.06*	*0*	*0.10*	*0.02*	*4.2*	*0*	*8.3*	*2.1*
unidentified raptor	0.06	0	0.10	0.02	4.2	0	8.3	2.1
Passerines	**22.10**	**28.8**	**35.31**	**6.58**	**97.9**	**96.9**	**75.0**	**62.5**

Note: Totals by bird type and overall might not correspond to the sum of individual species due to rounding

[1] 800-meter (m; 2,625-foot [ft]) radius plot for large birds; 100-m (328-ft) radius plot for small birds

[a] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b] State Species of Greatest Conservation Need (SDGFP 2014)

State/Federally Listed Species and Sensitive Species Observations

No federally listed species (ESA 1973) were observed during Year Two of fixed-point bird use surveys conducted in the Project area from May 3, 2016 – April 19, 2017 (Table 4). One peregrine falcon, a state-listed species, was observed during the 60-min fixed-point bird use surveys (Table 4) conducted in the fall of the Year Two surveys. Twelve non-listed special-status species were recorded during fixed-point bird use surveys and incidentally, including 24 bald eagles (a SGCN) within 15 groups, and one golden eagle (*Aquila chrysaetos*; a SSC) observed incidentally in the winter of 2016 (Table 4); both eagle species are further protected under the Bald and Golden Eagle Protection Act (1940). Two additional South Dakota SGCN were recorded during the Year Two survey period: ferruginous hawk (*Buteo regalis*; three observations within three groups), and American white pelican (*Pelecanus erythrorhynchos*; 10 observations within one group). The other eight non-listed special-status species observed were: great blue heron, white-faced ibis (*Plegadis chihi*), bufflehead (*Bucephala albeola*), common merganser (*Mergus merganser*), Cooper's hawk, merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), and Swainson's hawk (*Buteo swainsoni*); see Species Specific Summaries section for a detailed discussion of these species.

Table 4. Sensitive species observed during fixed-point bird use surveys (FP)[a] and Incidentally (Inc.) within the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

			FP		Inc.		Total	
Species	Scientific Name	Status	# Grps	# Obs	# Grps	# Obs	# Grps	# Obs
American white pelican	*Pelecanus erythrorhynchos*	SGCN, SSC	1	10	0	0	1	10
great blue heron	*Ardea herodias*	SSC	5	5	0	0	5	5
white-faced ibis	*Plegadis chihi*	SSC	1	1	0	0	1	1
bufflehead	*Bucephala albeola*	SSC	1	12	0	0	1	12
common merganser	*Mergus merganser*	SSC	2	10	0	0	2	10
bald eagle	*Haliaeetus leucocephalus*	SGCN, SSC, BGEPA	12	20	3	4	15	24
golden eagle	*Aquila chrysaetos*	SSC, BGEPA	0	0	1	1	1	1
Cooper's hawk	*Accipiter cooperii*	SSC	1	1	0	0	1	1
ferruginous hawk	*Buteo regalis*	SGCN	3	3	0	0	3	3
merlin	*Falco columbarius*	SSC	1	1	0	0	1	1
peregrine falcon	*Falco peregrinus*	SE, SGCN, SSC	1	1	0	0	1	1
sharp-shinned hawk	*Accipiter striatus*	SSC	2	2	0	0	2	2
Swainson's hawk	*Buteo swainsoni*	SSC	2	2	0	0	2	2

Grps = Number of groups, # Obs = Number of observations

[a] Within 60-minute (min) survey for large birds and 20-min survey for small birds

BGEPA = Bald and Golden Eagle Protection Act (1940)

SE = State Endangered,

SGCN = State Species of Greatest conservation Need (SDGFP 2014)

SSC = State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

Bird Flight Height and Behavior

Flight height characteristics, based on initial flight height observations and estimated use, were estimated for both bird types and species (Tables 5 and 6). During the 60-min fixed-point bird use surveys, 240 groups of large birds were observed flying within the 800-m radius plot, totaling 2,682 individuals. Although the percentage of large birds observed flying was evenly spread across flight height categories, the majority of waterbirds (78.1%) and shorebirds (84.1%) were recorded flying within the RSH, while approximately half (47.1%) of the waterfowl observations were recorded flying within the RSH for collision with turbine blades of 25 -- 200 m (82 – 656 ft) above ground level (Table 5). Diurnal raptors tended to fly within (53.6%) and below (39.3%) the RSH, with some subtype differences. The majority (61.9%) of flying buteos was recorded within the RSH, while the majority (90.0%) of harriers were recorded flying below the RSH and the majority (71.4%) of eagles were recorded flying within the RSH (Table 5).

During the first 20 min of the fixed-point bird use surveys, 326 groups of small birds were observed flying within the 100-m radius plot, totaling 3,098 individuals, mostly passerines (Table 5). Overall, 91.1% of flying small birds were recorded below the RSH (Table 5).

Table 5. Flight height (meters [m] above ground level), based on initial observation, characteristics by bird types and raptor subtypes observed during Year Two of the fixed-point bird use surveys[a] conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Bird Type/Subtype	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% Within Flight Height Categories		
					< 25 m	25 - 200 m[b]	> 200 m
Loons/Grebes	0	0	0	0	0	0	0
Waterbirds	10	96	83.40	63.6	11.5	78.1	10.4
Waterfowl	54	1,621	77.76	77.0	20.9	47.1	32
Shorebirds	34	477	12.94	90.3	15.9	84.1	0
Gulls/Terns	7	194	25.43	100	90.2	9.8	0
Rails/Coots	0	0	0	0	0	0	0
Diurnal Raptors	72	84	72.31	91.3	39.3	53.6	7.1
Accipiters	*3*	*3*	*31.33*	*100*	*66.7*	*33.3*	*0*
Buteos	*40*	*42*	*62.83*	*91.3*	*38.1*	*61.9*	*0*
Northern Harrier	*9*	*10*	*14.11*	*90.9*	*90.0*	*10.0*	*0*
Eagles	*13*	*21*	*143.08*	*100*	*4.8*	*71.4*	*23.8*
Falcons	*2*	*2*	*8.50*	*100*	*100*	*0*	*0*
Unidentified Raptors	*5*	*6*	*119.00*	*66.7*	*50.0*	*33.3*	*16.7*
Vultures	6	6	50.33	66.7	66.7	33.3	0
Upland Game Birds	2	3	1.00	4.2	100	0	0
Doves/Pigeons	45	110	6.33	72.4	99.1	0.9	0
Large Corvids	10	91	9.20	91.0	100	0	0
Goatsuckers	0	0	0	0	0	0	0
Large Birds Overall	240	2,682	48.08	78.7	31.3	48.7	19.9
Passerines	320	3,092	7.64	64.4	91.1	8.9	0
Woodpeckers	5	5	3.80	38.5	100	0	0
Kingfishers	0	0	0	0	0	0	0
Unidentified Birds	1	1	10.00	3.2	100	0	0
Small Birds Overall[c]	326	3,098	7.59	63.9	91.1	8.9	0

Obs = Observations

[a] 800-meter (m; 2,625-foot [ft]) radius plot and 60 min survey for large birds; 100-m (328-ft) radius plot and 20 min survey for small birds

[b] The likely rotor-swept height for potential collision with a turbine blade, or 25 – 200 m (82 – 656 ft) above ground level

[c] Excluding large corvids

One-hundred percent of Swainson’s hawks and common merganser groups were observed flying within RSH based on initial observation (Table 6) while half (50.0%) of sharp-shinned hawk groups were observed flying within RSH; 75.0% of bald eagle and 33.3% of ferruginous hawk groups were also observed flying within RSH. No other special-status species were observed flying within the RSH at any time (Table 6).

Table 6. Flight characteristics for non-listed special-status species observed[a] during Year Two of the fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within RSH[b] Based on Initial Observation	% Within RSH at Any time
American white pelican	1	0.04	100	0	0
great blue heron	3	0.02	60.0	0	0
white-faced ibis	1	<0.01	100	0	0
bufflehead	0	0.06	0	0	0
common merganser	1	0.05	10	100	100
bald eagle[c]	12	0.09	100	75.0[c]	95.0
Cooper's hawk	1	<0.01	100	0	0
ferruginous hawk	3	0.01	100	33.3	33.3
merlin	1	<0.01	100	0	0
peregrine falcon	1	<0.01	100	0	0
sharp-shinned hawk	2	<0.01	100	50.0	50.0
Swainson's hawk	2	<0.01	100	100	100

[a] 800-meter (m; 2,625-foot [ft]) radius plot and 60 min survey for large birds; 100-m (328-ft) radius plot and 20 min survey for small birds

[b] The likely rotor-swept height (RSH) for potential collision with a turbine blade, or 25 – 200 m (82-656 ft) above ground level

[c] Does not include the one unidentified eagle observed during fixed-point bird use surveys.

Spatial Use

For all large bird species combined, use (focused within 800 m) was highest at Point 9 (47.15 birds/20-min survey) largely due to high waterfowl use at this point (32.08 birds/20-min survey). Waterfowl were observed at all but two points, with use ranging from 0.08 – 32.42 birds/20-min survey (Table 7). Large bird use at other points ranged from 2.62 – 39.17 birds/20-min survey. Waterbird use was observed at seven of the 16 points, ranging from 0.08 (at Point 6) – 5.46 (at Point 9) birds/20-min survey and shorebird use was recorded at all points, ranging from 0.15 – 23.54 birds/20-min survey. Diurnal raptors were observed at all points but one, with use largely driven by buteos and harriers (Table 7). Diurnal raptor use was highest at Point 9 (0.62 birds/20-min survey), and ranged from 0.08 – 0.54 birds/20-min survey at other points. Eagle use (for the observations included in analysis) occurred at Points 4, 9, and 13 (0.08, 0.31, and 0.15 birds/20-min survey, respectively), while accipiters were only observed at Point 8 (0.08 birds/20-min). Small bird use (focused within 100 m), was highest at Point 8 (101.67 birds/20-min survey), and ranged from 4.08 – 84.15 birds/20-min surveys at all other points; small bird use at all points was mostly due to use by passerines (Table 7).

Eagle Use and Flight Paths

Overall, there were 205 hours (12,300 min) of eagle fixed-point use surveys (60-min surveys) conducted at the Project (Table 8) during Year Two. During this time, 20 bald eagles were visible for 135 min and one unidentified eagle for eight min. The majority of total eagle minutes as well as eagle risk minutes were accounted for during one 60-min survey on March 5, 2017 along the eastern edge of the Project at Point 9. During the survey one group of four and one group of five bald eagles were observed for a total of 72 total eagle minutes and 43 eagle risk minutes. The unidentified eagle was recorded at Point 12 after the initial 20-min survey period. Thirteen of the 20 bald eagle observations were observed after the initial 20-min survey period, including the individuals recorded at Points 7 and 15. Flight paths for bald eagles at the Project showed no apparent pattern (Figure 3).

Table 7. Mean use recorded at each survey point during the first 20 minutes of Year Two fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use (number of birds/20-minute survey)[a] by Survey Point															
Bird Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Loons/Grebes	**0**	**0**	**0**	**0**	**0**	**0**	**0.38**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Waterbirds	**0**	**0**	**0**	**0**	**0.46**	**0.08**	**1.85**	**0**	**5.46**	**0.23**	**2.31**	**0**	**0.38**	**0**	**0**	**0**
Waterfowl	**17.85**	**16.67**	**3.46**	**5.62**	**4.62**	**0.92**	**12.31**	**32.42**	**32.08**	**15.46**	**0**	**7.69**	**0**	**1.23**	**15.75**	**0.08**
Shorebirds	**0.31**	**0.17**	**23.54**	**0.54**	**0.92**	**1.46**	**0.62**	**0.58**	**8.54**	**0.23**	**0.15**	**0.23**	**1.92**	**0.31**	**0.50**	**0.69**
Gulls/Terns	**0.77**	**3.33**	**0**	**0**	**2.54**	**0**	**7.85**	**0**	**0**	**0.69**	**0**	**0**	**0**	**0**	**0**	**0**
Rails/Coots	**0**	**0**	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Diurnal Raptors	**0.46**	**0.42**	**0.08**	**0.54**	**0.23**	**0.23**	**0.23**	**0.17**	**0.62**	**0.46**	**0.46**	**0.54**	**0.54**	**0.15**	**0**	**0.23**
Accipiters	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Buteos	*0.31*	*0.25*	*0*	*0.38*	*0.08*	*0.15*	*0.15*	*0.08*	*0.08*	*0.31*	*0.38*	*0.46*	*0.31*	*0.15*	*0*	*0.08*
Northern Harrier	*0.08*	*0.17*	*0*	*0.08*	*0.15*	*0.08*	*0.08*	*0*	*0.08*	*0.08*	*0.08*	*0*	*0*	*0*	*0*	*0*
Eagles	*0*	*0*	*0*	*0.08*	*0*	*0*	*0*	*0*	*0.31*	*0*	*0*	*0*	*0.15*	*0*	*0*	*0*
Unidentified Raptors	*0.08*	*0*	*0.08*	*0*	*0*	*0*	*0*	*0*	*0.15*	*0.08*	*0*	*0.08*	*0.08*	*0*	*0*	*0.15*
Vultures	**0**	**0.08**	**0**	**0.15**	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0.23**	**0**	**0.08**	**0.08**	**0**
Upland Game Birds	**0.92**	**0.25**	**0.15**	**0.23**	**0.23**	**0.31**	**0.23**	**0.17**	**0.23**	**0.15**	**0.15**	**0.31**	**0.15**	**0.31**	**0.33**	**1.38**
Doves/Pigeons	**0.23**	**0.50**	**0.08**	**0.46**	**0.08**	**0.08**	**0.46**	**0.83**	**0.23**	**1.31**	**4**	**0.46**	**2.08**	**0.54**	**0.25**	**0.23**
Large Corvids	**0**	**0**	**0**	**0.15**	**0.15**	**0**	**0.08**	**5.00**	**0**	**0.08**	**0.08**	**0.38**	**0**	**0**	**2.17**	**0.15**
Goatsuckers	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Overall large birds	**20.62**	**21.42**	**27.38**	**7.69**	**9.31**	**3.08**	**24.00**	**39.17**	**47.15**	**18.62**	**7.15**	**9.85**	**5.08**	**2.62**	**19.08**	**2.77**
Passerines	**8.77**	**18.50**	**6.08**	**7.00**	**10.62**	**12.85**	**18.77**	**101.42**	**10**	**37.62**	**23.92**	**11.00**	**4.00**	**15.15**	**9.83**	**83.92**
Woodpeckers	**0**	**0**	**0**	**0.08**	**0**	**0**	**0.08**	**0.17**	**0.08**	**0.08**	**0**	**0.23**	**0.08**	**0.15**	**0.08**	**0**
Kingfishers	**0**	**0**	**0**	**0**	**0**	**0**	**0.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Unidentified Birds	**0.23**	**0.17**	**0**	**0.15**	**0.15**	**0.23**	**0.15**	**0.08**	**0.15**	**0**	**0**	**0**	**0**	**0.08**	**0.83**	**0.23**
Overall small birds	**9.00**	**18.67**	**6.08**	**7.23**	**10.77**	**13.08**	**19.08**	**101.67**	**10.23**	**37.69**	**23.92**	**11.23**	**4.08**	**15.38**	**10.75**	**84.15**

800-m (m; 2,625-foot [ft]) radius plot for large birds; 100-m (328-ft) radius plot for small birds

Table 8. Survey effort, number of eagle observations and groups, total eagle minutes (min), risk minutes, and eagle use by season, observed during Year Two of the 60-min bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Season	Survey Effort (hours)	Number of Eagle Observations	Number of Groups	Total Eagle Minutes	Risk Minutes[a]	Eagle Use[b]
Bald Eagle						
Spring	47	14	6	75	45	0.29
Summer	63	2	2	25	6	0.03
Fall	47	1	1	8	5	0.02
Winter	48	3	3	27	14	0.06
Overall Bald Eagle	**205**	**20**	**12**	**135**	**70**	
Unidentified Eagle						
Spring	47	0	0	0	0	0
Summer	63	0	0	0	0	0
Fall	47	1	1	8	8	0.02
Winter	48	0	0	0	0	0
Overall Unidentified Eagle	**205**	**1**	**1**	**8**	**8**	**0**

[a] Where eagles flew below 200 meters (m) above ground level and within 800 m of the observer

[b] Eagles/800-m plot/60 minutes

Available upon request.

Incidental Observations

Thirty-six unique bird species and 10 unidentified species were observed incidentally at the Project, totaling 4,029 birds within 379 separate groups (Table 9). Sandhill crane (763 birds within seven groups) and Canada goose (*Branta canadensis*; 400 birds within 19 groups) were the most abundant incidental species observed at the Project (Table 9). Six unique and four unidentified diurnal raptor species were recorded incidentally during the Year Two survey period, totaling 177 individuals within 164 groups. Red-tailed hawk was the most abundant (114 birds within 104 groups) diurnal raptor recorded incidentally; American kestrel (*Falco sparverius*) and golden eagle were only observed incidentally, with three and one observations, respectively (Table 9).

Table 9. Incidental wildlife observed while conducting all surveys at the at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Species	Scientific Name	# Groups	# Individuals
double-crested cormorant	*Phalacrocorax auritus*	2	2
sandhill crane	*Antigone canadensis*	7	763
blue-winged teal	*Anas discors*	3	13
cackling goose	*Branta hutchinsii*	14	289
Canada goose	*Branta canadensis*	19	400
Canvasback[a]	*Aythya valisineria*	2	33
greater white-fronted goose	*Anser albifrons*	5	87
Mallard	*Anas platyrhynchos*	8	30
northern pintail	*Anas acuta*	1	5
northern shoveler	*Anas clypeata*	1	1
redhead[a]	*Aythya americana*	1	50
ring-necked duck	*Aythya collaris*	1	20
Ross' goose[a]	*Chen rossii*	6	88
ruddy duck	*Oxyura jamaicensis*	2	12
snow goose	*Chen caerulescens*	6	332
unidentified duck		6	25
unidentified goose		3	1,196
unidentified waterfowl		4	54
Killdeer	*Charadrius vociferus*	26	40
upland sandpiper	*Bartramia longicauda*	7	7
Bonaparte's gull[a]	*Chroicocephalus philadelphia*	2	26
Franklin's gull	*Leucophaeus pipixcan*	2	60
ring-billed gull	*Larus delawarensis*	8	60
unidentified gull		2	22
American kestrel[a]	*Falco sparverius*	3	3
bald eagle	*Haliaeetus leucocephalus*	3	4
golden eagle[a]	*Aquila chrysaetos*	1	1
northern harrier	*Circus cyaneus*	17	18
rough-legged hawk	*Buteo lagopus*	9	9
red-tailed hawk	*Buteo jamaicensis*	104	114
unidentified accipiter	*Accipiter spp*	4	4
unidentified buteo	*Buteo spp*	6	7
unidentified eagle		2	2
unidentified raptor		15	15
turkey vulture	*Cathartes aura*	15	24
ring-necked pheasant	*Phasianus colchicus*	24	31

Table 9. Incidental wildlife observed while conducting all surveys at the at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

Species	Scientific Name	# Groups	# Individuals
wild turkey	*Meleagris gallopavo*	2	12
Eurasian collared-dove	*Streptopelia decaocto*	2	2
rock pigeon	*Columba livia*	5	16
American crow	*Corvus brachyrhynchos*	22	94
American robin	*Turdus migratorius*	1	2
blue jay	*Cyanocitta cristata*	2	3
northern shrike	*Lanius excubitor*	1	1
unidentified blackbird		1	50
northern flicker	*Colaptes auratus*	1	1
unidentified large bird		1	1
Total		**379**	**4,029**

[a.] Species that were only 0bserved incidentally.

DISCUSSION

The Guidelines use a tiered approach to assess impacts to species and their habitats, and avian use surveys are one of a suite of Tier 3 studies used to inform risk at the Project. Tier 3 studies were targeted to address questions regarding impact that could not be sufficiently addressed using available literature (i.e., Tiers 1 and 2 desktop analyses). These studies provide additional data that, when combined with available literature reviewed in previous Tiers, allow for a confident assessment of the risk of significant population-level adverse impacts to sensitive species; identify measures to mitigate significant adverse impacts, if necessary; and/or identify a need for more field studies, if the current survey effort did not provide sufficient data to adequately characterize the potential for significant adverse impacts to such species. While the avian use surveys reported herein were conducted across all species observed, the report focuses on a smaller group of species – diurnal raptors, eagles, listed species, and State sensitive species.

The impact of wind energy development on birds can be direct or indirect. Direct impacts include fatalities or injury associated with facility infrastructure and the loss of habitat where infrastructure is placed. Indirect impacts include the displacement of wildlife and rendering habitat unsuitable through fragmentation of the landscape.

The focus of this study was mainly to document large bird use with an emphasis on eagles and diurnal raptors. The majority (86%) of all bird observations during this study were waterfowl or passerine species. The most common waterfowl species were snow and greater-white fronted geese, while the most common passerine species were common grackle and red-winged blackbird. Waterbirds composed a small percentage of the total bird observations, with sandhill cranes being the most abundant waterbird species recorded during bird use surveys. Relatively few (69 observations) diurnal raptors were observed during standardized surveys and 177 were recorded incidentally. The most common diurnal raptor species was red-tailed hawk, documented both incidentally and during scheduled surveys; golden eagles were documented only incidentally within the Project area, while bald eagles were documented both incidentally and during fixed-point bird use surveys. One State-listed species (the State-endangered peregrine falcon) was documented during the Year Two survey period; no federally listed species were documented within the Project area during the survey period. Diurnal raptors and State sensitive species are discussed in more detail below;

Diurnal Raptors

Annual mean diurnal raptor use at the Project was 0.33 raptors/800-m plot/20-min survey, with highest use in the fall and spring, likely from an influx of migrating raptors. Mean raptor use was compared with other wind energy facilities that implemented similar protocols and had data covering similar seasons, ranking 33rd from the highest compared to the 47 other wind energy facilities in North America (Figure 4).

Publicly available data containing both mean raptor use and raptor fatality information in the Midwest is scarce, while data having this information for four seasons is even rarer (Table 10). The Beethoven Project, immediately adjacent to the Project, had a mean raptor use of 0.103 raptors/800-m plot/20-min survey (Derby and Thorn 2014) and a raptor fatality rate of 0.07 fatalities/MW/year (WEST 2016; Table 10). The Wessington Springs Project, approximately 80 miles north of the project, in South Dakota had a mean raptor use of 0.23 raptors/800-m plot/20-min survey and raptor fatality rates of 0.06 and 0.07 fatalities/MW/year during two separate years of fatality monitoring (Derby et al. 2010f, 2011d). Raptor fatality rates reported at other South Dakota wind energy facilities have ranged from 0 – 0.20 fatalities/MW/year (Table 10). Raptor fatality rates throughout the Midwest have ranged from zero at numerous facilities to 0.47 fatalities/MW/year at Buffalo Ridge, Phase I (Johnson et al. 2000a).

In the Midwest states, 55 diurnal raptor fatalities representing seven species have been documented at wind energy facilities in publicly available fatality studies. Red-tailed hawks represented most of the fatalities (38 fatalities; 69.1% of raptor fatalities), followed by American kestrel (five fatalities; 9.1% of raptor fatalities), sharp-shinned hawk (four fatalities; 7.3% of raptor fatalities), rough-legged hawk (three fatalities; 5.5% of raptor fatalities), and Cooper's hawk (two fatalities; 3.6% of raptor fatalities). Each of the remaining species (merlin, Swainson's hawk, and unidentified raptor) accounted for one fatality each. These are unadjusted, raw data. Cumulative fatalities and species are from data compiled by WEST from publicly available fatality studies (a list of facilities and references are available from WEST). Based on the currently available data, raptor fatality rates in the Project will likely be similar to other wind energy facilities in the Midwest that also have low raptor use and are likely to consist of the relatively common and widespread species documented in this survey.

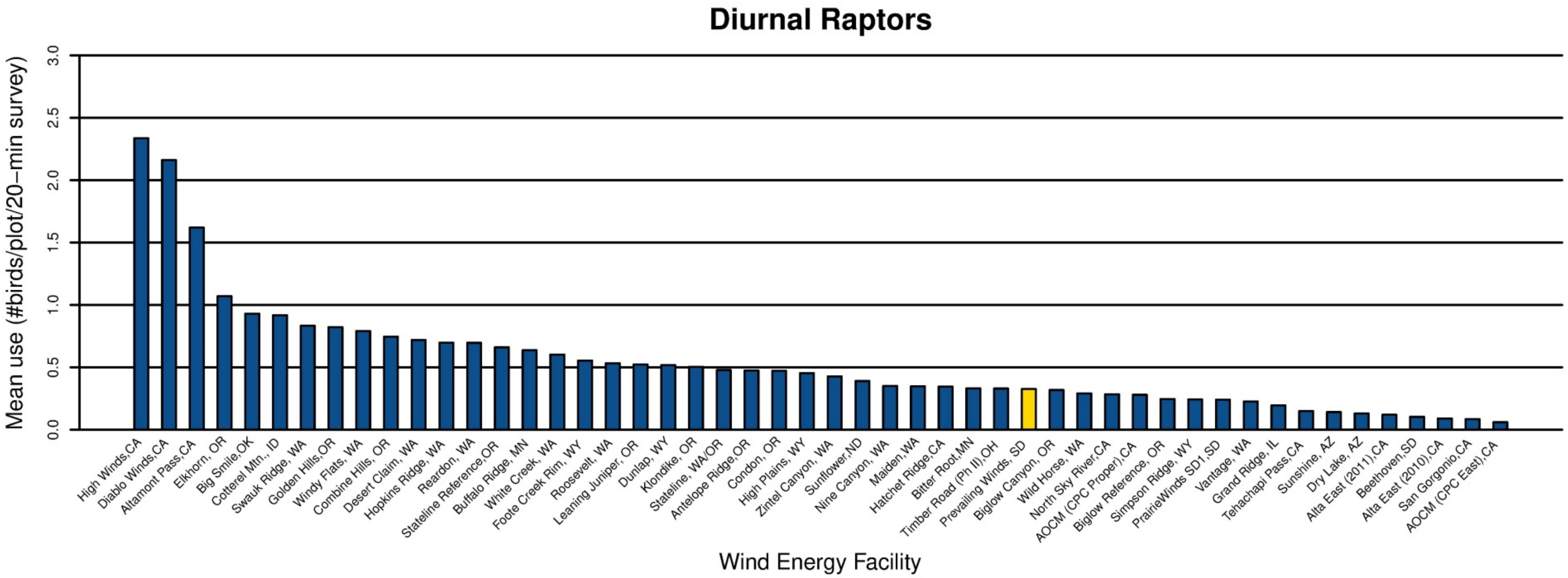

Figure 4. Comparison of estimated annual diurnal raptor use during the Year Two of the fixed-point bird use surveys conducted at the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017, and diurnal raptor use at other US wind resource areas with comparable raptor use data.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Prevailing Winds, SD	This study.				
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Wild Horse, WA	Erickson et al. 2003d
Diablo Winds, CA	WEST 2006	Roosevelt, WA	NWC and WEST 2004	North Sky River, CA	Erickson et al. 2011
Altamont Pass, CA	Orloff and Flannery 1992	Leaning Juniper, OR	Kronner et al. 2005	AOCM (CPC Proper), CA	Chatfield et al. 2010
Elkhorn, OR	WEST 2005a	Dunlap, WY	Johnson et al. 2009a	Biglow Reference, OR	WEST 2005c
Big Smile (Dempsey), OK	Derby et al. 2010a	Klondike, OR	Johnson et al. 2002	Simpson Ridge, WY	Johnson et al. 2000b
Cotterel Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003a	Vantage, WA	Jeffrey et al. 2007
Swauk Ridge, WA	Erickson et al. 2003b	Antelope Ridge, OR	WEST 2009	Grand Ridge, IL	Derby et al. 2009
Golden Hills, OR	Jeffrey et al. 2008	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Flats, WA	Johnson et al. 2007	High Plains, WY	Johnson et al. 2009b	Sunshine, AZ	WEST and the CPRS 2006
Combine Hills, OR	Young et al. 2003c	Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Dry Lake, AZ	Young et al. 2007b
Desert Claim, WA	Young et al. 2003b	Nine Canyon, WA	Erickson et al. 2001	Alta East (2011), CA	Chatfield et al. 2011
Hopkins Ridge, WA	Young et al. 2003a	Maiden, WA	Young et al. 2002	Alta East (2010), CA	Chatfield et al. 2011
Reardon, WA	WEST 2005b	Hatchet Ridge, CA	Young et al. 2007a	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Stateline Reference, OR	URS et al. 2001	Bitter Root. MN	Derby and Dahl 2009	AOCM (CPC East), CA	Chatfield et al. 2010
Buffalo Ridge, MN	Johnson et al. 2000a	Timber Road (Phase II), OH	Good et al. 2010	Beethoven, SD	Derby and Thorn 2014
White Creek, WA	NWC and WEST 2005	Biglow Canyon, OR	WEST 2005c		

Table 10. Raptor use (number of raptors/plot/20-minute survey) and fatality (number of bird fatalities/megawatt/year) estimates for wind-energy facilities in the Midwest with publicly available data.

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total #of Turbines	Total MW	Use Reference	Fatality Reference
Barton I & II, IA (2010-2011)	NA	0	80	160.0		Derby et al. 2011a
Beethoven (2016-2016)	0.103	0.07	43	80.0	Derby and Thorn 2014	WEST 2016
Big Blue, MN (2013)	NA	0	18	36.0		Fagen Engineering 2014
Big Blue, MN (2014)	NA	0	18	36.0		Fagen Engineering 2015
Blue Sky Green Field, WI (2008; 2009)	NA	0	88	145.0		Gruver et al. 2009
Buffalo Ridge I, SD (2009-2010)	NA	0.20	24	50.4		Derby et al. 2010b
Buffalo Ridge II, SD (2011-2012)	NA	0	105	210.0		Derby et al. 2012a
Buffalo Ridge, MN (Phase I; 1996)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1997)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1998)	NA	0	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 1999)	NA	0.47	73	25.0		Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1998)	NA	0	143	107.3		Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 1999)	NA	0	143	107.3		Johnson et al. 2000a
Buffalo Ridge, MN (Phase III; 1999)	NA	0	138	103.5		Johnson et al. 2000a
Cedar Ridge, WI (2009)	NA	0.18	41	67.6		BHE Environmental 2010
Cedar Ridge, WI (2010)	NA	0.13	41	68.0		BHE Environmental 2011
Elm Creek II, MN (2009-2010)	NA	0	67	100.0		Derby et al. 2010c
Elm Creek, MN (20011-2012)	NA	0	62	148.8		Derby et al. 2012b
Fowler I, IN (2009)	NA	0	162	301.0		Johnson et al. 2010
Grand Ridge I, IL (2009-2010)	0.2	0	66	99.0	Derby et al. 2009	Derby et al. 2010g
Kewaunee County, WI (1999-2001)	NA	0	31	20.5		Howe et al. 2002
Moraine II, MN (2009)	NA	0.37	33	49.5		Derby et al. 2010d
NPPD Ainsworth, NE (2006)	NA	0.06	36	20.5		Derby et al. 2007
Pioneer Prairie II, IA (2011-2012)	NA	0	62	102.3		Chodachek et al. 2012
PrairieWinds ND1 (Minot), ND (2010)	NA	0.05	80	115.5		Derby et al. 2011c
PrairieWinds ND1 (Minot), ND (2011)	NA	0.05	80	115.5		Derby et al. 2012c
PrairieWinds SD1, SD (2011-2012)	NA	0	108	162.0		Derby et al. 2012d
PrairieWinds SD1, SD (2012-2013)	NA	0.03	108	162.0		Derby et al. 2013
PrairieWinds SD1, SD (2013-2014)	NA	0.17	108	162.0		Derby et al. 2014
Rail Splitter, IL (2012-2013)	NA	0	67	100.5		Good et al. 2013
Ripley, Ont (2008)	NA	0.10	38	76.0		Jacques Whitford 2009
Rugby, ND (2010-2011)	NA	0.06	71	149.0		Derby et al. 2011b
Top of Iowa, IA (2003)	NA	0	89	80.0		Jain 2005
Top of Iowa, IA (2004)	NA	0.17	89	80.0		Jain 2005
Wessington Springs, SD (2009)	0.23	0.06	34	51.0	Derby et al. 2008	Derby et al. 2010f

Table 10. Raptor use (number of raptors/plot/20-minute survey) and fatality (number of bird fatalities/megawatt/year) estimates for wind-energy facilities in the Midwest with publicly available data.

Project Name	Raptor Use Estimate	Raptor Fatality Estimate	Total #of Turbines	Total MW	Use Reference	Fatality Reference
Wessington Springs, SD (2010)	0.23	0.07	34	51.0	Derby et al. 2008	Derby et al. 2011d
Winnebago, IA (2009-2010)	NA	0.27	10	20.0		Derby et al. 2010e

This fixed-point bird use survey was designed to provide a relative index of use by raptors during all seasons at the Project. While mean diurnal raptor use was higher during the fall and spring (0.55 and 0.51 raptors/800-m plot/20-min survey), probably due to an influx of migrant birds, the Project is not located within a known raptor migration corridor, and there are no features unique to the Project area, as compared to adjacent areas, that would appear to attract large numbers of diurnal raptors. Furthermore, raptor fatality rates reported from studies in the Midwest are typically low. Site-specific and regional data suggest there is some potential for raptor mortality, but these potential impacts to individuals are unlikely to cause significant adverse impacts to raptor populations. Likewise, there is some potential for habitat loss and displacement of individuals, but the resources available within the Project area are widely available at the local landscape level; therefore, any diurnal raptor habitat loss and displacement attributable to the Project is unlikely to result in significant adverse population-level impacts to raptors.

While abundance is intuitively connected to raptor fatality risk to some degree, risk is likely influenced by other factors as well, such as species-specific flight behaviors. Diurnal raptors were observed flying within all three fleight height categories; although the majority (53.6%) of diurnal raptors were observed flying within RSH, some differences were observed among raptor suptypes. A higher proportion of buteos and eagles flew within the RSH compared to other raptor types, while most of the harriers were observed flying below RSH, potentially indicating that some species may have a higher risk for collision; however, many of these are based on a few individual observations.

Species-Specific Summaries

American white Pelican, white-faced ibis, bufflehead, and common merganser

A single flock of 10 American white pelicans was recorded flying over the Project area in the spring; one white-faced ibis was recorded flying over the Project area in the summer; one group of 12 bufflehead was recorded using open water habitats within the Project area in the fall; and two common merganser groups, totaling 10 individuals, were observed flying over or using open water habitats within the Project area in the winter and spring. The limited number of sightings suggests that the Project area is not a major stopover or breeding area for any of these non-listed special-status species. Furthermore, habitats within the Project area are not unique in the general region, thus development of the Project would likely have minimal population-level impacts.

Great blue heron

Five great blue herons, a common summer resident and migrant in South Dakota, were recorded during the surveys conducted at the Project. Site-specific data indicate that use of the Project area by this species is low and population-level effects from Project development are unlikely.

Bald and golden eagles

A total of 24 bald eagle observations (20 during 60-min surveys and regardless of distance from observer, and four incidentally) were recorded within the Project area during Year Two surveys conducted from May 3, 2016 – April 19, 2017 (Table 4). The majority of total eagle minutes were accounted for during one survey in spring 2017 when two groups, totaling nine individual bald eagles, were observed at Point 9 for 72 total minutes. The majority (71.4%) of flying bald eagles recorded during fixed-point bird use surveys were observed within the RSH (Table 5). Bald eagles are uncommon in migration, summer, and winter throughout South Dakota; however, they are locally common below the Missouri River dams in winter and nesting within the State is increasingly reported (South Dakota Birds, Birding, and Nature 2017).

One golden eagle was recorded incidentally in the winter of 2016; no golden eagle nests were recorded during raptor nest surveys conducted in April of 2016, with most golden eagle nesting habitat in South Dakota found in the western portion of the state. Golden eagles are generally found on wide open prairies in the western half of the US (All About Birds 2017). In South Dakota, golden eagles are very often found on the Fort Pierre National Grasslands, located approximately 289.7 km (180 mi) northwest of the Project area, especially in winter and migration (South Dakota Birds, Birding, and Nature 2017).

The number and timing of eagle observations recorded during Year Two of the fixed-point bird use surveys suggest that year-round eagle use is expected. The presence of active bald eagle nests in the vicinity of the Project (Derby 2016) indicates bald eagles are present in the general area for an extended period of time (breeding season). Thus, development of the Project may influence individuals moving through or using the Project area, but given low use and apparent relatively low susceptibility of bald eagles to turbine impacts, potential impact to bald eagle populations appears minimal.

Swainson's and Ferruginous Hawk

There were two observations of Swainson's and three observations of ferruginous hawks during the Year Two study period (Table 4). Both of the Swainson's hawk observations were of flying individuals within the RSH and one of the three ferruginous hawk observations were within the RSH (Table 6). Swainson's hawks are common in South Dakota and utilize a variety of habitats, including open grasslands with occasional trees and shrubs, wetland edges, and agriculture fields, nesting in trees, shrubs, or occasionally on the ground (South Dakota Birds, Birding, and Nature 2017). Ferruginous hawk, an uncommon migrant and summer resident, is rarely observed in winter, and inhabits grasslands and open areas (South Dakota Birds, Birding, and Nature 2017).

The potential for individual mortality does exist for both species; however, the low number of fatalities reported throughout projects in the Midwest (one Swainson's hawk and no ferruginous hawk fatalities out of 55 total reported fatalities) suggests that these species are not particularly susceptible to turbine collisions in the Midwest. Collision mortality may affect a few individuals, but are unlikely to cause significant adverse impacts to either populations of the species.

Sharp-shinned and Cooper's Hawk

Two sharp-shinned hawks and one Cooper's hawk were recorded during the study period (Table 4). Both are an uncommon migrant in South Dakota, generally preferring wooded areas (South Dakota Birds, Birding, and Nature 2017). Only two Cooper's hawks and no sharp-shinned hawks have been found as fatalities through projects in the Midwest. Collision mortality may affect a few individuals of these species, but significant population-level impacts are unlikely.

Peregrine Falcon

Peregrine falcons, listed as endangered in the state of South Dakota, can be found in a variety of habitats, including tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, mountains, open forested regions, and human population centers (All About Birds 2017). When not breeding, they occur in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports. Still uncommon throughout most of its former range, reintroduction programs and natural reproduction are resulting in slowly increasing numbers and range (South Dakota Birds, Birding, and Nature 2017). In 2017, the SDGFP confirmed that two pairs of peregrine falcons successfully nested in the Black Hills of South Dakota, located approximately 300 miles west of the Project (Capital Journal 2017).

One juvenile peregrine falcon was recorded during the Year Two fixed-point bird use surveys, using grassland habitats within the Project area during the fall of 2016. Peregrine falcons have been reported in the general region where the Project is located, the closest one recorded on April of 2017 in Bon Homme County along the Missouri River, approximately 20 km (12.4 mi) to the southeast of the Project area (eBird 2017). Significant use of the Project area is unlikely due to the lack of nesting habitat and negative impacts from Project development are not expected.

YEAR ONE AND YEAR TWO SURVEYS COMPARISON SUMMARY

Ninety unique bird species were recorded during Year Two of bird use surveys compared to 72 unique bird species recorded in Year One of surveys conducted at the Project area, mainly due to a higher number of species recorded in the summer of 2016 – 2017 (60 unique species) compared to the summer of 2015 – 2016 (43 unique species). Temporal patterns of bird use were similar between years, with summer having the highest overall use, followed by migration seasons, and use being the lowest during winter. Species richness patterns were also similar between years, with overall species richness being higher for small birds compared to large birds; however, small bird species richness recorded in Year Two was almost twice as the small bird species richness recorded during Year One of surveys (2.64 and 1.64 mean number of species/plot/20-min survey, respectively).

Passerines were the most recorded bird type in both Year One and Year Two of surveys; two species composed approximately one-third (29%) of all observations in Year Two, compared to six species that composed approximately half (52%) of all observation in Year One, with red-winged blackbird being one of the most common species in both years. Waterfowl accounted for the majority of large bird observations in both years, with snow geese being the most recorded waterfowl species in Year Two and Canada geese being the most recorded waterfowl species in Year One. Waterbirds accounted for 1.5% of the total bird observations in Year Two with four species; they composed 9% of the total bird observations in Year One with only two species. Sandhill cranes were the most recorded waterbird species in both years.

Sixty-nine diurnal raptor observations within 61 groups were recorded in Year Two, compared to 89 within 83 groups Year One. Number of unique diurnal raptor species was similar between years (five in Year Two and eight in Year One); diurnal raptor species composition was similar between years, with red-tailed hawk and northern harrier being the most recorded diurnal raptor species. Diurnal raptor species composition varied between years, with American kestrel, Swainson’s hawk, and northern goshawk recorded only in Year One. Peregrine falcon was recorded only during Year Two surveys and golden eagle was observed (incidentally) only during the Year Two survey period.

Patterns of bird use varied seasonally between years. Large Bird use was highest in the spring and lowest in the summer in both years; small bird use patterns were different between years, with winter bird use being the lowest compared to any other season during Year Two surveys and the second highest during Year One surveys. Frequency of occurrence of waterbirds was similar between years, but mean use patterns were different, with waterbird use being recorded in all seasons but winter during Year Two surveys and only migration seasons during Year One surveys; almost 10 times less waterbird use was recorded in spring of Year Two surveys compared to Year One.

Diurnal raptor use was highest in the fall during both years; spring use was the second highest during Year Two and the lowest during Year One surveys. Species-specific patterns of use were different between years, with use by Cooper’s hawk being observed only in the summer of Year Two surveys, and both the fall and winter of Year One surveys. Bald eagle use was observed in all seasons but summer during Year Two surveys, and only in the winter during Year One surveys. Winter passerine use was lowest compared to any other season during Year Two surveys and was the second highest during Year One surveys.

Spatial patterns of bird use were similar between years. Although use by point varied annually and seasonally, large bird use by point was largely driven by waterfowl (generally high across points) and shorebirds (lower but consistent across points). Diurnal raptors were observed at all points but one, with use largely driven by buteos and harriers.

Diurnal raptor use at the Project was low during both years (0.33 and 0.31 raptors/800-m plot/20-min survey during Year Two and Year One, respectively), compared to other US wind facilities and comparable to other wind energy facilities in the Midwest with publicly available data. Eagle use was different between years, being higher in Year Two (20 bald eagles for a total of 135 min) compared to Year One (four bald eagles for a total of 15 min). It is unknown why eagle use was higher in Year Two compared to Year One, but most use was focused on just a one day during migration in Year Two at point 9. Based on current Project design, Point 9 is no longer part of the planned Project area.

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Appendix A. Descriptive Statistics for Bird Species Recorded during Year Two of Fixed-Point Bird Use Surveys Conducted at the Prevailing Winds Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year Two fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Loons/Grebes		**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**1**	**5**
unidentified grebe		0	0	0	0	1	5	0	0	1	5
Waterbirds		**6**	**46**	**4**	**74**	**5**	**20**	**0**	**0**	**15**	**140**
double-crested cormorant	*Phalacrocorax auritus*	1	4	0	0	2	17	0	0	3	21
glossy ibis	*Plegadis falcinellus*	0	0	2	3	0	0	0	0	2	3
great blue heron[a]	*Ardea herodias*	1	1	1	1	3	3	0	0	5	5
sandhill crane	*Antigone canadensis*	4	41	1	70	0	0	0	0	5	111
Waterfowl		**45**	**1,400**	**16**	**31**	**8**	**246**	**10**	**418**	**79**	**2,095**
blue-winged teal	*Anas discors*	5	10	7	12	0	0	0	0	12	22
bufflehead[a]	*Bucephala albeola*	0	0	0	0	1	12	0	0	1	12
cackling goose	*Branta hutchinsii*	3	74	0	0	0	0	0	0	3	74
Canada goose	*Branta canadensis*	4	21	0	0	0	0	2	8	6	29
common merganser[a]	*Mergus merganser*	0	0	0	0	0	0	1	1	1	1
greater white-fronted goose	*Anser albifrons*	2	129	0	0	0	0	2	350	4	479
green-winged teal	*Anas crecca*	0	0	1	1	1	2	0	0	2	3
mallard	*Anas platyrhynchos*	9	12	5	12	2	201	3	17	19	242
northern pintail	*Anas acuta*	2	10	0	0	0	0	0	0	2	10
northern shoveler	*Anas clypeata*	0	0	2	3	0	0	0	0	2	3
ring-necked duck	*Aythya collaris*	2	28	0	0	0	0	0	0	2	28
ruddy duck	*Oxyura jamaicensis*	0	0	0	0	1	1	0	0	1	1
snow goose	*Chen caerulescens*	7	496	1	3	0	0	0	0	8	499
unidentified duck		4	95	0	0	0	0	0	0	4	95
unidentified goose		4	480	0	0	0	0	0	0	4	480
unidentified waterfowl		3	45	0	0	3	30	2	42	8	117
Shorebirds		**41**	**58**	**20**	**26**	**12**	**443**	**1**	**1**	**74**	**528**
killdeer	*Charadrius vociferus*	41	58	18	23	7	21	0	0	66	102
unidentified shorebird		0	0	0	0	5	422	1	1	6	423
upland sandpiper	*Bartramia longicauda*	0	0	2	3	0	0	0	0	2	3
Gulls/Terns		**4**	**83**	**1**	**1**	**2**	**110**	**0**	**0**	**7**	**194**
Franklin's gull	*Leucophaeus pipixcan*	3	82	0	0	1	10	0	0	4	92
Herring gull	*Larus argentatus*	0	0	1	1	0	0	0	0	1	1
ring-billed gull	*Larus delawarensis*	1	1	0	0	0	0	0	0	1	1
unidentified gull		0	0	0	0	1	100	0	0	1	100

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year Two fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
Rails/Coots		**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**
American coot	*Fulica americana*	0	0	1	1	0	0	0	0	1	1
Diurnal Raptors		**19**	**24**	**11**	**13**	**25**	**26**	**6**	**6**	**61**	**69**
Accipiters		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
Cooper's hawk[a]	*Accipiter cooperii*	0	0	1	1	0	0	0	0	1	1
Buteos		*13*	*13*	*10*	*12*	*13*	*13*	*3*	*3*	*39*	*41*
red-tailed hawk	*Buteo jamaicensis*	12	12	9	11	11	11	0	0	32	34
rough-legged hawk	*Buteo lagopus*	0	0	0	0	2	2	3	3	5	5
unidentified buteo	*Buteo spp*	1	1	1	1	0	0	0	0	2	2
Northern Harrier		*3*	*4*	*0*	*0*	*7*	*7*	*0*	*0*	*10*	*11*
northern harrier	*Circus cyaneus*	3	4	0	0	7	7	0	0	10	11
Eagles		*1*	*4*	*0*	*0*	*1*	*1*	*2*	*2*	*4*	*7*
bald eagle[a,b,c]	*Haliaeetus leucocephalus*	1	4	0	0	1	1	2	2	4	7
Other Raptors		*2*	*3*	*0*	*0*	*4*	*5*	*1*	*1*	*7*	*9*
unidentified raptor		2	3	0	0	4	5	1	1	7	9
Vultures		**1**	**1**	**5**	**7**	**1**	**1**	**0**	**0**	**7**	**9**
turkey vulture	*Cathartes aura*	1	1	5	7	1	1	0	0	7	9
Upland Game Birds		**29**	**44**	**9**	**10**	**9**	**16**	**1**	**1**	**48**	**71**
ring-necked pheasant	*Phasianus colchicus*	27	28	9	10	8	9	1	1	45	48
wild turkey	*Meleagris gallopavo*	2	16	0	0	1	7	0	0	3	23
Doves/Pigeons		**10**	**16**	**39**	**61**	**12**	**68**	**1**	**7**	**62**	**152**
Eurasian collared-dove	*Streptopelia decaocto*	0	0	6	8	1	1	0	0	7	9
mourning dove	*Zenaida macroura*	8	12	33	53	7	27	0	0	48	92
rock pigeon	*Columba livia*	2	4	0	0	4	40	1	7	7	51
Large Corvids		**8**	**68**	**1**	**1**	**4**	**26**	**5**	**5**	**18**	**100**
American crow	*Corvus brachyrhynchos*	8	68	1	1	4	26	5	5	18	100
Passerines		**166**	**1,054**	**321**	**1,829**	**137**	**2,655**	**57**	**317**	**681**	**5,855**
alder flycatcher	*Empidonax alnorum*	0	0	1	1	0	0	0	0	1	1
American goldfinch	*Spinus tristis*	0	0	13	13	10	19	4	15	27	47
American robin	*Turdus migratorius*	14	25	16	21	13	52	5	8	48	106
American tree sparrow	*Spizella arborea*	0	0	0	0	0	0	2	7	2	7
Baltimore oriole	*Icterus galbula*	0	0	2	2	0	0	0	0	2	2
barn swallow	*Hirundo rustica*	4	5	24	63	0	0	0	0	28	68

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year Two fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
blue jay	*Cyanocitta cristata*	0	0	4	4	6	8	0	0	10	12
bobolink	*Dolichonyx oryzivorus*	0	0	5	5	0	0	0	0	5	5
Brewer's blackbird	*Euphagus cyanocephalus*	0	0	1	4	2	3	0	0	3	7
brown-headed cowbird	*Molothrus ater*	10	16	29	64	8	293	0	0	47	373
brown thrasher	*Toxostoma rufum*	1	1	3	4	1	1	0	0	5	6
clay-colored sparrow	*Spizella pallida*	0	0	0	0	1	1	0	0	1	1
cliff swallow	*Petrochelidon pyrrhonota*	1	25	25	127	3	35	0	0	29	187
common grackle	*Quiscalus quiscula*	6	18	17	1,032	7	540	0	0	30	1,590
common yellowthroat	*Geothlypis trichas*	0	0	5	5	0	0	0	0	5	5
dickcissel	*Spiza americana*	0	0	13	15	0	0	0	0	13	15
eastern bluebird	*Sialia sialis*	1	1	2	2	0	0	1	5	4	8
eastern kingbird	*Tyrannus tyrannus*	1	2	26	45	0	0	0	0	27	47
European starling	*Sturnus vulgaris*	5	14	0	0	7	238	0	0	12	252
field sparrow	*Spizella pusilla*	1	1	3	3	0	0	0	0	4	4
horned lark	*Eremophila alpestris*	13	39	1	1	11	80	35	266	60	386
house finch	*Haemorhous mexicanus*	0	0	2	2	0	0	0	0	2	2
house sparrow	*Passer domesticus*	0	0	4	15	0	0	0	0	4	15
house wren	*Troglodytes aedon*	0	0	1	1	1	1	0	0	2	2
Lincoln's sparrow	*Melospiza lincolnii*	0	0	1	1	0	0	0	0	1	1
marsh wren	*Cistothorus palustris*	0	0	4	4	0	0	0	0	4	4
northern shrike	*Lanius excubitor*	0	0	0	0	1	1	2	2	3	3
orchard oriole	*Icterus spurius*	0	0	3	3	0	0	0	0	3	3
red-winged blackbird	*Agelaius phoeniceus*	23	631	45	235	16	239	0	0	84	1,105
Savannah sparrow	*Passerculus sandwichensis*	1	1	0	0	0	0	0	0	1	1
snow bunting	*Plectrophenax nivalis*	0	0	0	0	0	0	6	12	6	12
song sparrow	*Melospiza melodia*	2	2	7	7	3	53	0	0	12	62
spotted towhee	*Pipilo maculatus*	0	0	1	1	0	0	0	0	1	1
swamp sparrow	*Melospiza georgiana*	0	0	1	1	0	0	0	0	1	1
tree swallow	*Tachycineta bicolor*	2	3	0	0	0	0	0	0	2	3
unidentified blackbird		6	92	0	0	12	998	0	0	18	1,090
unidentified sparrow		3	9	1	1	10	36	1	1	15	47
vesper sparrow	*Pooecetes gramineus*	3	3	5	6	1	3	0	0	9	12
western bluebird	*Sialia mexicana*	0	0	2	2	0	0	0	0	2	2
western kingbird	*Tyrannus verticalis*	0	0	2	2	0	0	0	0	2	2

Appendix A1. Summary of individuals and group observations, regardless of distance from observer, by bird type and species recorded during the first 20 minutes of Year Two fixed-point bird use surveys conducted in the Prevailing Winds Wind Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**	**# Grps**	**# Obs**
western meadowlark	*Sturnella neglecta*	67	150	42	49	24	54	1	1	134	254
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	2	16	6	82	0	0	0	0	8	98
yellow warbler	*Setophaga petechia*	0	0	4	6	0	0	0	0	4	6
Goatsuckers		**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**
common nighthawk	*Chordeiles minor*	0	0	1	1	0	0	0	0	1	1
Woodpeckers		**1**	**1**	**6**	**6**	**7**	**8**	**0**	**0**	**14**	**15**
downy woodpecker	*Picoides pubescens*	0	0	0	0	1	1	0	0	1	1
northern flicker	*Colaptes auratus*	0	0	2	2	4	5	0	0	6	7
red-bellied woodpecker	*Melanerpes carolinus*	0	0	2	2	0	0	0	0	2	2
red-headed woodpecker	*Melanerpes erythrocephalus*	1	1	2	2	2	2	0	0	5	5
Kingfishers		**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**
belted kingfisher	*Megaceryle alcyon*	0	0	0	0	1	1	0	0	1	1
Unidentified Birds		**9**	**16**	**0**	**0**	**3**	**13**	**8**	**11**	**20**	**40**
unidentified bird (small)		9	16	0	0	3	13	8	11	20	40
Overall		**339**	**2,811**	**435**	**2,061**	**227**	**3,638**	**89**	**766**	**1,090**	**9,276**

Grps = Number of groups, # Obs = Number of observations

[a] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b] State Species of Greatest Conservation Need (SDGFP 2014)

[c] Bald and Golden Eagle Protection Act (1940)

Appendix A2. Mean large bird use (number of large birds/800-meter radius plot/20-minute survey), percent of total use, and frequency of occurrence for each large bird type and species by season during Year Two of the fixed-point bird use surveys conducted at the Prevailing Winds Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use				Percent of Use (%)				Frequency of Occurrence (%)			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Loons/Grebes	**0**	**0**	**0.1**	**0**	**0**	**0**	**0.5**	**0**	**0**	**0**	**2.1**	**0**
unidentified grebe	0	0	0.1	0	0	0	0.5	0	0	0	2.1	0
Waterbirds	**0.96**	**1.23**	**0.42**	**0**	**2.6**	**33.7**	**2.1**	**0**	**10.6**	**4.8**	**6.4**	**0**
double-crested cormorant	0.09	0	0.35	0	0.2	0	1.8	0	2.2	0	4.2	0
glossy ibis	0	0.05	0	0	0	1.3	0	0	0	3.1	0	0
great blue heron[a]	0.02	0.02	0.06	0	<0.1	0.4	0.3	0	2.1	1.6	6.4	0
sandhill crane	0.85	1.17	0	0	2.3	32	0	0	6.2	1.7	0	0
Waterfowl	**29.2**	**0.48**	**5.12**	**8.71**	**80.3**	**13.3**	**25.5**	**95.4**	**44.7**	**7.8**	**6.2**	**8.3**
blue-winged teal	0.22	0.19	0	0	0.6	5.1	0	0	11.1	6.2	0	0
bufflehead[a]	0	0	0.25	0	0	0	1.2	0	0	0	2.1	0
cackling goose	1.54	0	0	0	4.2	0	0	0	6.2	0	0	0
Canada goose	0.44	0	0	0.17	1.2	0	0	1.8	8.5	0	0	2.1
common merganser[a]	0	0	0	0.02	0	0	0	0.2	0	0	0	2.1
greater white-fronted goose	2.69	0	0	7.29	7.4	0	0	79.9	4.2	0	0	2.1
green-winged teal	0	0.02	0.04	0	0	0.4	0.2	0	0	1.6	2.1	0
mallard	0.26	0.19	4.19	0.35	0.7	5.1	20.8	3.9	17.1	3.1	4.2	4.2
northern pintail	0.21	0	0	0	0.6	0	0	0	4.2	0	0	0
northern shoveler	0	0.05	0	0	0	1.3	0	0	0	3.1	0	0
ring-necked duck	0.58	0	0	0	1.6	0	0	0	4.2	0	0	0
ruddy duck	0	0	0.02	0	0	0	0.1	0	0	0	2.1	0
snow goose	10.34	0.05	0	0	28.4	1.3	0	0	10.6	1.6	0	0
unidentified duck	1.98	0	0	0	5.4	0	0	0	8.5	0	0	0
unidentified goose	10	0	0	0	27.5	0	0	0	8.3	0	0	0
unidentified waterfowl	0.94	0	0.62	0.88	2.6	0	3.1	9.6	6.2	0	2.1	4.2
Shorebirds	**1.21**	**0.41**	**9.26**	**0.02**	**3.3**	**11.3**	**46**	**0.2**	**52.2**	**30.2**	**25.8**	**2.1**
killdeer	1.21	0.37	0.47	0	3.3	10.1	2.3	0	52.2	28.6	15.4	0
unidentified shorebird	0	0	8.79	0.02	0	0	43.7	0.2	0	0	10.4	2.1
upland sandpiper	0	0.05	0	0	0	1.3	0	0	0	3.1	0	0
Gulls/Terns	**1.77**	**0.02**	**2.29**	**0**	**4.9**	**0.5**	**11.4**	**0**	**8.5**	**1.7**	**4.2**	**0**
Franklin's gull	1.75	0	0.21	0	4.8	0	1	0	6.4	0	2.1	0
Herring gull	0	0.02	0	0	0	0.5	0	0	0	1.7	0	0
ring-billed gull	0.02	0	0	0	<0.1	0	0	0	2.1	0	0	0
unidentified gull	0	0	2.08	0	0	0	10.4	0	0	0	2.1	0
Rails/Coots	**0**	**0.02**	**0**	**0**	**0**	**0.4**	**0**	**0**	**0**	**1.6**	**0**	**0**
American coot	0	0.02	0	0	0	0.4	0	0	0	1.6	0	0

Appendix A2. Mean large bird use (number of large birds/800-meter radius plot/20-minute survey), percent of total use, and frequency of occurrence for each large bird type and species by season during Year Two of the fixed-point bird use surveys conducted at the Prevailing Winds Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use				**Percent of Use (%)**				**Frequency of Occurrence (%)**			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Diurnal Raptors	**0.51**	**0.21**	**0.55**	**0.12**	**1.4**	**5.7**	**2.7**	**1.4**	**33.9**	**15.9**	**38.2**	**8.3**
Accipiters	*0*	*0.02*	*0*	*0*	*0*	*0.5*	*0*	*0*	*0*	*1.7*	*0*	*0*
Cooper's hawk[a]	0	0.02	0	0	0	0.5	0	0	0	1.7	0	0
Buteos	*0.28*	*0.19*	*0.28*	*0.06*	*0.8*	*5.2*	*1.4*	*0.7*	*23.3*	*14.3*	*25.4*	*6.2*
red-tailed hawk	0.25	0.17	0.23	0	0.7	4.8	1.2	0	21.1	12.7	21.2	0
rough-legged hawk	0	0	0.04	0.06	0	0	0.2	0.7	0	0	4.2	6.2
unidentified buteo	0.02	0.02	0	0	<0.1	0.4	0	0	2.2	1.6	0	0
Northern Harrier	*0.09*	*0*	*0.15*	*0*	*0.2*	*0*	*0.7*	*0*	*6.4*	*0*	*14.9*	*0*
northern harrier	0.09	0	0.15	0	0.2	0	0.7	0	6.4	0	14.9	0
Eagles	*0.08*	*0*	*0.02*	*0.04*	*0.2*	*0*	*0.1*	*0.5*	*2.1*	*0*	*2.1*	*2.1*
bald eagle[a,b,c]	0.08	0	0.02	0.04	0.2	0	0.1	0.5	2.1	0	2.1	2.1
Other Raptors	*0.06*	*0*	*0.1*	*0.02*	*0.2*	*0*	*0.5*	*0.2*	*4.2*	*0*	*8.3*	*2.1*
unidentified raptor	0.06	0	0.1	0.02	0.2	0	0.5	0.2	4.2	0	8.3	2.1
Vultures	**0.02**	**0.11**	**0.02**	**0**	**<0.1**	**3.1**	**0.1**	**0**	**2.2**	**8**	**2.2**	**0**
turkey vulture	0.02	0.11	0.02	0	<0.1	3.1	0.1	0	2.2	8	2.2	0
Upland Game Birds	**0.93**	**0.16**	**0.34**	**0.02**	**2.6**	**4.4**	**1.7**	**0.2**	**53.8**	**12.7**	**19**	**2.1**
ring-necked pheasant	0.6	0.16	0.19	0.02	1.7	4.4	0.9	0.2	51.7	12.7	16.8	2.1
wild turkey	0.33	0	0.16	0	0.9	0	0.8	0	4.2	0	2.2	0
Doves/Pigeons	**0.34**	**0.98**	**1.45**	**0.15**	**0.9**	**26.8**	**7.2**	**1.6**	**17.2**	**49.5**	**15**	**2.1**
Eurasian collared-dove	0	0.13	0.02	0	0	3.5	0.1	0	0	8	2.2	0
mourning dove	0.26	0.85	0.6	0	0.7	23.2	3	0	13.1	43	10.8	0
rock pigeon	0.08	0	0.83	0.15	0.2	0	4.1	1.6	4.2	0	6.2	2.1
Large Corvids	**1.42**	**0.02**	**0.54**	**0.1**	**3.9**	**0.5**	**2.7**	**1.1**	**14.7**	**1.7**	**2.1**	**6.2**
American crow	1.42	0.02	0.54	0.1	3.9	0.5	2.7	1.1	14.7	1.7	2.1	6.2
Goatsuckers	**0**	**0.02**	**0**	**0**	**0**	**0.4**	**0**	**0**	**0**	**1.6**	**0**	**0**
common nighthawk	0	0.02	0	0	0	0.4	0	0	0	1.6	0	0
Overall	**36.38**	**3.65**	**20.11**	**9.12**	**100**	**100**	**100**	**100**				

Note: Totals by bird type and overall might not correspond to the sum of individual species due to rounding

[a.] State Species of Concern tracked by the South Dakota Natural Heritage Program (SDGFP 2017)

[b.] State Species of Greatest Conservation Need (SDGFP 2014)

[c.] Bald and Golden Eagle Protection Act (1940)

Appendix A3. Mean small bird use (number of large birds/100-meter plot/20-minute survey), percent of total use, and frequency of occurrence for each small bird type and species by season during Year Two of the fixed-point bird use surveys conducted at the Prevaling Winds Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use				Percent of Use (%)				Frequency of Occurrence %)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Passerines	**22.10**	**28.8**	**35.31**	**6.58**	**99.2**	**99.7**	**98.8**	**96.9**	**97.9**	**96.9**	**75.0**	**62.5**
alder flycatcher	0	0.02	0	0	0	<0.1	0	0	0	1.6	0	0
American goldfinch	0	0.21	0.41	0.31	0	0.7	1.2	4.6	0	21.2	21.9	6.2
American robin	0.53	0.34	0.40	0.17	2.4	1.2	1.1	2.5	21.2	23.8	10.8	8.3
American tree sparrow	0	0	0	0.15	0	0	0	2.1	0	0	0	2.1
Baltimore oriole	0	0.03	0	0	0	0.1	0	0	0	3.1	0	0
barn swallow	0.11	1.00	0	0	0.5	3.4	0	0	8.8	31.7	0	0
blue jay	0	0.07	0.04	0	0	0.2	0.1	0	0	6.6	4.4	0
bobolink	0	0.08	0	0	0	0.3	0	0	0	6.2	0	0
Brewer's blackbird	0	0.07	0.07	0	0	0.2	0.2	0	0	1.7	4.4	0
brown-headed cowbird	0.36	1.00	6.51	0	1.6	3.5	18.2	0	15.6	36.1	15.6	0
brown thrasher	0.02	0.06	0.02	0	<0.1	0.2	<0.1	0	2.2	4.8	2.2	0
clay-colored sparrow	0	0	0.02	0	0	0	<0.1	0	0	0	2.2	0
cliff swallow	0.56	2.06	0.78	0	2.5	7.1	2.2	0	2.2	38.5	6.7	0
common grackle	0.38	16.14	12.00	0	1.7	55.9	33.6	0	8.3	22.4	11.1	0
common yellowthroat	0	0.08	0	0	0	0.3	0	0	0	7.9	0	0
dickcissel	0	0.23	0	0	0	0.8	0	0	0	17.2	0	0
eastern bluebird	0.02	0.03	0	0.10	<0.1	0.1	0	1.5	2.1	3.3	0	2.1
eastern kingbird	0.04	0.71	0	0	0.2	2.5	0	0	2.2	34.6	0	0
European starling	0.29	0	0.8	0	1.3	0	2.2	0	10.4	0	10.7	0
field sparrow	0.02	0.05	0	0	<0.1	0.2	0	0	2.1	4.7	0	0
horned lark	0.81	0.02	1.67	5.54	3.6	<0.1	4.7	81.6	22.9	1.6	14.6	45.8
house finch	0	0.03	0	0	0	0.1	0	0	0	3.2	0	0
house sparrow	0	0.25	0	0	0	0.9	0	0	0	6.4	0	0
house wren	0	0.02	0.02	0	0	<0.1	<0.1	0	0	1.7	2.2	0
Lincoln's sparrow	0	0.02	0	0	0	<0.1	0	0	0	1.6	0	0
marsh wren	0	0.06	0	0	0	0.2	0	0	0	6.2	0	0
northern shrike	0	0	0.02	0.02	0	0	<0.1	0.3	0	0	2.1	2.1
orchard oriole	0	0.05	0	0	0	0.2	0	0	0	4.8	0	0
red-winged blackbird	13.19	3.67	5.28	0	59.2	12.7	14.8	0	34.2	50.6	30.6	0
Savannah sparrow	0.02	0	0	0	<0.1	0	0	0	2.1	0	0	0
snow bunting	0	0	0	0.25	0	0	0	3.7	0	0	0	10.4
song sparrow	0.04	0.11	1.18	0	0.2	0.4	3.3	0	4.2	11.1	6.7	0
spotted towhee	0	0.02	0	0	0	<0.1	0	0	0	1.6	0	0

Appendix A3. Mean small bird use (number of large birds/100-meter plot/20-minute survey), percent of total use, and frequency of occurrence for each small bird type and species by season during Year Two of the fixed-point bird use surveys conducted at the Prevaling Winds Project in Bon Homme and Charles Mix counties, South Dakota, from May 3, 2016 – April 19, 2017.

	Mean Use				Percent of Use (%)				Frequency of Occurrence %)			
	Spring	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
swamp sparrow	0	0.02	0	0	0	<0.1	0	0	0	1.6	0	0
tree swallow	0.07	0	0	0	0.3	0	0	0	4.4	0	0	0
unidentified blackbird	1.92	0	4.19	0	8.6	0	11.7	0	10.4	0	4.2	0
unidentified sparrow	0.19	0.02	0.76	0.02	0.8	<0.1	2.1	0.3	4.2	1.6	21.1	2.1
vesper sparrow	0.07	0.09	0.07	0	0.3	0.3	0.2	0	4.4	6.2	2.2	0
western bluebird	0	0.03	0	0	0	0.1	0	0	0	3.1	0	0
western kingbird	0	0.02	0	0	0	<0.1	0	0	0	1.6	0	0
western meadowlark	3.14	0.78	1.07	0.02	14.1	2.7	3	0.3	71.7	52.1	39.3	2.1
yellow-headed blackbird	0.33	1.36	0	0	1.5	4.7	0	0	2.1	6.4	0	0
yellow warbler	0	0.10	0	0	0	0.3	0	0	0	6.4	0	0
Woodpeckers	0.02	0.10	0.13	0	<0.1	0.3	0.4	0	2.2	9.8	10.7	0
downy woodpecker	0	0	0.02	0	0	0	<0.1	0	0	0	2.1	0
northern flicker	0	0.03	0.06	0	0	0.1	0.2	0	0	3.3	4.2	0
red-bellied woodpecker	0	0.03	0	0	0	0.1	0	0	0	3.3	0	0
red-headed woodpecker	0.02	0.03	0.04	0	<0.1	0.1	0.1	0	2.2	3.1	4.4	0
Kingfishers	0	0	0.02	0	0	0	<0.1	0	0	0	2.1	0
belted kingfisher	0	0	0.02	0	0	0	<0.1	0	0	0	2.1	0
Unidentified Birds	0.17	0	0.27	0.21	0.7	0	0.8	3.1	12.5	0	6.2	12.5
unidentified bird (small)	0.17	0	0.27	0.21	0.7	0	0.8	3.1	12.5	0	6.2	12.5
Overall	22.29	28.9	35.73	6.79	100	100	100	100				

Note: Totals by bird type and overall might not correspond to the sum of individual species due to rounding

APPENDIX H - BALD EAGLE NEST MONITORING

Available upon request.

APPENDIX I - NORTHERN LONG-EARED BAT ACOUSTIC SURVEY

NORTHERN LONG-EARED BAT ACOUSTIC SURVEY REPORT FOR PROJECT FEASIBLITY AND LOCATION

Prevailing Winds Study Area in Bon Homme and Charles Mix Counties, South Dakota

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REPORT REFERENCE

Derby, C., S. Simon, and K. Murray. 2016. Northern Long-eared Bat Acoustic Survey Report, Prevailing Winds Wind Farm. Prepared for Prevailing Winds, LLC, Chokio, Minnesota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

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INTRODUCTION

Prevailing Winds, LLC (Prevailing Winds), is considering the development of the Prevailing Winds Wind Farm (Project), located in Bon Homme and Charles Mix Counties, South Dakota. To help in siting the eventual Project, Prevailing Winds evaluated a large Study Area (see Figure 1 for depiction of the Study Area as defined for 2015 studies). Prevailing Winds requested that Western Ecosystems Technology, Inc. (WEST) evaluate the potential for the federally threatened northern long-eared bat (*Myotis septentrionalis*; [NLEB]) to occur within the 2015 Study Area during the summer months. This report describes the results of the NLEB presence or probable absence acoustical assessment completed for the Study Area by WEST. These surveys were conducted following the survey recommendations found in the U.S. Fish and Wildlife Service (USFWS) *Northern Long-eared Bat Interim Conference and Planning Guidance* (USFWS 2014a) and *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015).

NORTHERN LONG-EARED BAT SUMMER HABITAT REQUIREMENTS

NLEB are forest dependent species, generally relying on forest features for both foraging and roosting during the summer months (USFWS 2013; USFWS 2007). In particular, NLEB appear to be a forest interior species that require adequate canopy closure for both roost and foraging habitat (Lausen 2009). Additionally, riparian areas are considered critical resource areas for many species of bats because they support higher concentrations of prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999). While NLEB are associated with forest habitats, they also occur in agricultural settings where forest habitats have been highly fragmented.

Wing morphology of the NLEB makes them ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Abundance of NLEB prey items, particularly beetles and moths, are typically higher in more closed forest stands than in openings, which supports studies which have found that NLEB tend to avoid open habitats (Owen et al. 2003).

During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (USFWS 2007; USFWS 2013). Males and non-reproductive females may also roost in cooler places, like caves and mines. NLEB seem opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. NLEB have also been found roosting in structures like barns and sheds.

During the summer months, NLEBs are unlikely to cross over large open lands (i.e., land lacking suitable habitat) to search for foraging and roosting habitats, but rather to use tree-lined linear features as travel corridors to and from roosting and foraging habitats (USFWS 2014a). These tree-lined corridors may be important for bats as navigational aids in agricultural landscapes, as protection from predators and wind, and may act to concentrate insect prey (Verboom and Huitema 1997). The NLEB is expected to be particularly tied to intact forested habitats; for example, Henderson and Broders (2008) found that NLEB did not travel more than 255 feet (78 meters) from the edge of intact forest structure. A study of nine female NLEBs using an intensively managed forest in West Virginia found this species forages in areas with forest patch sizes between 114 and 161 acres (46 and 65 hectares; Owen et al. 2003); however, studies in landscapes dominated by agricultural activities found NLEB can use woodlots and riparian zones with as little as 15 to 49 acres (6 to 20 hectares) of forest cover (Henderson and Broders 2008; Foster and Kurta 1999).

METHODS

Acoustic surveys followed the USFWS *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015), per the *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014a). The USFWS guidelines require one survey site for every 123 acres of suitable habitat for a minimum of four detector nights (USFWS 2014a). Two sampling locations at each survey site should then be surveyed for a minimum of two detector/nights each.

Initial desktop assessment of potential habitat conducted by WEST, identified approximately 1,180 acres of forested habitat; as such, this equates to 20 survey locations (two detectors per site). Although the USFWS protocol calls for 20 survey locations (10 sites with two detectors per site) for two detector/nights (for a total of 40 detector/nights), WEST surveyed 20 locations/stations for a minimum of two nights each for a total of 104 detector nights. WEST biologists deployed up to eight detectors at suitable sites throughout the Study Area for a minimum of four detector nights.

Acoustic surveys were conducted from July 21 – August 10, 2015 following USFWS guidelines (USFWS 2015). Bats were surveyed using SD1 or SD2 AnaBat™ ultrasonic detectors (Titley Electronics Pty Ltd., NSW, Australia), or SM2 Song Meter detectors (Wildlife Acoustics, Inc., Concord, Maine). Acoustic monitoring began before sunset and continued for the entire night. Survey duration at each site was for a minimum of two nights. If weather conditions such as persistent rain (> 30 minutes), strong winds (> 9 mph for > 30 minutes), or persistent cold temperatures (below 10°C [50°F] for > 30 minutes) occurred during the first five hours of a survey night, then that site was surveyed for an additional night (USFWS 2014). To maximize the quality of recorded echolocation calls, detectors were positioned at least 1.5 meters off the ground, at ≥ 45° angle, and with PVC tube weatherproofing (Britzke et al. 2010, USFWS 2014a). Sensitivity was set to “6” on AnaBat detectors, and the amplifier gain was set to 36 decibels for the SM2 units.

Bat calls were identified to species using Bat Call Identification (BCID; Allen 2012). If the identification program identified calls as NLEB at a site with a high degree of probability ($P < 0.05$), then qualitative analysis was conducted to determine if NLEB were present or absent at the site. Qualitative echolocation call analysis was conducted by a biologist experienced with acoustic identification and who met required USFWS qualifications (Dr. Kevin Murray of WEST; USFWS 2014a). If probable NLEB echolocation call sequences identified by BCID were not characteristic of NLEB, contained distinct calls produced by species other than NLEB, or were of insufficient quality, they were reclassified. Per USFWS guidelines, NLEB were considered present at sites with probable calls verified by qualitative analysis. NLEB were considered absent from sites with no probable NLEB calls or from sites with probable NLEB calls that were not verified by qualitative analysis. The Study Area lies well outside of the accepted range of Indiana bats; therefore Indiana bats were not included in the BCID model.

RESULTS

AnaBat and SM2 detectors were used to survey 20 acoustic survey locations, consisting of two detector stations per site, from July 21 – August 10, 2015. UTM coordinates and brief site descriptions for each site are listed in Table 1. Pictures and datasheets with site descriptions are found in Appendices A and B. WEST checked weather at the Hajek Farms, Tyndall, SD (KSDTYNDA2) weather station, which can be found on Weather Underground's Wundermap (http://www.wunderground.com/wundermap/). Weather conditions at sites 1, 2, 3, 4, 5, 6a, and 8 did not meet the standards for acoustic monitoring set by USFWS (2014a) on July 25 and at sites 6, 9, 10, and 11 on July 27 due to wind speeds sustaining greater than 9 miles per hour during the first five hours of survey on both nights. However, data on these nights were still included in the analysis because, while not ideal, conditions could still be suitable during a portion of the night and NLEB and other bats might still be detected. Weather conditions at all 20 locations for all other survey nights met the criteria established by the USFWS (2014a), and each detector location had at least two detector nights with good weather conditions (Table 2). Acoustic surveys were completed at 20 locations (two detector stations per site) for a total of 104 detector nights (Tables 1 and 2). BCID identified a total of 6,478 bat call files and identified 6,323 files (98%) to species, with an average of 62.3 bat calls per detector night (Table 2). Table 2 summarizes the number of detector nights, number of bat call files, and number of bat calls identified to species at each site. Table 3 provides information on species identifications for each site.

Based on the BCID analysis, nine stations (locations), recorded potential NLEB calls with a p-value less than 0.05 for the maximum-likelihood estimation (Table 4); therefore data from the nine stations were included in qualitative analysis (USFWS 2014a). Six stations (PW1, PW6a, PW8a, PW11, PW14, and PW16) recorded probable (i.e., p-value <0.05) NLEB calls on a single night only; stations PW9a and PW17 recorded probable NLEB calls on two and three nights, respectively; and station PW13 recorded probable NLEB calls on six nights (Table 4). Qualitative identification verified the presence of NLEB at stations PW9a (on a single night only) and PW13 (on six nights); however, qualitative analysis did not verify the presence of NLEB at the remaining seven stations with probable NLEB calls (Table 4).

DISCUSSIONS/CONCULSIONS

Limited information is available on NLEB migratory pathways and behaviors. While there is some information suggesting this species tends to follow forested areas and avoid open areas if possible, these bats may occasional move through non-forested areas.

The habitat assessment conducted by WEST at the Study Area provides information on potential NLEB habitat that might be found within the Study Area and nearby areas. If these bats occur in the area during the summer months, they will likely occur within or near (within

1,000 feet) of these habitat patches. Given its association with forest habitat (Henderson and Broders 2008; Foster and Kurta 1999), WEST anticipates that the larger and more contiguous blocks of forested areas would be more likely to be used by these species compared to the smaller forested blocks and/or tree lines and shelterbelts.

The NLEB was qualitatively verified as occurring at two acoustical stations surveyed within the Study Area (stations PW9a and PW13). Though not documented during this survey effort, there is potential for NLEB to be present within other suitable habitat within the Study Area during the summer months, particularly in the west/southwest portions of the Study Area, given the density and distribution of potential NLEB habitat; and the connectivity to larger forested and/or forested riparian habitats just outside of the Study Area boundary (i.e., forested/semi-forested corridors of Choteau Creek and Dry Choteau Creek and tributaries thereof).

Surveys are considered complete for all 20 stations at the Study Area and no further action is recommended to confirm NLEB presence within the current boundary (Table 5); however, acoustic data is probabilistic and presence determinations can be error prone. For a more detailed assessment of NLEB occurrence in the area, the USFWS guidelines (USFWS 2014a, 2015) recommend mist-netting in combination with radio-telemetry and emergence counts to confirm roost tree locations and roost size (Phase 3 and 4). Though the possibility exists for mist-netting results to contradict the acoustic results, it is unlikely for the USFWS to overturn acoustic evidence with mist-net evidence.

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Table 1. Location and site description of the 20 acoustic survey stations at the Prevailing Winds Study Area.

Station ID	Zone	Easting†	Northing†	Site Description
PW1	14	0569563	4776786	Edge of shelterbelts, adjacent to agricultural fields
PW2	14	0568133	4774899	Open woodlot adjacent to pasture
PW3	14	0568878	4775146	Edge of shrubby grove, adjacent to pond and pasture
PW4	14	0572800	4773535	Edge of shelterbelt and creek bed, adjacent to hay fields
PW5	14	0570321	4772303	Edge of small forest patch, adjacent to pasture
PW6	14	0579638	4770270	Edge of shelterbelt and grassy area, adjacent to pasture
PW6a	14	0574168	4770744	Grassy path adjacent to forest
PW7	14	0572985	4766554	Edge of forest in pasture
PW8	14	0575714	4766373	Edge of forest in grassy area, adjacent to pasture
PW8a	14	0575652	4768628	Grassy area adjacent to forest
PW9	14	0580064	4765600	Grassy path adjacent to forest edge and cornfield
PW9a	14	0569742	4766932	Pasture adjacent to forest edge
PW10	14	0578533	4763193	Grassy area adjacent to shelterbelt
PW11	14	0576700	4763072	Grassy area adjacent to forest edge and cropland
PW12	14	0575445	4762139	Grassy area adjacent to forest edge
PW13	14	0574443	4759581	Grassy/shrubby area adjacent to forest edges
PW14	14	0574925	4758670	Grassy/shrubby area adjacent to cedar/juniper
PW15	14	0575580	4758206	Grassy area adjacent to forest edge
PW16	14	0576680	4757714	Grassy area adjacent to forest edge
PW17	14	0578987	4756031	Grassy area adjacent to forest edge and cropland

Table 2. Number of bat calls recorded at each acoustic survey station determined by BCID for the Prevailing Winds Study Area.

Acoustic Survey Station	Total Bat Calls	Calls Identified	Detector Nights	Bat Calls/ Detector Night
PW1	248	241 (97%)	6	41.3
PW2	406	390 (96%)	6	67.7
PW3	104	100 (96%)	6	17.3
PW4	42	42 (100%)	6	7
PW5	137	135 (96%)	6	22.8
PW6a	1,309	1,296 (99%)	5	261.8
PW6	185	183 (99%)	9	20.6
PW7	379	372 (98%)	3	126.3
PW8	279	271 (97%)	5	55.8
PW8a	530	520 (98%)	4	132.5
PW9	325	320 (98%)	5	65
PW9a	203	194 (96%)	4	50.8
PW10	209	207 (99%)	5	41.8
PW11	458	450 (98%)	5	91.6
PW12	53	53 (100%)	3	17.7
PW13	699	674 (96%)	6	116.5
PW14	36	36 (100%)	6	6
PW15	29	28 (97%)	2	14.5
PW16	192	188 (98%)	6	32
PW17	655	623 (95%)	6	109.2
Total	**6,478**	**6,323 (98%)**	**104**	**62.3**

Table 3. Summary of BCID echolocation call identifications for the Prevailing Winds Study Area[1].

Station ID	EPFU	LABO	LACI	LANO	MYLU	MYSE	NYHU	PESU	UNK	Total
PW1	42	24	71	89	2	1	3	9	7	248
PW2	137	137	11	39	1	0	14	51	16	406
PW3	19	35	2	13	2	0	8	21	4	104
PW4	21	0	1	19	0	0	0	1	0	42
PW5	72	4	9	48	0	0	1	1	2	137
PW6	100	4	9	62	1	0	0	7	2	185
PW6a	626	176	22	425	1	1	29	16	13	1,309
PW7	234	36	6	60	25	0	4	7	7	379
PW8	40	181	0	2	5	0	36	7	8	279
PW8a	113	316	7	30	4	1	31	18	10	530
PW9	47	14	35	213	0	0	4	7	5	325
PW9a	51	55	9	32	4	5	5	33	9	203
PW10	97	10	16	76	2	0	0	6	2	209
PW11	115	59	48	182	2	1	3	40	8	458
PW12	24	7	0	16	0	0	1	5	0	53
PW13	123	223	8	56	15	195	28	26	25	699
PW14	14	3	1	16	0	2	0	0	0	36
PW15	16	0	1	8	0	0	2	1	1	29
PW16	45	63	2	32	9	1	14	22	4	192
PW17	138	218	3	62	8	3	17	174	32	655

[1] EPFU = Big Brown Bat; LABO = Eastern Red Bat; LACI = Hoary Bat; LANO = Silver-haired Bat; MYLU = Little Brown Bat; MYSE = Northern Long-eared Bat; NYHU = Evening Bat; PESU = Tri-colored bat; UNK = Unknown

Table 4. Summary of Myotis call identifications by BCID and qualitative analysis[1] for stations with potential Northern long-eared bat calls at the Prevailing Winds Study Area.

Station ID	Date	Identification Method	MYSE (NLEB)
PW1	July 24	BCID	1
		Qualitative	0
PW6a	July 31	BCID	1
		Qualitative	0
PW8a	July 30	BCID	1
		Qualitative	0
PW9a	August 9	BCID	1
		Qualitative	0

Table 4. Summary of Myotis call identifications by BCID and qualitative analysis[1] for stations with potential Northern long-eared bat calls at the Prevailing Winds Study Area.

Station ID	Date	Identification Method	MYSE (NLEB)
PW9a	August 10	BCID	4
		Qualitative	1
PW11	July 29	BCID	1
		Qualitative	0
PW13	August 1	BCID	39
		Qualitative	25
PW13	August 2	BCID	41
		Qualitative	21
PW13	August 3	BCID	33
		Qualitative	23
PW13	August 4	BCID	29
		Qualitative	19
PW13	August 5	BCID	19
		Qualitative	9
PW13	August 6	BCID	34
		Qualitative	16
PW14	August 1	BCID	2
		Qualitative	0
PW16	August 1	BCID	1
		Qualitative	0
PW17	August 1	BCID	1
		Qualitative	0
PW17	August 4	BCID	1
		Qualitative	0
PW17	August 5	BCID	1
		Qualitative	0

[1] Only calls with p-values < 0.05 for the maximum-likelihood estimation were included in qualitative analysis (USFWS 2014a).

Table 5. Summary of actions at each acoustic survey site for the Prevailing Winds Study Area.

Station ID	BCID NLEB Calls	Probable NLEB Calls (P < 0.05)	NLEB Qualitatively Verified	Presence/Absence Determination
PW1	Yes	Yes	No	NLEB absent
PW2	No	No	No	NLEB absent
PW3	No	No	No	NLEB absent
PW4	No	No	No	NLEB absent
PW5	No	No	No	NLEB absent
PW6	No	No	No	NLEB absent
PW6a	Yes	Yes	No	NLEB absent
PW7	No	No	No	NLEB absent
PW8	No	No	No	NLEB absent
PW8a	Yes	Yes	No	NLEB absent
PW9	No	No	No	NLEB absent
PW9a	Yes	Yes	Yes	NLEB present
PW10	No	No	No	NLEB absent
PW11	Yes	Yes	No	NLEB absent
PW12	No	No	No	NLEB absent
PW13	Yes	Yes	Yes	NLEB present
PW14	Yes	Yes	No	NLEB absent
PW15	No	No	No	NLEB absent
PW16	Yes	Yes	No	NLEB absent
PW17	Yes	Yes	No	NLEB absent

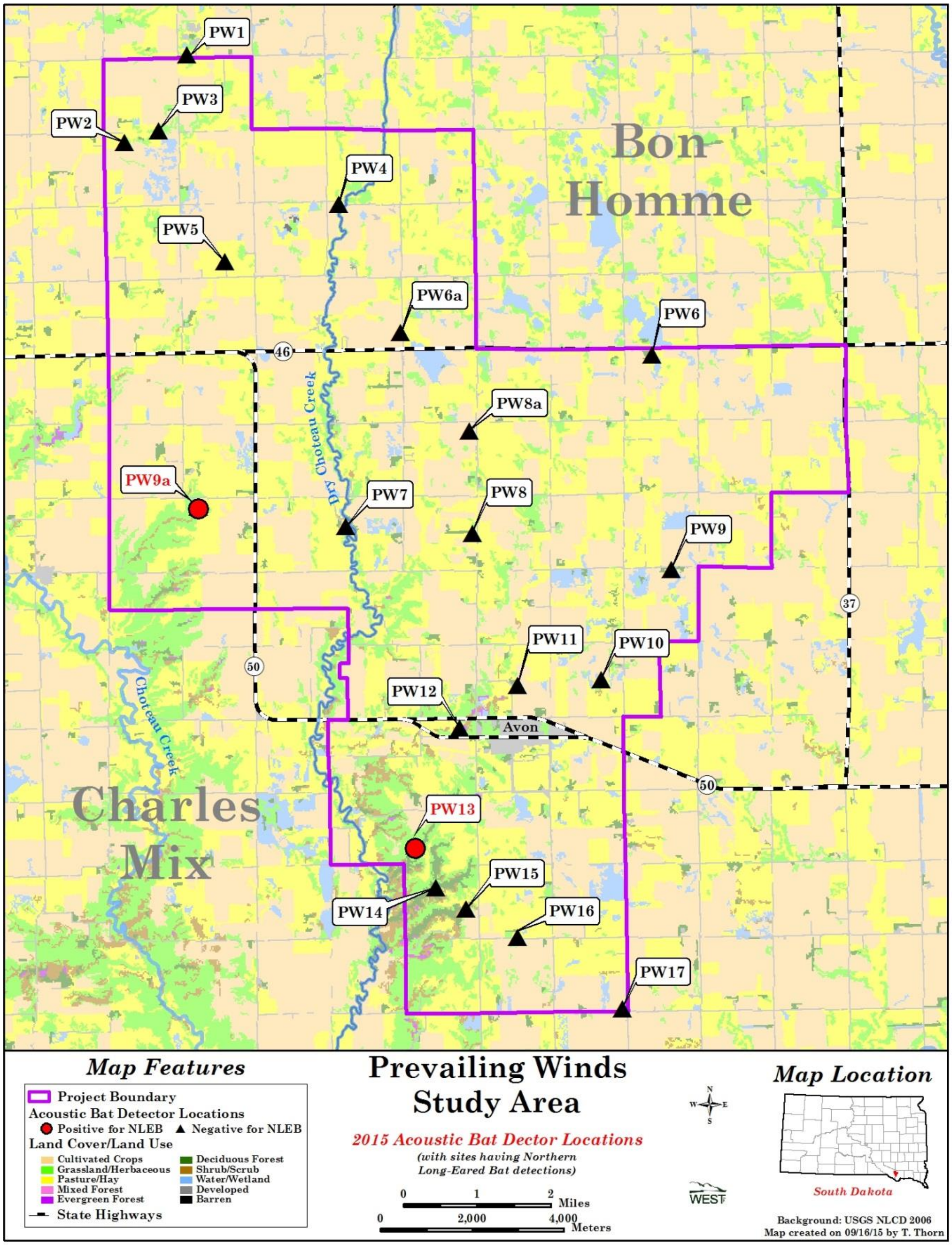


Figure 1. Locations of acoustic bat detectors and those confirmed positive for NLEB at the Prevailing Winds Study Area from July 21 through August 10, 2015.

Appendix A. Pictures of Acoustic Survey Sites

Photo 1. Bat habitat surveyed by AnaBat detector at station PW1.

Photo 2. Bat habitat surveyed by AnaBat detector at site PW2.

Photo 3. Bat habitat surveyed by AnaBat detector at station PW3.

Photo 4. Bat habitat surveyed by AnaBat detector at site PW4.

Photo 5. Bat habitat surveyed by AnaBat detector at station PW5.

Photo 6 . Bat habitat surveyed by AnaBat detector at site PW6.

Photo 7. Bat habitat surveyed by AnaBat detector at station PW6a.

Photo 8. Bat habitat surveyed by AnaBat detector at site PW7.

Photo 9. Bat habitat surveyed by AnaBat detector at station PW8.

Photo 10. Bat habitat surveyed by AnaBat detector at site PW8a.

Photo 11. Bat habitat surveyed by AnaBat detector at station PW9.

Photo 12. Bat habitat surveyed by AnaBat detector at site PW9a.

Photo 13. Bat habitat surveyed by AnaBat detector at station PW10.

Photo 14. Bat habitat surveyed by AnaBat detector at site PW11.

Photo 15. Bat habitat surveyed by AnaBat detector at station PW12.

Photo 16. Bat habitat surveyed by AnaBat detector at site PW13.

Photo 17. Bat habitat surveyed by AnaBat detector at station PW14.

Photo 18. Bat habitat surveyed by AnaBat detector at site PW15.

Photo 19. Bat habitat surveyed by AnaBat detector at station PW16.

Photo 20. Bat habitat surveyed by AnaBat detector at site PW17.

Appendix B. Datasheets from Acoustic Survey Sites

Acoustic Monitoring STATION

2011 Data Form

Station #: PW-1

Observer: RS

Date: 7-21-15

Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0569503 Northing: 4776786

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80814 *(microphone)*

_________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 1.5 *(Height from ground to detector/microphone)*

Aspect: E *(Bearing or Cardinal Direction of mic)*

Power Supply: 12V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe		Deciduous Forest		Grassland		Other (describe)	
Crop/Agriculture	1	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

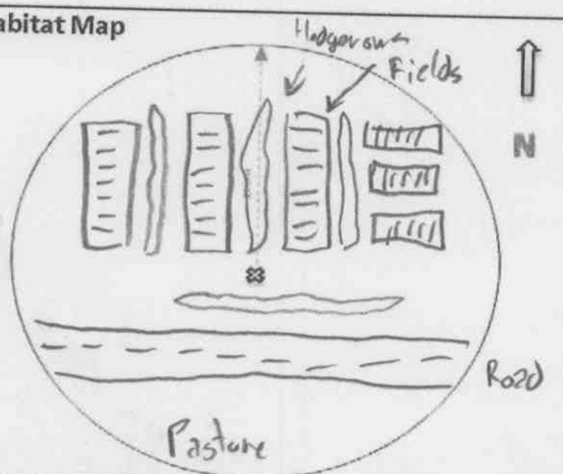
Topography: [✓ Flat] Slope High Point Low Point Other: _________

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). __Label__ and mail to your bat liaison on your thumb drive.* N, E, S, W, Unit, Core

General Remarks: _________

Habitat Map



Codes Bat Features	Description
AS=anthropogenic structure	:
CV=cave	:
MN=mine	:
RO=rocky outcrop	:
CF=coniferous forest stand	:
DF=deciduous forest stand	:
WA=water	:
Other=:	

Map out bat __and__ habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: Pw-2

Observer: RS Date: 7-21-15 Project: Prevailing Wind

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0568133 Northing: 4774899

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80966 *(microphone)*

_______ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2m *(Height from ground to detector/microphone)*

Aspect: E *(Bearing or Cardinal Direction of mic)*

Power Supply: 12V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe	2	Deciduous Forest		Grassland		Other (describe)	3
Crop/Agriculture	1	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

-Pasture

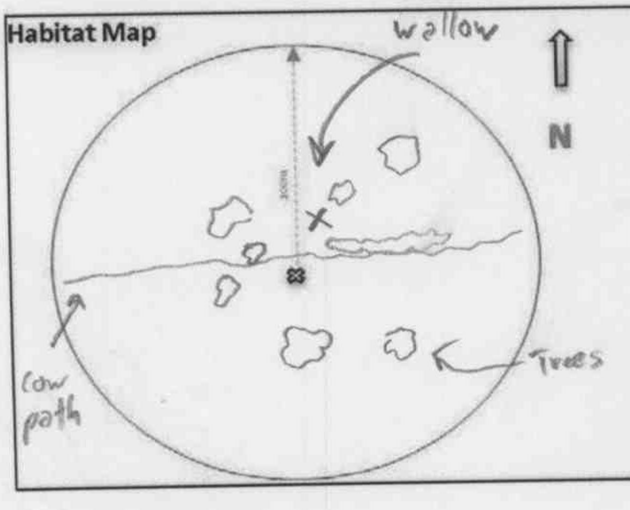
Topography: [✓ Flat] Slope High Point Low Point Other: _______

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: N, E, S, W, Unit, Cone

Habitat Map



Codes Bat Features Description

AS=anthropogenic structure :

CV=cave :

MN=mine :

RO=rocky outcrop :

CF=coniferous forest stand :

DF=deciduous forest stand :

WA=water :

Other=:

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: Pw-3

Observer: RS Date: 7-21-15 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0568878 Northing: 4775146

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 03697 *(microphone)*

________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2m *(Height from ground to detector/microphone)*

Aspect: NE *(Bearing or Cardinal Direction of mic)*

Power Supply: 12V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe	2	Deciduous Forest		Grassland		Other (describe)	1
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland	3	Pinyon-Juniper		Water (lake, etc.)			

Pasture

Topography: Flat Slope High Point [✓ Low Point] Other: ________

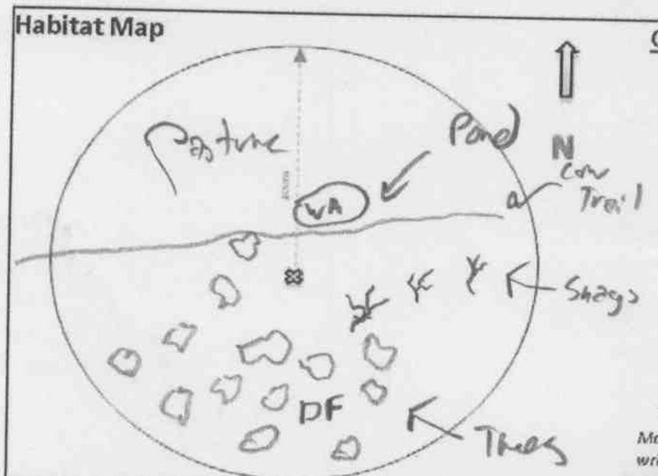
Was this station chosen to sample a bat feature? [✓ Yes] No

N, E, S, W, unit, Cone

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: ________

Habitat Map



Codes Bat Features — Description

AS=anthropogenic structure :

CV=cave :

MN=mine :

RO=rocky outcrop :

CF=coniferous forest stand :

DF=deciduous forest stand :

WA=water :

Other=:

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION

2011 Data Form

Observer: RS

Date: 7-21-15

Station #: PW-4

Project: Prevailing Winds

Station Information

Datum: NAD27 or NAD83 Zone: 14 Easting: 0572800 Northing: 4773535

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 03483 (microphone)

(recorder, if applicable)

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: E
(Bearing or Cardinal Direction of mic)

Power Supply: 12V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe	1	Deciduous Forest		Grassland		Other (describe)	2 hay field
Crop/Agriculture	2	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

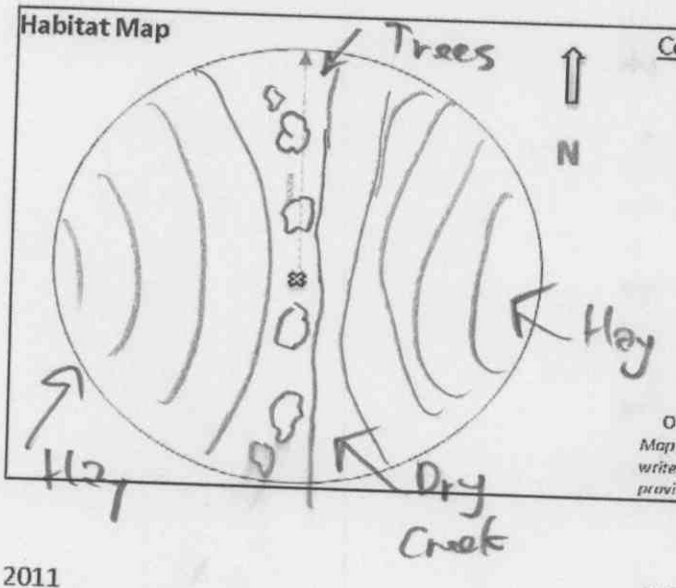
Topography: [✓ Flat] Slope High Point Low Point Other:

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.* N, E, S, W, Unit, Core

General Remarks:

Habitat Map



Codes Bat Features Description

AS=anthropogenic structure :

CV=cave :

MN=mine :

RO=rocky outcrop :

CF=coniferous forest stand :

DF=deciduous forest stand :

WA=water :

Other=:

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: Pw-5

Observer: RS Date: 7-21-15 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0570321 Northing: 4772303

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80917 *(microphone)*

________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: E
(Bearing or Cardinal Direction of mic)

Power Supply: 12V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe	1	Deciduous Forest	3	Grassland		Other (describe)	2
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

Pasture

Topography: [✓ Flat] Slope High Point Low Point Other: ________

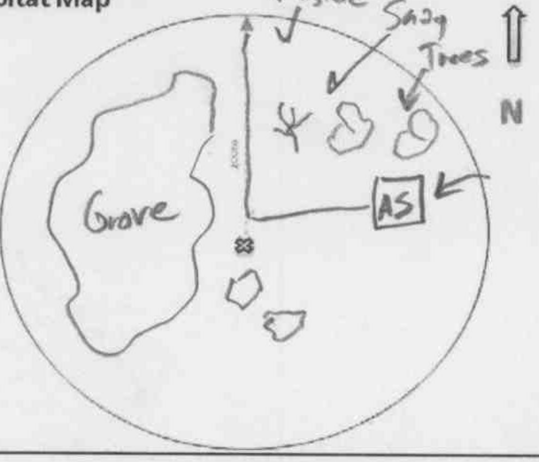
Was this station chosen to sample a bat feature? [✓ Yes] No

N, E, S, W, unit, cone

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: ________

Habitat Map



Codes Bat Features	Description
AS=anthropogenic structure	:
CV=cave	:
MN=mine	:
RO=rocky outcrop	:
CF=coniferous forest stand	:
DF=deciduous forest stand	:
WA=water	:

Other=: ________

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION

2011 Data Form

Station #: PW-6

Observer: RS

Date: 7-21-15

Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0579638 Northing: 4770270

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80482 *(microphone)*

________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: NE
(Bearing or Cardinal Direction of mic)

Power Supply: 12V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe	1	Deciduous Forest		Grassland		Other (describe)	2
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

Pasture

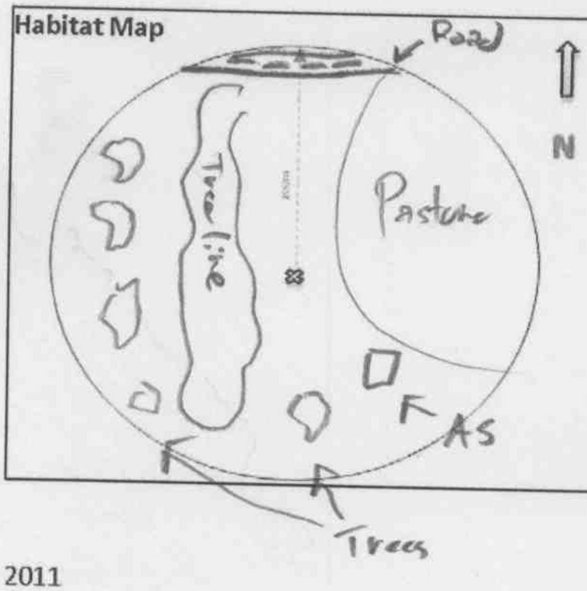
Topography: Flat [✓ Slope] High Point Low Point Other: ________

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.).* ***Label*** *and mail to your bat liaison on your thumb drive.* N, E, S, W, Unit, Cone

General Remarks: ________

Habitat Map



Codes Bat Features

Description

AS=anthropogenic structure :
CV=cave :
MN=mine :
RO=rocky outcrop :
CF=coniferous forest stand :
DF=deciduous forest stand :
WA=water :
Other=:

Map out bat ***and*** *habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.*

Acoustic Monitoring STATION **2011 Data Form** **Station #:** PW-6A

Observer: Ryan McDonald **Date:** 7/28/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14 T **Easting:** 574168 **Northing:** 4770744

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80966 (microphone)

________ (recorder, if applicable)

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: 350°
(Bearing or Cardinal Direction of mic)

Power Supply: 12V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	1	Grassland	2	Other (describe)	4
Crop/Agriculture	3	Coniferous Forest		Desert		road	
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

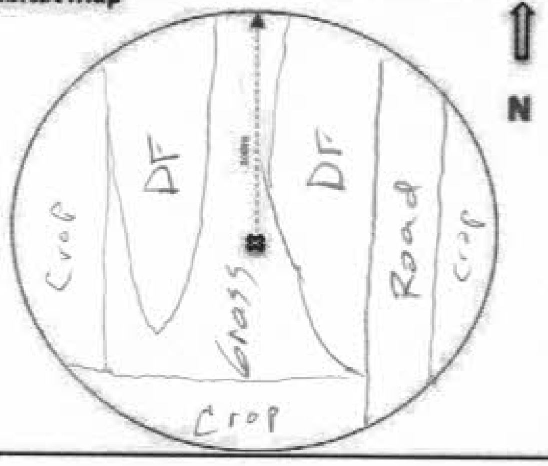
Topography: [✓ Flat] Slope High Point Low Point Other: ________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: grassy road leads directly to point

Habitat Map



Codes	Bat Features	Description
AS	anthropogenic structure	
CV	cave	
MN	mine	
RO	rocky outcrop	
CF	coniferous forest stand	
DF	deciduous forest stand	mature
WA	water	

Other=: ________

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION

2011 Data Form

Observer: RS

Date: 7-21-15

Station #: PW-7

Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0572985 Northing: 4766554

Detector Type: SD2 SD1 Anabat II [✓ SM2] Pettersson B.A.T.

Serial Number(s): 015567 *(microphone)*

________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: PVC Elbow Reflector Plate [✓ None]

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: NE
(Bearing or Cardinal Direction of mic)

Power Supply: 6V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	1	Grassland		Other (describe)	2 Pasture
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

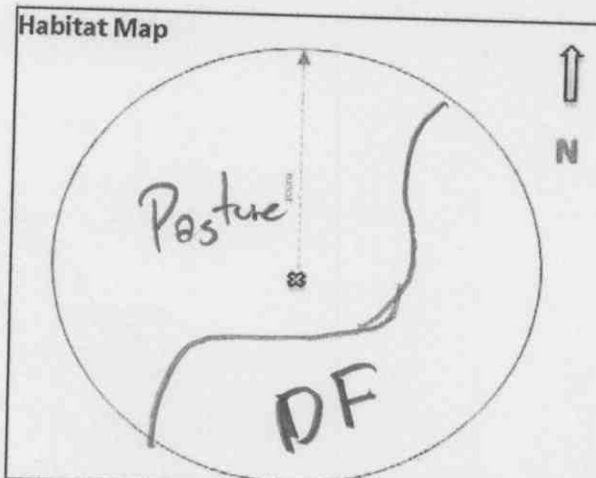
Topography: Flat Slope High Point [✓ Low Point] Other: ________

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.* N, E, S, W, Unit, Cone

General Remarks: ________

Habitat Map



Codes Bat Features | **Description**

AS=anthropogenic structure :
CV=cave :
MN=mine :
RO=rocky outcrop :
CF=coniferous forest stand :
DF=deciduous forest stand :
WA=water :
Other=:

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION

2011 Data Form

Station #: PW-8

Observer: RS

Date: 7-21-15

Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 Easting: 0575714 Northing: 4766373

Detector Type: SD2 SD1 Anabat II [✓ SM2] Pettersson B.A.T.

Serial Number(s): 015653 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: [✓ N/A] Pulley Fixed

Station Type: Fixed [✓ Temporary]

Microphone Protection: Plastic Bin Bat Hat [✓ None]

Met Tower Present? Yes [✓ No]

Sound Reception: PVC Elbow Reflector Plate [✓ None]

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: E
(Bearing or Cardinal Direction of mic)

Power Supply: GV
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe	1	Deciduous Forest	2	Grassland	3	Other (describe)	
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

Topography: [✓ Flat] Slope High Point Low Point Other: __________

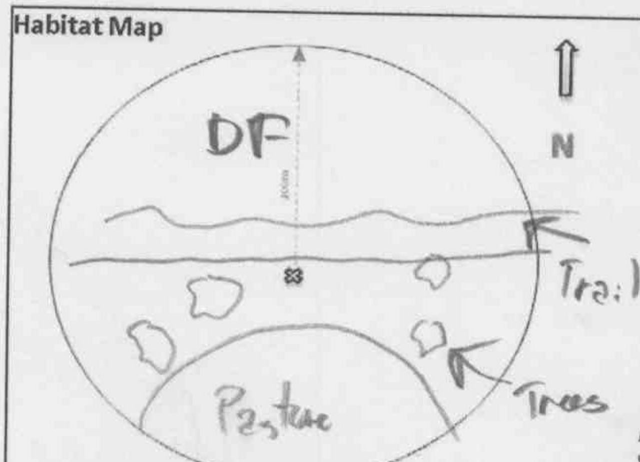
Was this station chosen to sample a bat feature? [✓ Yes] No

N, E, S, W, Unit, Cave

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). **Label** and mail to your bat liaison on your thumb drive.*

General Remarks: __________

Habitat Map



Codes Bat Features — **Description**

AS=anthropogenic structure :
CV=cave :
MN=mine :
RO=rocky outcrop :
CF=coniferous forest stand :
DF=deciduous forest stand :
WA=water :
Other=:

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION **2011 Data Form** **Station #:** PW 8 A

Observer: Ryan McDonald **Date:** 7/28/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14 T **Easting:** 575652 **Northing:** 4768628

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80917 *(microphone)*

______ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: 120
(Bearing or Cardinal Direction of mic)

Power Supply: 12V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	1	Grassland	2	Other (describe)	
Crop/Agriculture	3	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

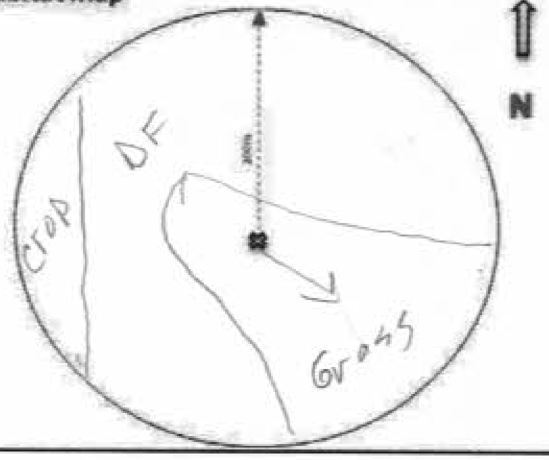
Topography: [✓ Flat] Slope High Point Low Point Other: ______

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: follow driveway to point

Habitat Map



Codes Bat Features	Description
AS=anthropogenic structure	:
CV=cave	:
MN=mine	:
RO=rocky outcrop	:
CF=coniferous forest stand	:
DF=deciduous forest stand	:
WA=water	:

Other=: ______

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION **2011 Data Form** **Station #:** PW-9

Observer: Ryan McDonald **Date:** 7/27/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14 T **Easting:** 580064 **Northing:** 4765600

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 034835 *(microphone)*

__________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2 *(Height from ground to detector/microphone)*

Aspect: 270° *(Bearing, or Cardinal Direction of mic)*

Power Supply: 12 V battery *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe		Deciduous Forest	2	Grassland	4	Other (describe)	
Crop/Agriculture	1	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper	3	Water (lake, etc.)			

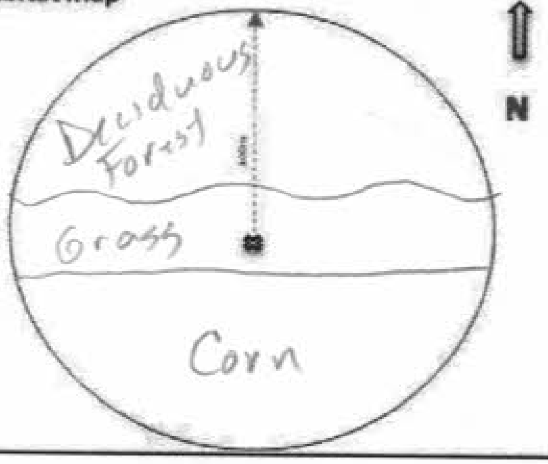
Topography: [✓ Flat] Slope High Point Low Point Other: __________

Was this station chosen to sample a bat feature? [✓ Yes] No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). __Label__ and mail to your bat liaison on your thumb drive.*

General Remarks: __________

Habitat Map



Codes **Bat Features**	**Description**
AS=anthropogenic structure	:
CV=cave	:
MN=mine	:
RO=rocky outcrop	:
CF=coniferous forest stand	: mature
DF=deciduous forest stand	: mature
WA=water	:
Other=:	

Map out bat __and__ habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: PW 9A

Observer: Ryan McDonald Date: 8/7/2015 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14T Easting: 569742 Northing: 4766932

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80917 *(microphone)*

__________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 1.5 *(Height from ground to detector/microphone)*

Aspect: 80° *(Bearing or Cardinal Direction of mic)*

Power Supply: 12 V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe		Deciduous Forest	2	Grassland	1	Other (describe)	
Crop/Agriculture		Coniferous Forest	3	Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)	4		

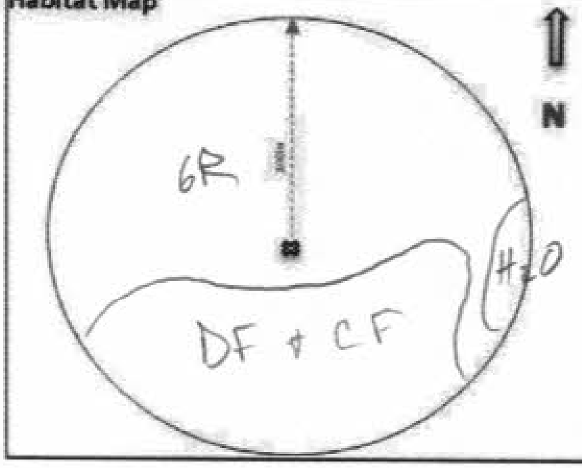
Topography: Flat [✓ Slope] High Point Low Point Other: ________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: ________

Habitat Map



Codes Bat Features — Description

AS=anthropogenic structure :
CV=cave :
MN=mine :
RO=rocky outcrop :
CF=coniferous forest stand :
DF=deciduous forest stand :
WA=water :
Other= :

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form **Station #:** PW10

Observer: Ryan McDonald **Date:** 7/27/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14T **Easting:** 578533 **Northing:** 4763193

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80814 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: 15°
(Bearing or Cardinal Direction of mic)

Power Supply: 12 V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	2	Grassland	1	Other (describe)	
Crop/Agriculture	3	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

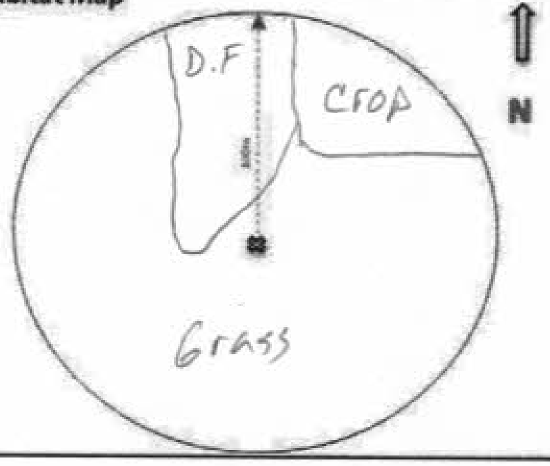
Topography: [✓ Flat] Slope High Point Low Point Other: _______________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: _______________

Habitat Map



Codes **Bat Features**	**Description**
AS=anthropogenic structure	:
CV=cave	:
MN=mine	:
RO=rocky outcrop	:
CF=coniferous forest stand	:
DF=deciduous forest stand	: mature
WA=water	:
Other=:	

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION **2011 Data Form** **Station #:** DW-11

Observer: Ryan McDonald **Date:** 7/27/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14T **Easting:** 576700 **Northing:** 4763072

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 03697 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: 5°
(Bearing or Cardinal Direction of mic)

Power Supply: 12 V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	1	Grassland	3	Other (describe)	
Crop/Agriculture	2	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

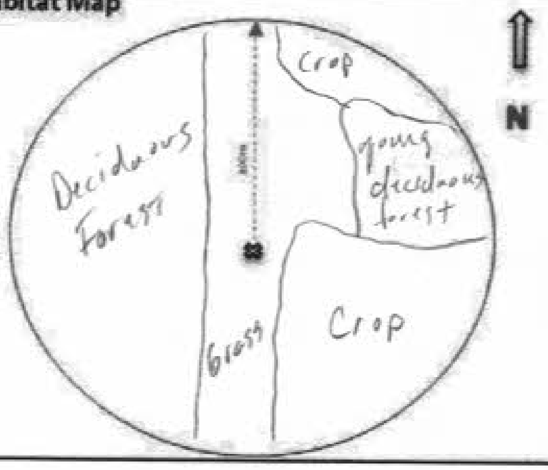
Topography: [✓ Flat] Slope High Point Low Point Other: ____________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: ____________

Habitat Map



Codes **Bat Features** **Description**

AS=anthropogenic structure: ____________
CV=cave: ____________
MN=mine: ____________
RO=rocky outcrop: ____________
CF=coniferous forest stand: ____________
DF=deciduous forest stand: ____________
WA=water: ____________
Other=: ____________

Map out bat and habitat features within 100 m radius of detector (x). Label using codes provided, and write in any other features of interest (cliff, mud, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: PW12

Observer: Ryan McDonald Date: 7/28/2015 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 T Easting: 575445 Northing: 4762139

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T. Serial Number(s): 80482 (microphone)

__________ (recorder, if applicable)

Placement: [✓ Ground] Raised Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary] Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No] Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2 (Height from ground to detector/microphone) Aspect: 200° (Bearing or Cardinal Direction of mic) Power Supply: 12 V (e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat: Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	2	Grassland	1	Other (describe)	
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

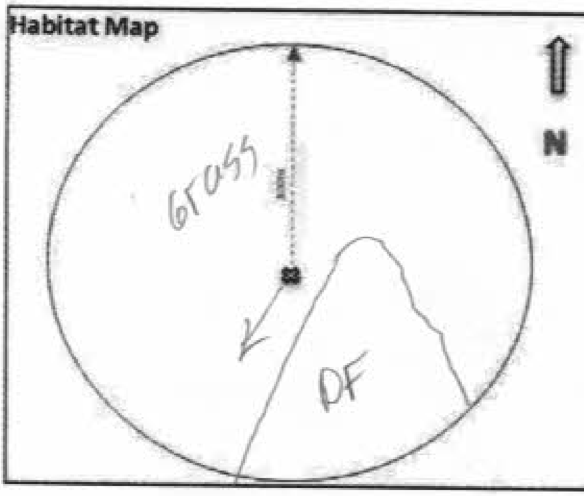
Topography: Flat Slope High Point [✓ Low Point] Other: ________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: ________

Habitat Map



Codes Bat Features Description

AS=anthropogenic structure: ________

CV=cave: ________

MN=mine: ________

RO=rocky outcrop: ________

CF=coniferous forest stand: ________

DF=deciduous forest stand: ________

WA=water: ________

Other: ________

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: PW 13

Observer: Ryan McDonald Date: 8/1/2015 Project: Prevailing Winds

Station Information

Datum: NAD27 or NAD83 Zone: 14 T Easting: 574443 Northing: 4759581

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 03483 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 1.5 *(Height from ground to detector/microphone)*

Aspect: 90 *(Bearing or Cardinal Direction of mic)*

Power Supply: 12 V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe		Deciduous Forest	1	Grassland	2	Other (describe)	
Crop/Agriculture		Coniferous Forest	3	Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

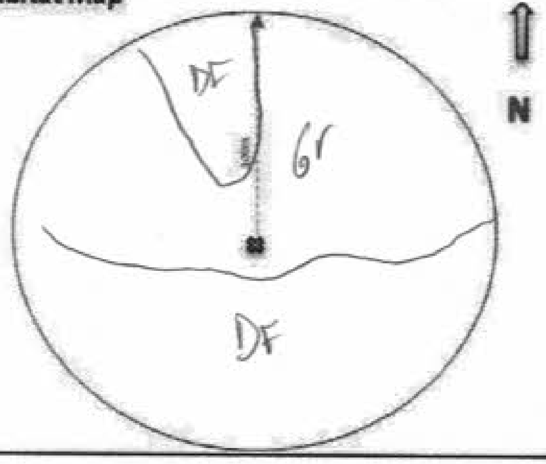
Topography: Flat Slope High Point [✓ Low Point] Other: _______________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: _______________

Habitat Map



Codes Bat Features **Description**

AS=anthropogenic structure: _______________

CV=cave: _______________

MN=mine: _______________

RO=rocky outcrop: _______________

CF=coniferous forest stand: _______________

DF=deciduous forest stand: _______________

WA=water: _______________

Other=: _______________

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION **2011 Data Form** **Station #:** PW-14

Observer: Ryan McDonald **Date:** 8/1/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14T **Easting:** 574925 **Northing:** 4758670

Detector Type: SD2 [✓ SD1] Anabat II SM2 Pettersson B.A.T. **Serial Number(s):** 03697 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised **Raised System:** N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary] **Microphone Protection:** [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No] **Sound Reception:** [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2 *(Height from ground to detector/microphone)* **Aspect:** 30 *(Bearing or Cardinal Direction of mic)* **Power Supply:** 12 V *(e.g., voltage and Amp-hours of battery, solar panel, etc.)*

Habitat Information

Habitat: *Rank by abundance within 100 m of detector. 1 = most abundant, etc.*

Shrub/Steppe	3	Deciduous Forest	2	Grassland	4	Other (describe)	
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper	1	Water (lake, etc.)			

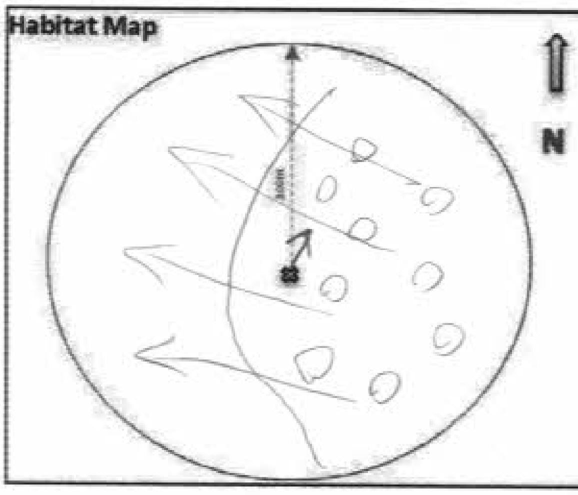
Topography: Flat [✓ Slope] High Point Low Point Other: _______________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.).* ***Label*** *and mail to your bat liaison on your thumb drive.*

General Remarks: _______________

Habitat Map



Codes	Bat Features	Description
AS=	anthropogenic structure	:
CV=	cave	:
MN=	mine	:
RO=	rocky outcrop	:
CF=	coniferous forest stand	:
DF=	deciduous forest stand	:
WA=	water	:
Other=	:	

Map out bat ***and*** *habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.*

Acoustic Monitoring STATION 2011 Data Form Station #: PW-15

Observer: Ryan McDonald Date: 8/1/2015 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14T Easting: 575580 Northing: 4758206

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80966 (microphone)

_____ (recorder, if applicable)

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 1.5
(Height from ground to detector/microphone)

Aspect: 0°
(Bearing or Cardinal Direction of mic)

Power Supply: 12 V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	2	Grassland	1	Other (describe)	
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)	3		

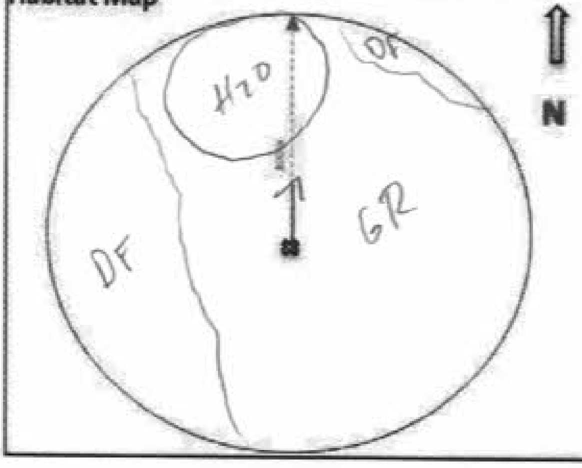
Topography: Flat Slope High Point [✓ Low Point] Other: _____

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: _____

Habitat Map



Codes Bat Features Description

AS=anthropogenic structure : _____

CV=cave : _____

MN=mine : _____

RO=rocky outcrop : _____

CF=coniferous forest stand : _____

DF=deciduous forest stand : _____

WA=water : _____

Other=: _____

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION **2011 Data Form** **Station #:** PW 16

Observer: Ryan McDonald **Date:** 8/1/2015 **Project:** Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] **Zone:** 14 T **Easting:** 576680 **Northing:** 4757714

Detector Type: SD2 SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80482 *(microphone)*

_______________ *(recorder, if applicable)*

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 2
(Height from ground to detector/microphone)

Aspect: 0
(Bearing or Cardinal Direction of mic)

Power Supply: 12 V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	2	Grassland	1	Other (describe)	
Crop/Agriculture		Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

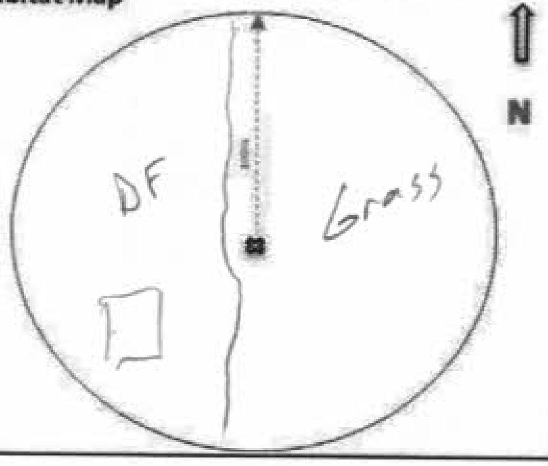
Topography: [✓ Flat] Slope High Point Low Point Other: _______________

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.). Label and mail to your bat liaison on your thumb drive.*

General Remarks: _______________

Habitat Map



Codes	Bat Features	Description
AS=	anthropogenic structure	:
CV=	cave	:
MN=	mine	:
RO=	rocky outcrop	:
CF=	coniferous forest stand	:
DF=	deciduous forest stand	:
WA=	water	:

Other=: _______________

Map out bat and habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.

Acoustic Monitoring STATION 2011 Data Form Station #: DW-17

Observer: Ryan McDonald Date: 8/1/2015 Project: Prevailing Winds

Station Information

Datum: NAD27 or [✓ NAD83] Zone: 14 T Easting: 578987 Northing: 4756031

Detector Type: [✓ SD2] SD1 Anabat II SM2 Pettersson B.A.T.

Serial Number(s): 80917 (microphone)

_____________ (recorder, if applicable)

Placement: [✓ Ground] Raised

Raised System: N/A Pulley [✓ Fixed]

Station Type: Fixed [✓ Temporary]

Microphone Protection: [✓ Plastic Bin] Bat Hat None

Met Tower Present? Yes [✓ No]

Sound Reception: [✓ PVC Elbow] Reflector Plate None

Microphone Ht (m): 1.5
(Height from ground to detector/microphone)

Aspect: 280°
(Bearing or Cardinal Direction of mic)

Power Supply: 12 V
(e.g., voltage and Amp-hours of battery, solar panel, etc.)

Habitat Information

Habitat:
Rank by abundance within 100 m of detector. 1 = most abundant, etc.

Shrub/Steppe		Deciduous Forest	1	Grassland	2	Other (describe)	
Crop/Agriculture	3	Coniferous Forest		Desert			
Riparian/Wetland		Pinyon-Juniper		Water (lake, etc.)			

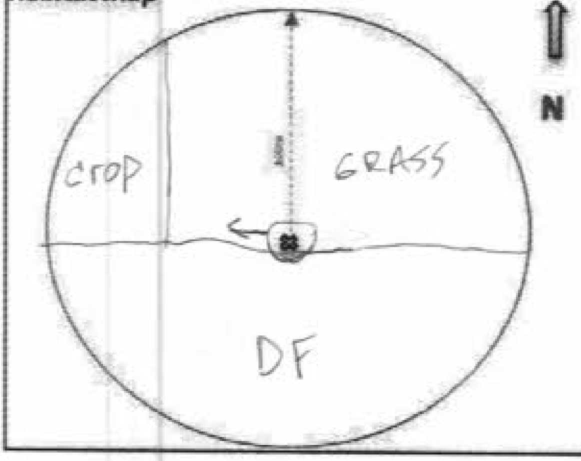
Topography: [✓ Flat] Slope High Point Low Point Other:

Was this station chosen to sample a bat feature? Yes No

Photos: *Take photos of the area from each cardinal direction (facing away from the detector), as well as from the direction the microphone is pointing, and one of the detector set-up itself. Also take photos of any bat features present and anything else of interest (e.g., sage grouse pellets, etc.).* ***Label*** *and mail to your bat liaison on your thumb drive.*

General Remarks: There

Habitat Map



Codes Bat Features **Description**

AS=anthropogenic structure:
CV=cave:
MN=mine:
RO=rocky outcrop:
CF=coniferous forest stand:
DF=deciduous forest stand:
WA=water:
Other=:

Map out bat ***and*** *habitat features within 100 m radius of detector (s). Label using codes provided, and write in any other features of interest (cliff, road, etc.). Provide descriptions for bat features in spaces provided.*

APPENDIX J - NORTHERN LONG-EARED BAT PRESENCE/ABSENCE SURVEY

WEST Inc.

ENVIRONMENTAL & STATISTICAL CONSULTANTS

4007 State Street, Suite 109, Bismarck, ND 58503
Phone: 701-250-1756 ◆ www.west-inc.com ◆ Fax: 701-250-1761

February 12, 2018

Bridget Canty
Prevailing Winds, LLC.

RE: Prevailing Winds Project
Northern Long-eared Bat 2016 Summer Presence/Absence Survey

Dear Ms. Canty,

Prevailing Winds, LLC, (Prevailing Winds) requested that Western EcoSystems Technology, Inc. (WEST) implement the USFWS 2016 Northern Long-eared Bat Survey[1] guidance to determine the presence/absence of the proposed northern long-eared bat (*Myotis septentrionalis*) within the Prevailing Winds Wind Project (the Project). Based on the Project boundary, as provided by Prevailing Winds before the 2016 survey, there were approximately 440 acres of wooded habitat within the Project boundary. The USFWS 2016 guidelines call for a minimum of two sample locations each sampled for two nights (total of four acoustic detector nights) for each 123 acres of woodlands. Based on the amount of wooded habitat, the guidelines required that 8 locations (see attached figure) be surveyed for 2 nights each, for a total of 16 detector nights.

A combination eight Anabat SD1 and SD2 detectors, with microphones elevated to 10 feet, were placed in habitat that would likely attract bats commuting between roosting and foraging areas (e.g., along forest edges and along forest corridors) in adherence with the USFWS 2016 guidelines. Detectors were deployed from July 12 until August 4, during which adequate nighttime sample conditions of low wind (below 9 mph), mild temperatures (above 50^{o}F), and lack of sustained precipitation (less than 1 hour) occurred on a minimum of two nights based on local weather stations. Other nights had elevated winds or sustained periods of rain. Regardless, call data from all nights from all detectors were analyzed.

Echolocation call analysis followed the acoustic survey guidelines issued by the USFWS which involves a combination of automated species identification software and qualitative review by an acoustic expert. Echolocation call data were reviewed using Kaleidoscope version 4.0.0, one of the candidate acoustic identification programs recommended by USFWS[2]. We selected the

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[1] US Fish and Wildlife Service (USFWS). 2016. Range-wide Indiana Bat Summer Survey Guidelines (April 2016). Available: https://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html

[2] http://www.fws.gov/midwest/endangered/mammals/inba/surveys/inbaAcousticSoftware.html

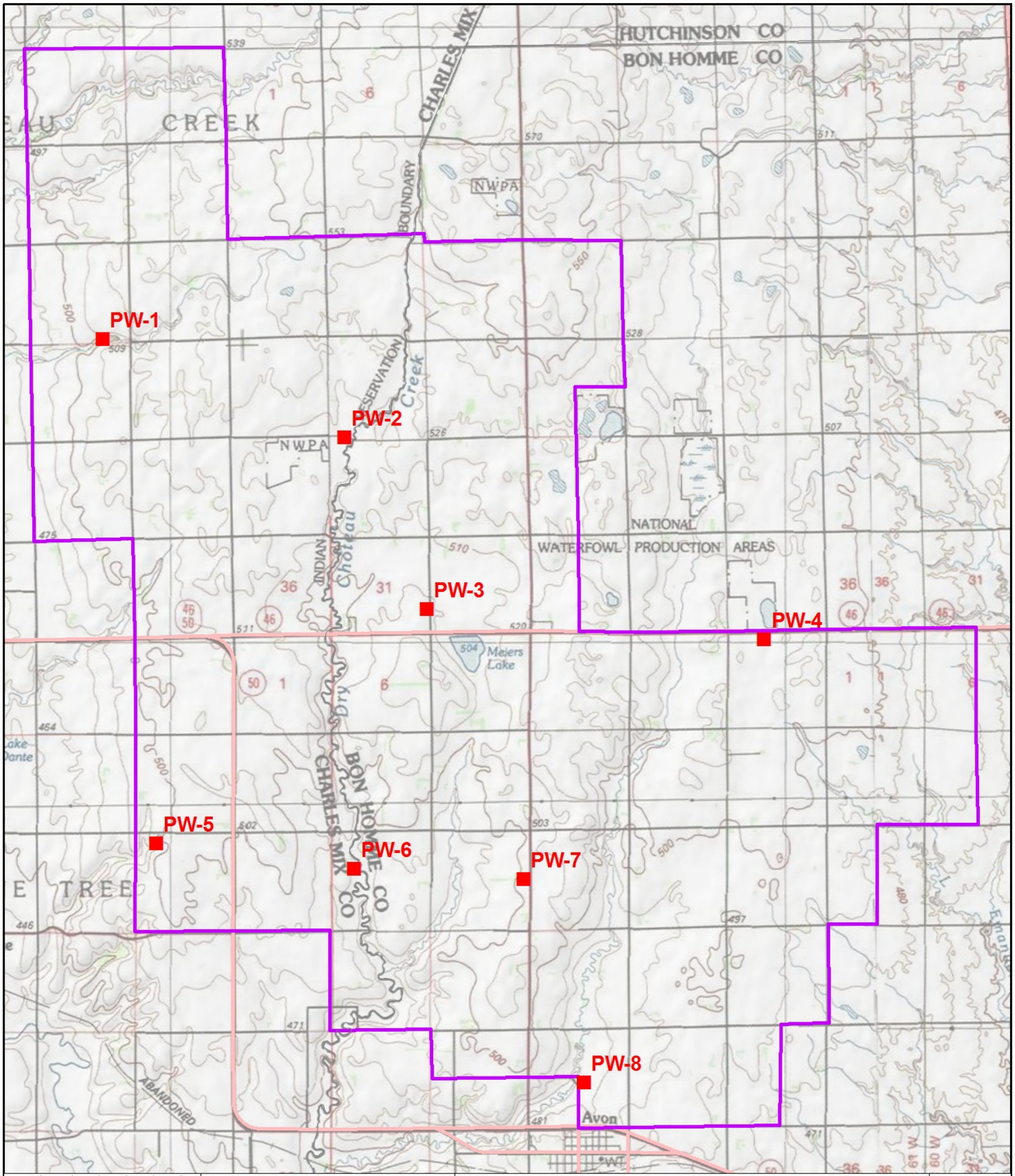
South Dakota subset of 7 species, as well as the northern long-eared bat, from the Bats of North America 3.1.0 classifier, and used the recommended sensitivity setting of -1 (Liberal). Kaleidoscope probabilistically identifies echolocation calls to species based on statistical comparison of the unknown calls to known calls. If the program identified potential northern long-eared bat calls, or identified a night that northern long-eared bats were likely present (Presence p-value > 0.05), then qualitative identification was performed to determine if calls were likely to have been produced by northern long-eared bats or other species. All calls that were identified as northern long-eared bat were reviewed by Jeff Gruver (WEST, Inc.), a recognized bat acoustic expert, per USFWS guidelines. Qualitative review was based on Mr. Gruver’s extensive experience with bat acoustics, and relied primarily on comparison of calls recorded at the site to known calls from northern long-eared and other species (e.g., little brown bats) that can produce calls similar to northern long-eared bats.

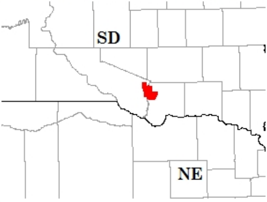
No northern long-eared bat calls were recorded at any station during the sampling period, indicating probable absence within the area.

Please let me know if you have any questions or need further information.

Sincerely,

Clayton Derby
Senior Manager





Prevailing Winds Wind Project

Anabat Locations 2016

Data Source: ESRI USA Topo Maps
Coordinate System: UTM, NAD83, zn 14N
Map produced on 06/29/2016 by T. Thorn

0 1 2 mi
0 1 2 km

Map Features

- ▭ Project Boundary
- 🟥 Potential Anabat Locations

N
W E
S

APPENDIX K - WHOOPING CRANE HABITAT REVIEW

Whooping Crane Habitat Review
Prevailing Winds Wind Project
Bon Homme and Charles Mix
Counties, South Dakota

Prepared for:

Prevailing Winds, LLC
101 Second Street West
P.O. Box 321
Chokio, Minnesota 56221

Prepared by:

Clayton Derby
Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, ND 58503

August, 2016

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

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INTRODUCTION

The Prevailing Winds Wind Project (PWWP) is proposed for development by Prevailing Winds Wind Project LLC (Prevailing Winds) in Bon Homme and Charles Mix Counties, South Dakota. Prevailing Winds requested that Western EcoSystems Technology, Inc. (WEST) implement a desktop review and analysis of potential whooping crane (*Grus americana*) habitat resources within the PWWP and to compare these resources to areas outside of the project boundary to the north, south, east, and west. The habitat review and analysis evaluates whether or not the proposed PWWP area represents the only unique whooping crane habitat compare to the surrounding landscape. From this analysis all parties can then discuss what impacts there may be to whooping cranes from development of the PWWP.

PROJECT AREA

The PWWP is located in the southeastern South Dakota counties of Bon Homme and Charles Mix, just north of the city of Avon (Figure 1). The PWWP is currently about 37,017 acres (ac; 150 square kilometers [km^2]; 58 square miles [mi^2]). Landscape within the project area is generally flat with some steeper hills. Elevations range from 454.5 to 573.7 meters (m; 1,491.2 to 1,882.3 feet [ft]) above sea level. Historically, the PWWP's landscape was dominated by grasslands but has since been converted largely to agricultural use with crop production and livestock grazing the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Wetlands are scattered throughout the PWWP with some being man-made. Common agricultural crops include small grains, corn, soybeans, and alfalfa.

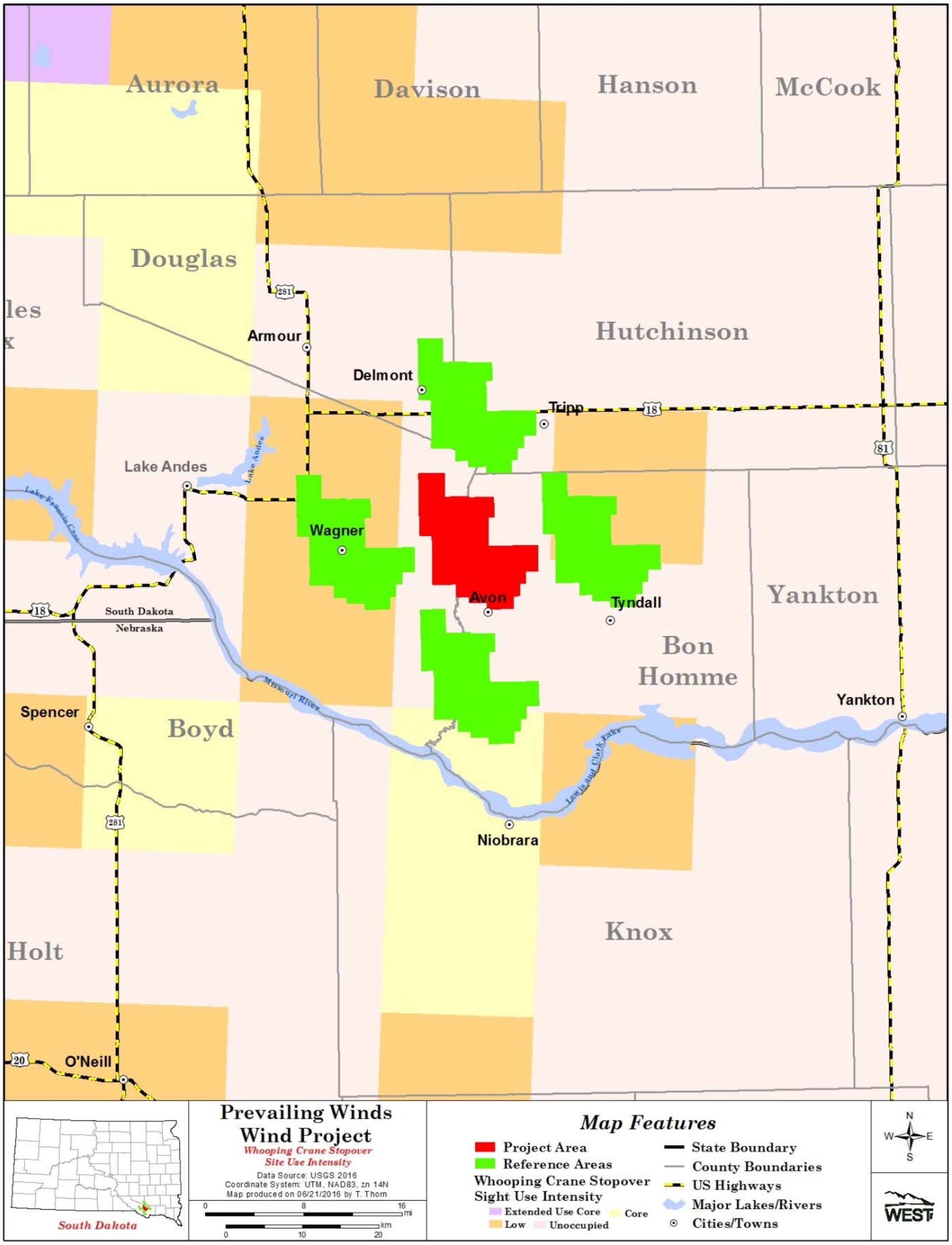

Figure 1. Location of the Prevailing Winds Wind Project, alternate areas, and whooping crane stopover site use intensity.

METHODS

A desktop review was completed using ArcGIS, ArcMap 10.3, land cover information from the National Land Cover Database (NLCD), wetland data from the National Wetland Inventory (NWI), 2014 National Agricultural Imagery Program (NAIP) aerial imagery, and the current project boundary as provided by Prevailing Winds. A site visit was not completed by WEST for this exercise specifically, but WEST has conducted other surveys at the PWWP and confirmed that the mapping generally agrees with current conditions.

The whooping crane habitat analysis included a comparison of land cover within the proposed PWWP boundary and four alternate areas of the same dimensions located adjacent (based on the PWWP's boundary extent) to the PWWP boundary in the four cardinal directions (Figure 1). A potentially suitable habitat assessment (Watershed Institute 2012) was also used to quantify and compare whooping crane habitat within the study areas. This assessment first screens all wetlands within the study areas for minimum size, visual obstructions, and disturbances. Those wetlands left are then quantified by their size, density of wetlands around them, distance to food, whether they are natural or man-made, and their water regime as a means to quantify suitability. This work was initially done in Kansas and the results were compared to Quivira National Wildlife Refuge, a traditional migratory stopover area. In Kansas, it was determined that a score of 12 or higher represented potentially suitable whooping crane habitat.

RESULTS

There is almost 17,588 ac of cropland within the proposed project area, or 47.5% of the total area. Pasture/hay lands make up approximately 38% of the project area while grass/herbaceous lands and developed areas occupy another 6.7% and 4.3% respectively. Water, forest, shrub/scrub, and barren habitats comprise the remaining 3.5% of the PWWP (Figure 2; Table 1).

Croplands, Grasslands, and Other Habitats

The percentage of cropland varied between the project area and comparison areas, with the PWWP containing the second lowest (47.5%) and the east comparison area the most (66.4%; Figure 2; Table 1). The south reference area had the least cropland (39.8%) with the north and west areas comprised of 54.1% and 55.4% cropland respectively (Table 1). All cropland has the potential as foraging areas for whooping cranes but crop type could influence the extent of use of a particular field during any one migration season.

Considering grassland/herbaceous and pasture/hay habitats as "grasslands", this habitat type also varied between analyzed areas (Figure 2; Table 1). The south (46.6%) had the most while the east reference area had the least (26.6%). Grassland percentages in the other three areas ranged from 44.2% (PWWP) to 34.8% (Table 1).

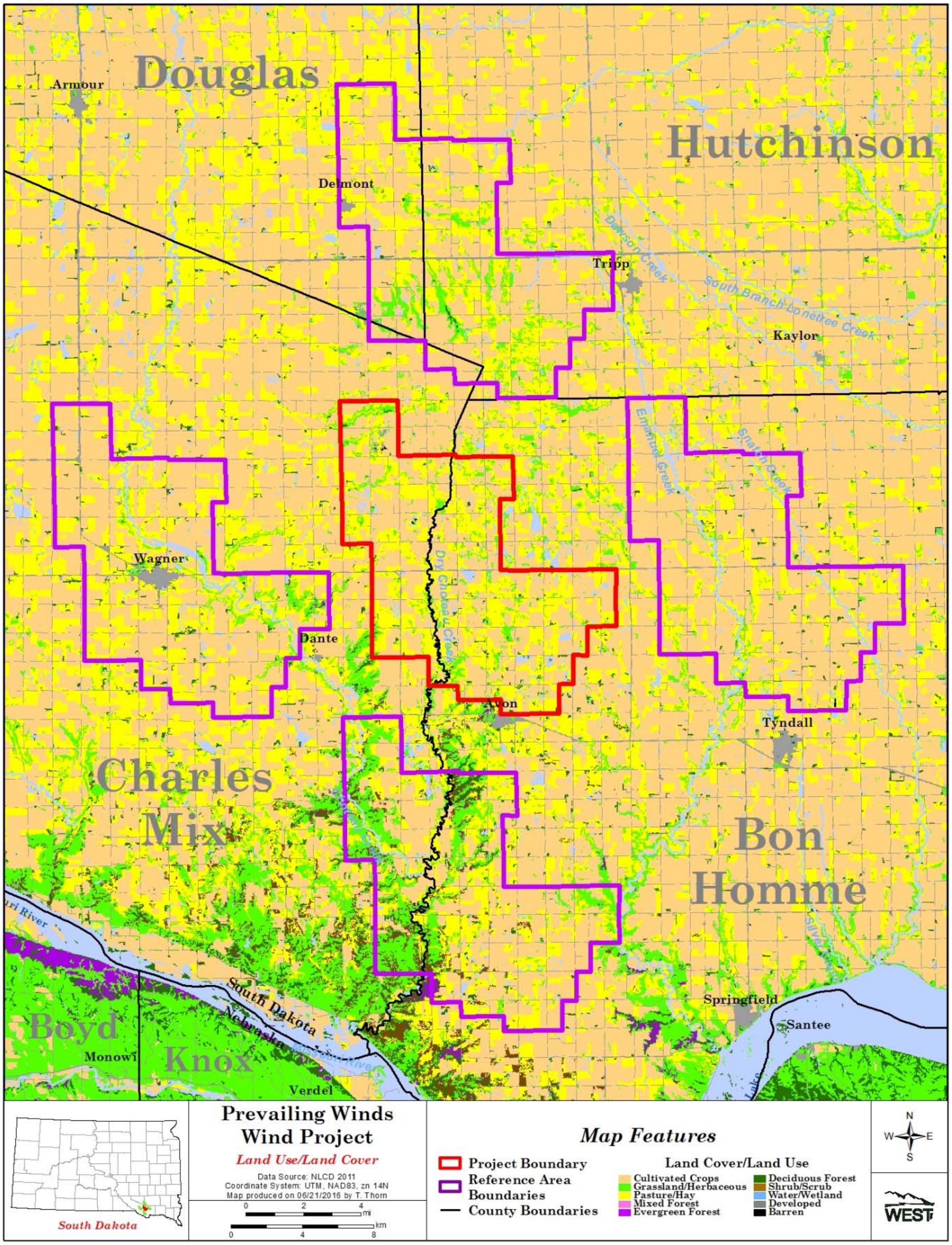

Figure 2. Land Use/Land Cover within and around the Prevailing Winds Wind Project.

The influence of grassland habitats on migrating whooping crane behavior is unknown; however, short grasslands (i.e. grazed pasture) adjacent to wetlands may provide loafing areas and cranes may utilize grasslands to some degree for foraging.

All other habitat types comprised approximately 8.3% of the PWWP's area. This is similar to the north, east, and west reference areas while in the south comparison area, other habitat types occupied 13.6% of the area. Shrub/scrub land made up almost half of the other habitats in this area (Figure 2; Table 1).

Table 1. Land Use/Land Cover within the Prevailing Winds Wind Project and adjacent areas.

	PWWP		North		East		South		West	
Habitat Type	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**cres**	**%**
Cultivated Crops	17,588.3	47.5	20,033.3	54.1	24,592.7	66.4	14,716.9	39.8	20,507.8	55.4
Grassland/Herbaceous	2,481.9	6.7	2,922.5	7.9	995.0	2.7	7,270.35	19.6	1,398.2	3.8
Pasture/Hay	13,897.5	37.5	11,676.7	31.5	8,853.2	23.9	9,985.0	27.0	1,1482.6	31.0
Developed	1,578.0	4.3	1,894.3	5.1	1,668.2	4.5	1,142.3	3.1	1,998.4	5.4
Water/Wetlands	1,016.5	2.8	327.6	0.9	562.2	1.5	682.0	1.8	1,086.7	2.9
Forests	372.1	1.0	152.5	0.4	307.5	0.8	958.8	2.6	441.8	1.2
Shrub/Scrub	67.5	0.2	9.7	<0.1	22.7	<0.1	2,251.6	6.1	93.3	0.3
Barren	14.7	<0.1			15.1	<0.1	9.7	<0.1	7.8	<0.1

National Land Cover Database - Fry et al. 2011.

Wetlands

NWI wetland data was used for this analysis because it represents wetland features to a higher degree than the NLCD. For this analysis, it is assumed that all wetlands are potential whooping crane roosting areas under one water regime or another (e.g., drought, normal, or flood). The PWWP had similar total acres, mean size and size range of wetland basins as the north and east reference areas (Table 2). Total number of wetland basins ranged from 792 in the PWWP to 924 in the east reference area. The south comparison area had the fewest basins (507) and the lowest total wetland acreage (688 ac). However, mean wetland size and wetland size range was similar to all other areas except the west comparison area (Table 2). The west reference area has by far the highest total wetland acreage (2,268.7 ac). However, almost 41% of the total acreage is made up of wetlands associated with Choteau Creek (Figure 3). This causes the size and acreage range of wetlands within this area to be somewhat misleading

Freshwater emergent (77.5%) made up the highest percentages of wetland types in the PWWP, with freshwater ponds accounting for another 14.7% (Table 3). Wetlands in all the comparison areas were 83% or greater freshwater emergent (Table 3). The west and south reference areas contained riverine wetlands with slightly more the 8% of wetlands in the west and 4% in the south classified as this wetland type (Table 3).

To summarize, the PWWP had similar wetland acreages and types as those for the north and east comparison areas and to a lesser extent the south area. The south reference area had the fewest wetland basins and smallest wetland total acreage but had similar mean wetland size and wetland size range to all other areas except the west. Wetland statistics (highest total wetland acreage, mean wetland size, and basin size range) for the west reference area were misleading due wetlands associated with Choteau Creek which intersects the area from north central to southeast (Figure 3).

Table 2. Comparison of the number of wetland basins and mean size within the Prevailing Winds Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Size - acres	Range - acres
PWWP	792	1,304.9	1.6	<0.1 – 63.4
North	913	1,158.0	1.3	<0.1 – 39.5
East	924	1,149.0	1.2	<0.1 – 34.6
South	507	687.8	1.4	<0.1 – 54.8
West	769	2,268.7	3.0	<0.1 – 919.8

Data Source: NWI data with wetland parts dissolved.

Table 3. Wetland types within the Prevailing Winds Wind Project and adjacent areas.

Wetland Type	PWWP		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Freshwater Emergent	1,011.0	77.5	962.8	83.1	987.9	85.9	610.9	88.8	1959.4	86.4
Freshwater Forested/Shrub	44.3	3.4	20.5	1.8	43.2	3.8	4.4	0.6	15.8	0.7
Freshwater Pond	192.2	14.7	122.6	10.6	95.0	8.3	43.4	6.3	79.4	3.5
Lake	57.4	4.4	52.0	4.5	23.9	2.1			24.7	1.1
Riverine							29.1	4.2	189.4	8.3

Data Source: NWI 2010.

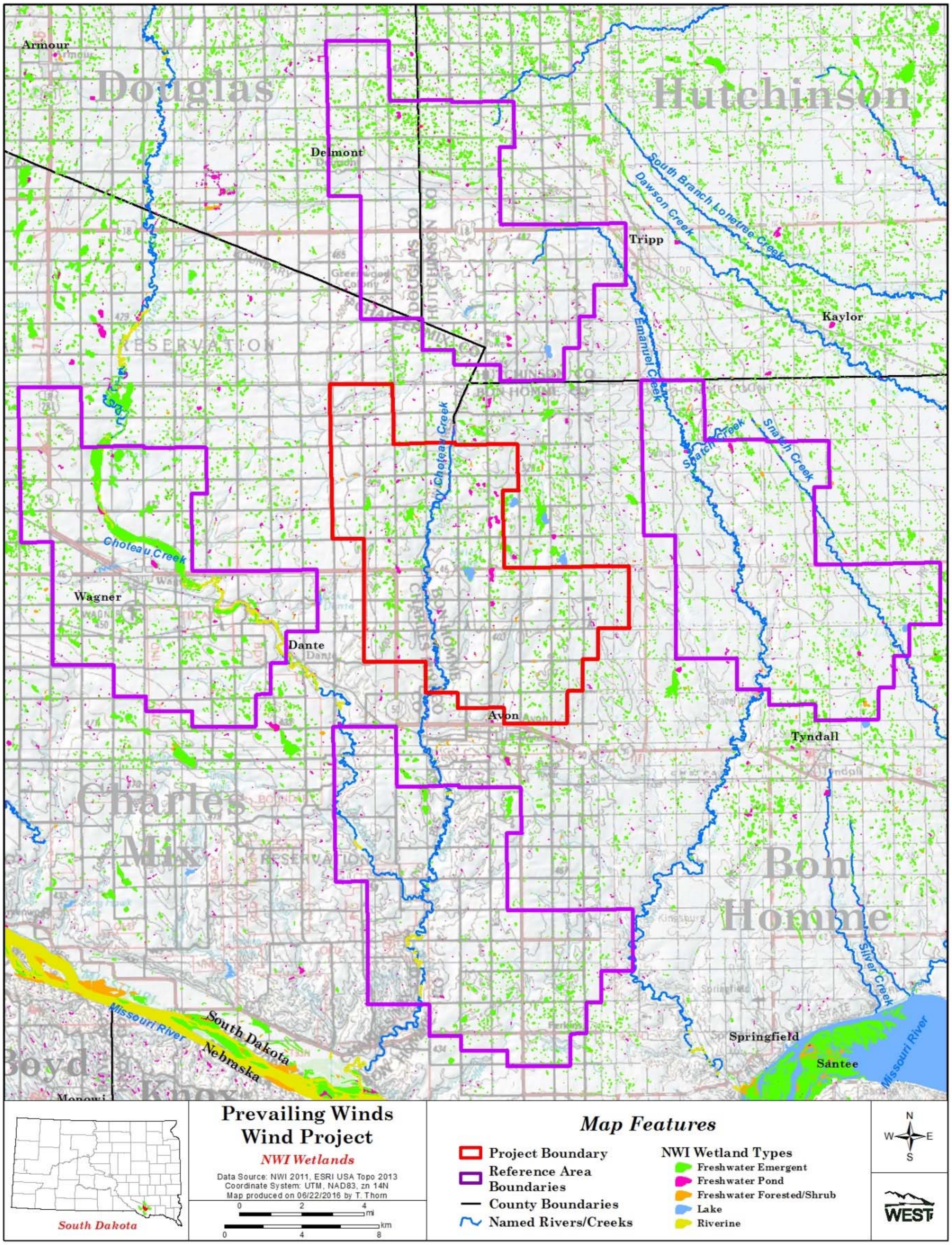

Figure 3. NWI wetlands within and around the Prevailing Winds Wind Project.

Whooping Crane Suitable Habitat Assessment

The habitat assessment model identified 262 wetland basins within the PWWP as potential whooping crane roosting habitat. The mean suitability score for these wetlands was 9.4 with the scores ranging from 6 to 16 (Table 4). This mean suitability score and range was similar to the score and range for three of the four reference areas. The exception being the southern comparison area which had the fewest potential whooping crane roosting wetlands, lowest total potential wetland acreage, lowest mean suitability score and lowest and narrowest score range (Table 4).

In Kansas, a wetland with a score of 12 or more was considered suitable potential whooping crane habitat (Watershed Institute 2012). If applied to the PWWP, there would be 41 wetlands (15.6% of identified potential whooping crane wetlands) considered as such. The south reference area would have only 13 and the north, east, and west comparison areas would have between 33 and 63 potentially suitable whooping crane wetlands

Table 4. Comparison of suitable whooping crane habitat within the Prevailing Winds Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Score	Score range
PWWP	262	490.1	9.4	6 – 16
North	270	517.2	9.8	6 – 18
South	157	285.9	8.4	5 – 14
East	244	395.6	9.7	6 – 16
West	284	1,239.8	9.8	6 – 17

Data Derived From: Potentially Suitable Habitat Assessment, Watershed Institute 2012.

Whooping Crane Stopover Site Use Intensity

USGS and its' partners recently determined whooping crane stopover sites and the intensity of use of these areas within the Great Plains using radio telemetry information from 2010 to 2014 of tagged whopping cranes (Pearse et al. 2015). Stopover sites and their use intensity were based on 20 km square grid cells.

The PWWP and the north review area fall within “unoccupied” 20 km cells while the east and west reference areas lie within “low intensity” cells and the south intersects a “core intensity” cell (Figure 1). USGS describes an “unoccupied” cell as “lacking evidence of use”, “low intensity” cell shows “evidence of use and low stopover site use intensity”, and a “core intensity” site “contains density of stopovers identified as high use intensity and crane days of lower intensity” (Pearse et al. 2015).

DISCUSSION

Whooping cranes are currently listed as endangered under the Endangered Species Act (32 FR 4001, 1967 March 11) except where nonessential experimental populations exist (66 FR 33903-33917, 2001 June 26; 62 FR 38932-38939, 1997 July 21; and 58 FR 5647-5658, 1993 January 22). In the US, the whooping crane was listed as threatened with extinction in 1967 and endangered in 1970 – both listings were "grandfathered" into the Endangered Species Act of 1973 (ESA 1973). The 2015 – 2016 winter population within the primary wintering grounds was estimated at 329 birds (291 – 371, 95% confidence interval.). There was another 10 whooping cranes thought to be outside of the primary wintering grounds when systematic surveys were conducted (USFWW 2016). Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas. During the migration, most birds pass through central South Dakota.

The USGS has recently determined whooping crane stopover sites and their intensity of use within the Great Plains from radio telemetry information. This information shows whooping crane use directly to the south, east, and west of the project area. Although no whooping crane use was document within the 20 km grid cell the project falls within, at the least, it is possible that whooping cranes would fly over or through the project area during migration. Whooping cranes generally migrate at 1,000-6,000 ft (305-1830 m) altitude, well above turbine height (Stehn 2007), and thus for the most part are unlikely to collide with turbines. However, as whooping cranes ascend and descend during takeoff and landing, or migrate during inclement weather, they may fly at lower altitudes and may fly at altitudes corresponding to the rotor-swept areas. In summary, low altitude flight is generally of short duration in the morning and evenings with more time and distance covered at higher elevation during typical migration flight; reducing potential risk to whooping cranes.

No whooping cranes have been reported as being killed or injured by wind turbines (NWCC 2004), but one sandhill crane (*Grus canadensis*) was reported at the Altamont wind energy facility in California (Smallwood and Karas 2009), it is unclear if this was a result of turbine collision or collision with a power line. Two sandhill cranes were also apparently struck by turbines during a study of wintering cranes in Texas (Navarrete and Griffis 2011a). It appears that cranes are not overly susceptible to collision with turbines given that 100,000's sandhill cranes migrate twice annually through the Great Plains and none have been documented as wind turbine collision fatalities in this region during migration.

Besides direct mortality, concern has also been raised regarding potential displacement impacts that wind facilities may have on whooping cranes. For example, if whooping cranes avoid wind facilities, the likelihood of impacts with turbines is further decreased but the availability of habitat in the project area may be diminished, causing cranes to have to fly further to find suitable habitat to roost and forage. To date, very little quantitative data is available to help address displacement impacts on whooping cranes or sandhill cranes. A presentation by Navarrete and Griffis (2011b) suggested that the mean density of sandhill cranes wintering in the high plains of Texas increased the further away from studied wind facilities and this distribution was not a random event. There is an operating wind energy facility just north of the proposed project boundary. What, if any impact this facility has on crane use in and around the surrounding area is unknown.

Although developed for transmission line impacts on whooping crane habitat in Kansas, the Watershed Institute's (2012) potentially suitable habitat assessment for whooping cranes can help to quantify potential whooping crane habitat in and around a proposed wind energy project. This tool indicates that the range of scores and average score at the PWWP is similar to three of the four other study areas. The exception being the southern reference area which had fewer potential roost wetlands, with the average score for those basins one less than the other areas. Overall, the average score and the majority of the individual wetland scores were lower than the reference score of 12 developed for quality habitat at the Quivira National Wildlife Refuge.

SUMMARY

In analyzing the potential for significant impacts from wind development on whooping crane stopover habitat, Stehn (2007) suggests assessing whether there is "lots of suitable stopover habitat in the general area … or is the proposed wind farm site the only suitable whooping crane stopover habitat for miles around". This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the project area to surrounding (in the four cardinal directions) areas of the same dimensions, located adjacent (based on the PWWP's boundary extent) to the PWWP boundary. A Geographic Information System (GIS) was used to calculate the amount of the various habitats and in the case of wetlands, number of individual basins and their type, in each of the areas compared to the proposed PWWP (Tables 1, 2, and 3). This analysis shows that both roosting (i.e. wetlands) and foraging (i.e. croplands) habitats are available in the PWWP and alternate areas. Potential whooping crane habitat within the PWWP appears to be most similar to that in the north, east, and west reference areas and more suitable than that found in the south alternate area. Based on the USGS's recent determination of whooping crane stopover use sites adjacent to the proposed project area, whooping cranes will likely migrate over or through the PWWP during some migration period. There is potential whooping habitat within the PWWP but this habitat is not unique compared to adjacent areas.

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APPENDIX L - BIRD AND BAT CONSERVATION STRATEGY

Bird and Bat Conservation Strategy
Prevailing Wind Park Project
Bon Homme, Charles Mix, and Hutchinson Counties, South Dakota

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EXECUTIVE SUMMARY

Prevailing Wind Park, LLC (Prevailing Wind) is developing the Prevailing Wind Park Project (Project) near Avon, South Dakota. As part of the wind energy development process, Prevailing Wind voluntarily implemented the tiered approach detailed in the final Land-Based Wind Energy Guidelines (WEG) and incorporated agency recommendations in Project survey efforts and development. The purpose of this Bird and Bat Conservation Strategy is to develop and implement a program to identify and minimize risks to avian and bat species that may result from construction and operation of the Project.

Information gathered during Tier 1, 2, and 3 studies was used during the development process to reduce potential impacts to birds and bats and their habitats. Tier 1 and 2 studies included a review of environmental characteristics and other aspects to help inform the Project in an overall sense. This analysis, as well as the Project’s biological and environmental assessments, concluded that the Project area was suited for wind energy development and any significant impacts could be avoided, minimized, or mitigated with pre-construction design and siting.

Tier 3 studies included whooping crane habitat assessment, avian use surveys, raptor and eagle nest surveys, acoustic bat surveys, and northern long-eared bat presence/absence surveys, to help determine impacts to birds and bats and assist in avoiding and minimizing impacts. Results of these studies indicated that no direct or indirect impacts to whooping cranes were expected, but due to the location of the Project and the whooping crane migration corridor, whooping cranes could use the Project area. Direct impacts to migratory birds were anticipated to be similar to other wind projects in South Dakota and elsewhere in the Midwest. Direct impacts to bald and golden eagles were unlikely as a result of low eagle use within the Project area. No eagle nests were found in the Project; however, nests were observed in the surrounding areas. Impacts to bats were anticipated to be low and within the range of other wind energy projects in South Dakota and the Midwest region. Northern long-eared bats were detected within the Project area during bat acoustic surveys in 2015, but the Project was revised to be several miles away from the area of detection.

Tier 4 studies planned include post-construction studies to estimate the actual impacts the Project has on birds and bats. For this Project, the focus will be on the Tier 4a questions set forth in the WEG. Post-construction surveys will include fatality monitoring (i.e., standardized carcass searches and bias trials), operations personnel training, and adaptive management as deemed necessary. Given that the information collected during the pre-construction period indicated that the Project is not likely to cause significant adverse impacts, per the WEG, it is not anticipated that Tier 5 research will be necessary at this Project.

This document includes whooping crane migration use data from the Central Flyway stretching from Canada to Texas, collected, managed, and owned by the US Fish and Wildlife Service (USFWS). Data were provided to Western Ecosystems, Technology, Inc. (WEST), as a courtesy for their use. The USFWS has not directed, reviewed, or endorsed any aspect of the use of these data. Any and all data analysis, interpretation, and conclusions from these data are solely those of WEST.

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1.0 INTRODUCTION

The Prevailing Wind Park Project (Project) is located in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota (Figure 1). The Project area was changed over the course of Tier 1, 2, and 3 studies, with different but overlapping Project areas surveyed in 2015 and 2016. The current Project boundary continues to be overlapping with those studies in 2015 and 2016, but extends somewhat outside of both areas to the northwest and northeast. Overall landscape characteristics are similar throughout the region contained within the boundaries. As part of the wind energy development process, Prevailing Wind Park, LLC (Prevailing Wind) has been implementing the US Fish and Wildlife Service's (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012)). This Bird and Bat Conservation Strategy (BBCS) describes Prevailing Wind's process to identify and avoid and/or minimize potential impacts to birds and bats that may result from the construction and operation of the Project.

Specifically, this BBCS document was developed to:

1) Respond to the recommendations in the WEG for completion of a BBCS and post-construction monitoring actions;
2) Consolidate documentation of steps already taken to avoid and minimize potential effects on birds and bats during Project planning and development;
3) Identify and implement steps to further reduce the potential for avian and bat fatality or other potential adverse effects on birds and bats at the Project; and
4) Continue the coordination between Prevailing Wind and state and federal wildlife agencies.

1.1 Project Description

The Project mostly falls within the Southern Missouri Coteau Slope Level IV Ecoregion, with only a small portion falling within the Southern Missouri Coteau Level IV Ecoregion (US Environmental Protection Agency 2013). Historically, this area was dominated by mixed-grass prairie with numerous wetlands scattered throughout; today, the majority of the Project area has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices (Table 1, Figure 2; US Geological Survey (USGS) National Land Cover Database [NLCD] 2011, Homer et al. 2015). Trees and shrubs can be found around farmsteads, within planted shelter belts, and along drainages (Hamilton and Derby 2016; Appendix A). The landscape within the Project area is generally flat with elevation ranging from 455–574 meters (m; 1,491–1,882 feet [ft]; USGS 2016).

The 2015 Project area included land south of Avon, South Dakota, but in 2016, the Project area was reduced (Figure 2); the 2015 Project boundary was 8.2 miles (mi; 13.2 kilometers [km]) from the Missouri River, while the adjusted 2016 boundary was 12.1 mi (19.5 km) from the River. Additionally, the current Project boundary extends somewhat further to the northwest and northeast (Figure 2). Land use/cover types were assessed using the current boundary.

Cultivated cropland (49.92%) and grasslands (42.22%; including herbaceous/pasture/hay lands) dominated the overall landscape (Table 1, Figure 2).

Table 1. Land use/cover types acreage and percent (%) cover within the current Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, based on the US Geological Service's (USGS) National Land Cover Database (NLCD).

Land Use/Cover	Project Acres	% Cover
Cultivated Crops	25,128.83	49.92
Pasture/Hay	17,731.32	35.23
Grassland/Herbaceous	3,520.49	6.99
Developed	2,158.00	4.29
Wetlands/Open Water	1,336.99	2.66
Forest	375.96	0.75
Shrub/Scrub	69.65	0.14
Barren Land	14.67	0.03
Total	**50,335.91**	**100.00**

Data Source: USGS NLCD 2011

Based on the USFWS's National Wetland Inventory (NWI; USFWS NWI 2009), there are approximately 1,826 acres (ac; 739 hectares [ha]) of wetlands within the Project area, with freshwater emergent wetlands making up the majority (77.1%) of wetlands (Table 2).

Table 2. Wetlands present within the Prevailing Wind Park Project, Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, based on the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI).

Wetland Type	Project Acres	Percent Total
Freshwater Emergent Wetland	1,407.89	77.10
Freshwater Pond	245.70	13.46
Lake	128.75	7.05
Freshwater Forested/Shrub Wetland	43.7	2.39
Total	**1,826.04**	**100.00**

Data Source: USFWS MWI 2009

Figure 1. Location of the Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota.

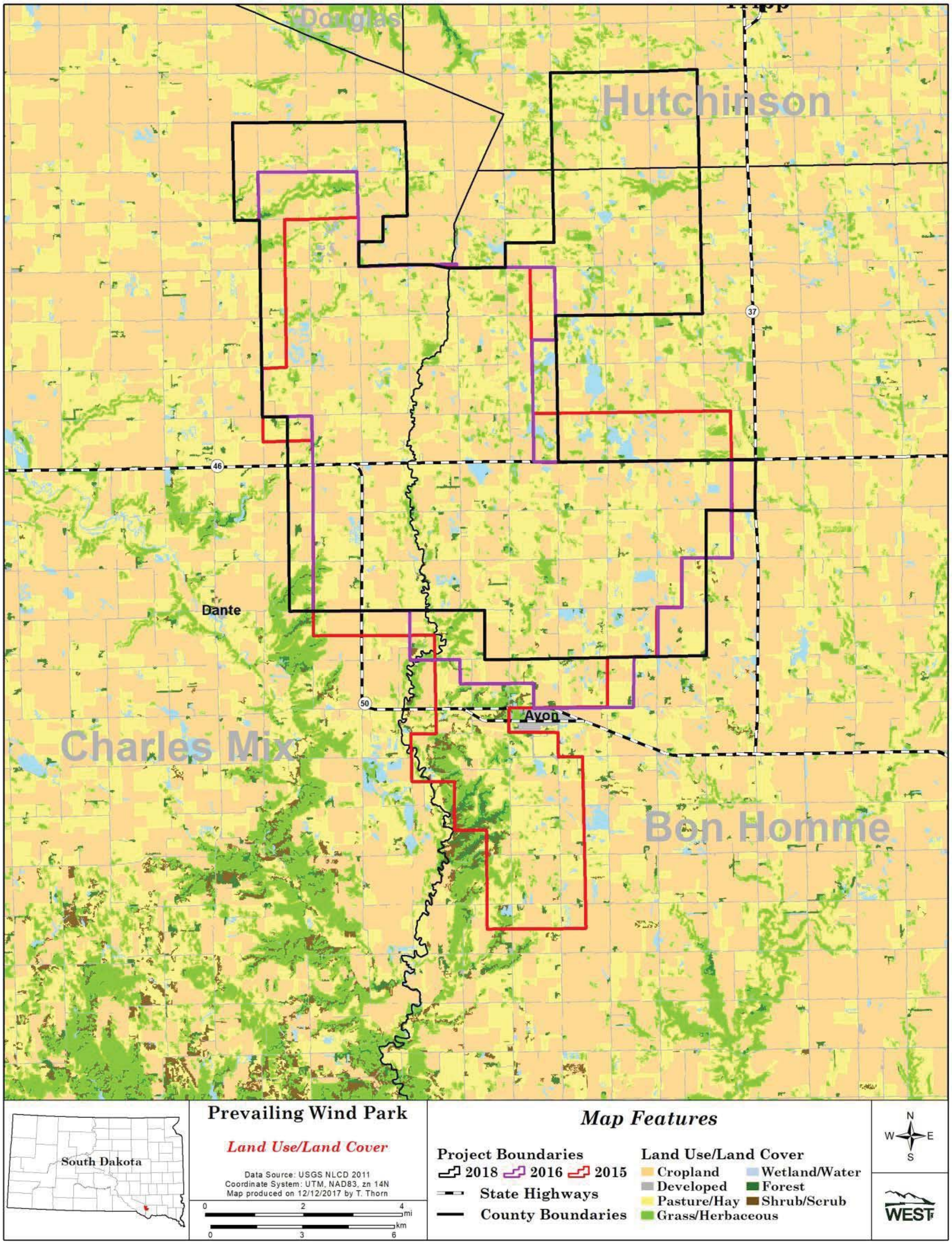

Figure 2. Land use/cover types within the 2015, 2016, and current Prevailing Wind Park Project boundaries in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota (Sources: US Geological Survey (USGS) National Land Cover Data [NLCD] 2011, Homer et al. 2015).

The Project, planned for 200-megawatt (MW) output, will consist of either 57 3.6-MW turbines or 61 3.8 MW turbines. Turbines will have a hub height of 105 or 110 m (344.5 or 360.9 ft) with 136 or 137 m (446.2 or 449.5 ft) blades.

1.2 Project Siting, Construction, and Best Management Practices

The siting and development of the Project included a tiered-study review process that aligned closely with the tiered approach detailed in the final WEG (USFWS 2012). Information gathered during Tier 1–3 studies was used during the turbine and infrastructure siting process to minimize potential impacts to birds and bats and their habitats. Prior to designing the facility layout, Prevailing Wind incorporated setback and constraint information from expert sources, literature reviews, and siting standards suggested by the South Dakota Public Utilities Commission. This information was used to establish setbacks and inform site design.

1.2.1 Project Siting and Design Measures Used to Reduce Impacts

- The Project is attempting to avoid impacts to wildlife and habitat by siting turbines and roads mostly in cultivated fields.
- Standard, state-required, setbacks for non-participating landowners, residences, noise, airports, etc., will be implemented.
- Existing roads and field accesses will be used or improved for access roads when practicable.
- Electrical collection systems within the Project will be buried underground.
- Wind turbines designed with tubular towers and no external ladders or platforms on the towers or nacelles will be used so bird perching and nesting opportunities are minimized.
- The number of turbines with visibility lighting will be minimized, within Federal Aviation Administration (FAA) requirements.
- Implementation of FAA-approved lighting that uses the shortest allowable flash duration, the minimum allowed flashes per minute, and synchronized flashing, will reduce the potential for nocturnal migrating birds to be disoriented by lights.
- Lighting at the operations and maintenance facility, Project substation, and other installations will be minimized and designed such that light is directed downward (toward the access or work area), and is hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting will be used where practicable.
- Permanent meteorological towers without guy wires will be used, installing the minimum number needed within the Project area to minimize collision risk for birds.

1.2.2 Operational Procedures to Minimize Impacts

- Impacts to wetlands and water resources will be avoided or mitigated by following provisions of the Clean Water Act (1972).

- A Site Environmental Plan, specific to the operational activities of the Project, will be developed and implemented by the Site Supervisor or his/her designated Environmental Manager including, but not limited to:
    - Exhibits identifying sensitive resources and associated set-backs.
    - An employee orientation program to raise awareness of any wildlife issues on the site, as well as how to treat sensitive resource areas.
    - Instructions for employees and contractors to drive at an appropriate speed on all public and private roads within the Project area, in consideration of potential wildlife that may be present and to promote general site safety.
    - Instructions for employees to avoid harassing or disturbing wildlife, especially during the breeding seasons.
    - Federal and state measures for handling toxic substances to minimize contamination of water and wildlife resources.
    - Local policies for noxious weed control (e.g., cleaning vehicles and equipment arriving from areas with known invasive species issues, using locally sourced topsoil, identification and annual removal, etc.).
    - Parts and equipment that may be used as cover by prey will not be stored in the vicinity of wind turbines.
- During normal operational activities, if facility personnel discover carrion on or near Project facilities, reasonable measures will be taken to minimize attracting predators/scavengers such as raptors and vultures.
- A Wildlife Response and Reporting System or similar program will be implemented to establish protocols for identifying and communicating bird and bat fatalities.

1.3 Key Bird and Bat Regulations

1.3.1 Federal Endangered Species Act

Certain species at risk of extinction, including several birds and bats, are protected under the federal Endangered Species Act (ESA) of 1973, as amended (ESA 1973). The federal ESA provides a program for conservation and recovery of threatened and endangered species. Section 3 of the ESA defines and lists species as “endangered” and “threatened” and provides regulatory protection for the listed species (ESA Section [§] 3 1973). Section 9 of the federal ESA prohibits the “take” of species listed by USFWS as threatened or endangered (ESA Section [§] 9 1973). Take is defined in Section 3 as follows: “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct” (ESA § 3 1973). As of February 2017, there were 16 endangered and threatened animal species believed to or known to occur in South Dakota (USFWS 2017), five of which had the potential to occur within the Project area according to the Tier 1 and 2 studies (Hamilton and Derby 2016; Appendix A); Section 2.1 includes a description of these species.

1.3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, capture, kill, or possess any migratory bird or part, nest, or egg of any such bird listed in wildlife protection treaties between the US, Great Britain, Mexico, Japan, and Russia (and other countries of the former Soviet Union; MBTA 1918). Most birds (except for introduced species and non-migratory game birds) within the US are protected under the MBTA. The birds, occupied nests, and the contents of the nests (eggs or chicks) within the Project area are afforded protection pursuant to the MBTA. Due to the potential for resident and migratory birds within the Project area, compliance with the MBTA has been considered in the development of this BBCS. Unlike the ESA and the Bald and Golden Eagle Protection Act (BGEPA), no permits are available to authorize incidental take of birds under the MBTA. However, on December 22, 2017, the U.S. Department of the Interior's Solicitor's Office issued a legal opinion in which it concluded that the MBTA ". . . is a law limited in relevant part to affirmative and purposeful actions . . ." and as such, any incidental takings would not constitute criminal violations (*See*, DOI Solicitor's Opinion, M-37050 [December 22, 2017]).

1.3.3 Bald and Golden Eagle Protection Act

The federal BGEPA (1940), administered by the USFWS, was enacted to protect bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles, their nests, eggs, and parts (e.g., feathers or talons). The BGEPA states that no person shall take, possess, sell, purchase, barter, offer for sale, transport, export, or import any bald or golden eagle alive or dead, or any body part, nest or egg without a valid permit to do so (BGEPA 1940). The BGEPA also prohibits the take of bald and golden eagles unless pursuant to regulations. Take is defined by the BGEPA as an action "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb". Disturb is defined in the BGEPA as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (USFWS 2007b). In addition to immediate impacts, this definition also covers impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles were not present.

In 2009, the USFWS issued a final rule on new permit regulations that would allow some disturbance of eagles "in the course of conducting lawful activities" (50 Code of Federal Regulations [CFR] § 22.26 2009). The USFWS's description of its 2009 rule suggests that recurring, incidental take of eagles, will only be authorized if every avoidance measure has been exhausted. Removal of nests will still generally be permitted only in cases where the nest poses a threat to human health, or where the removal would protect eagles. Take permits may be issued when "necessary for the protection of other interests in any particular locality" (USFWS 2009). The discussion expands the definition of such public and private interests to include utility infrastructure development and maintenance. The document states that due to concerns about population declines, permits for take of golden eagles are likely to be restricted throughout the eagle's range (USFWS 2009). Considerations for issuing take permits include the health of the local and regional eagle populations, availability of suitable nesting and foraging habitat for any displaced eagles, and whether the take and associated mitigation provides a net benefit to eagles (50 CFR § 22.26 2009). In April 2013, the USFWS issued the *Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2* to address these new regulatory matters (ECPG; USFWS 2013). In December 2016, the USFWS published notice of a final rule revising its eagle permitting regulations and extended the maximum permit duration to 30 years. The development of an Eagle Conservation Plan for this Project is underway following the 2016 eagle rule to meet USFWS's requirements for addressing take under the BGEPA.

1.3.4 Birds of Conservation Concern

The USFWS's list of Birds of Conservation Concern (BCC) includes migratory and non-migratory bird species of conservation priority across North America; concern for these BCC species results from naturally or human-caused small ranges or population sizes, threats to habitat and other factors (USFWS 2015b). The Project area falls within Bird Conservation Region 11, which lists 27 bird species (USFWS 2008).

1.3.5 South Dakota State Issues

The South Dakota Game, Fish, and Parks (SDGFP) manages a state-specific list of endangered and threatened species. As of April 2016, South Dakota listed 16 endangered and threatened species that did not appear on the federal list for a total of 22 state-listed species; the SDGFP is responsible for managing and conserving the state's endangered species. Seven of the 22 state-listed species are birds; no state-listed bat species were included in this list (SDGFP 2014a). Seventy-seven species listed by the South Dakota Wildlife Action Plan as species of greatest conservation need have records of occurrence in at least one of the counties in which the Project is located (SDGFP 2014a, SDGFP 2014b; USGS 2015; NatureServe 2017). Some of these species are only associated with the Missouri River and would not be expected to occur in the Project. Section 2.1 includes a description of the state-listed species potentially occurring in the Project area.

2.0 PRE-CONSTRUCTION: TIER 1-3 SUMMARIES

The WEG outlines a tiered approach to assessing suitability and risks to wildlife at a potential wind resource area. The tiered approach ensures that sufficient data are collected to enable project proponents to make informed decisions about continued development of a proposed project (USFWS 2012). At each tier, potential issues associated with the development or operations of the opposed project are identified and questions are formulated to guide the decision process. This process starts with a broad scope and provides more site-specific detail at each tier as more data are gathered and the potential for avian and bat issues are better understood. The sections below briefly describe the efforts completed as part of Tiers 1–3 studies (Appendices A–F).

2.1 Tiers 1 and 2: Desktop Evaluation Review

As recommended in the WEG, Tier 1 and 2 studies for the Project evaluated potential issues that needed to be addressed before further actions could be taken with the development or operations of the proposed Project. The objective of the Tiers 1 and 2 studies was to assist the developer in further identifying a potential Project site through a preliminary evaluation or screening of public data from federal, state, and tribal entities, and to offer early guidance about the sensitivity of the Project in regards to flora and fauna. Tier 1 and 2 studies provided a preliminary evaluation or screening of public data from federal, state, and tribal entities and offered early guidance about the sensitivity of the site, in regards to flora and fauna; these studies also included a more substantive review of existing information, including publicly available data on land use land cover, topography, wetland data, wildlife, habitat, and sensitive plant distribution, and a reconnaissance level site visit (Hamilton and Derby 2016; Appendix A)

The Tier 1 and 2 Report identified federally and state-listed wildlife species present in the Project area (Hamilton and Derby 2016; Appendix A). Five of the 16 animal species listed as federally listed species in South Dakota had the potential to occur within the Project area, including the federally endangered interior least tern (*Sterna antillarum athalassos*) and whooping crane (*Grus americana*), and the federally threatened piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and northern long-eared bat (*Myotis septentrionalis*). The interior least tern, whooping crane, and piping plover are also listed as threatened or endangered in the state of South Dakota (SDGFP 2016); additionally, the state-threatened osprey (*Pandion haliaetus*) has the potential to occur within the Project area (Hamilton and Derby 2016; Appendix A).

According to the Tier 1 and 2 studies, no suitable nesting habitat for interior least tern was identified within the Project, but the interior least tern could potentially nest along the Missouri River or pass through the Project area during spring and fall migration (Hamilton and Derby 2016; Appendix A). No suitable habitat for piping plover was observed in the Project during the site visit conducted in 2016, and this species is unlikely to breed within the Project, but individuals could potentially migrate through the Project area; piping plover Critical Habitat has been designated along the Missouri River in both counties 19.5 km (12.1 mi) south of the Project area (Appendix A). No suitable habitat for rufa red knot was observed in the Project during the site visit conducted in 2016 and this species is unlikely to breed within the Project, but could potentially migrate through the Project area (Appendix A). The 2016 Project boundary occurred 3.5 km (2.2 mi) east of 95% of the confirmed whooping crane sightings within the 354-km (220-mi) whooping crane national migration corridor (Figure 3), but is within the South Dakota specific migration corridor; therefore, whooping cranes may occasionally migrate through the Project area (Appendix A).

The Tier 1 and 2 studies recommended coordinating with the USFWS and South Dakota Game, Fish, and Parks in regards to Project development. This coordination occurred during an in person site visit and was used for both the formal scoping process in the Tier 3 studies as well as to inform ongoing Project siting. In conclusion, the Tier 1 and 2 studies did not find any items that suggested abandonment of the Project area, and as such, the pre-construction efforts progressed to Tier 3 studies to further investigate issues in more detail.

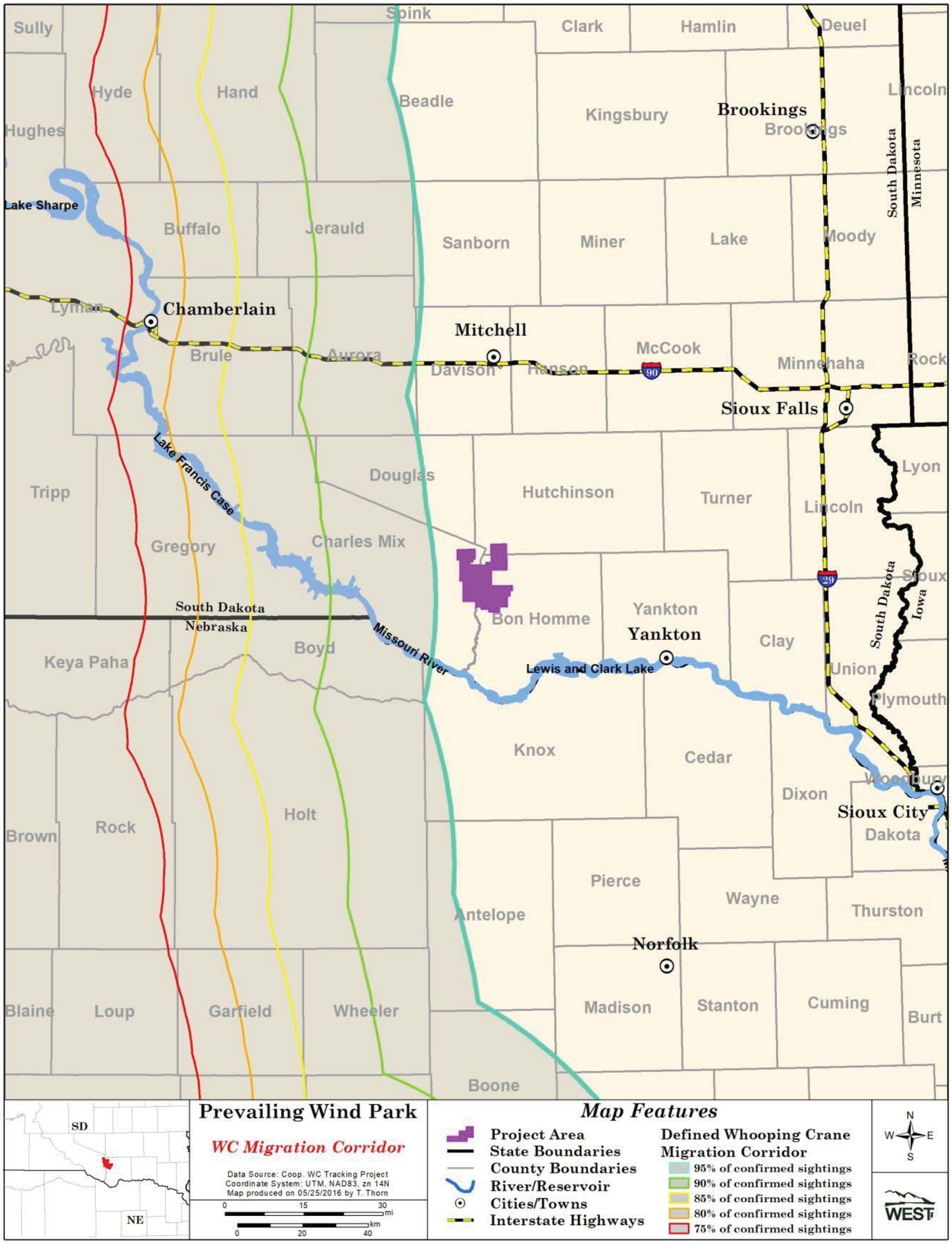

Figure 3. Location of the national whooping crane migration corridor in relation to the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota.

2.2 Tier 3: Baseline Survey Results Review

A number of site-specific baseline avian and bat studies have been conducted within the Project area since 2015. A brief summary of each of these baseline studies is provided below and final reports are provided in Appendices B–F. The data collected and methods used to conduct the Tier 3 studies were consistent with other regional studies and followed the recommendations in the WEG. The results of Tier 3 studies indicated that significant adverse impacts are not anticipated from the Project.

2.2.1 Whooping Crane Habitat Review

Whooping crane habitat was assessed within the Project and surrounding area to determine if the Project area contained unique features to attract whooping cranes (Derby 2016b; Appendix B). This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the Project area to adjacent areas of the same dimensions in the four cardinal directions, located adjacent to the Project boundary, based on the Project's boundary extent (Figure 4). GIS was used to calculate the amount of the various habitats and in the case of wetlands, number of individual basins, their type, and suitability (score of 12 or higher according to the Watershed Institute 2012), in each of the adjacent areas compared to the proposed Project (Tables 3 and 4). This analysis showed that both roosting (i.e., wetlands) and foraging (i.e., croplands) habitats were available in the Project and alternate areas.

Potential whooping crane habitat within the Project appeared to be most similar to that in the north, east, and west reference areas and more suitable than that found in the south alternate area (Derby 2016), indicating that the potential whooping crane habitat found within the Project was not unique compared to adjacent areas. Based on the USGS's recent determination of whooping crane stopover use sites and their intensity of use within the Great Plains Region from radio telemetry information (Pearse et al. 2015), whooping crane use occurs adjacent to the proposed Project area, and it is possible that this species could fly over or through the Project area during the migration period (Appendix B).

Table 3. Comparison of land use/cover acreage and percent (%) cover for whooping crane habitat assessment within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota, and adjacent areas.

Habitat Type	Project Area		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Cultivated Crops	17,588.3	47.5	20,033.3	54.1	24,592.7	66.4	14,716.9	39.8	20,507.8	55.4
Grassland/ Herbaceous	2,481.9	6.7	2,922.5	7.9	995.0	2.7	7,270.3	19.6	1,398.2	3.8
Pasture/Hay	13,897.5	37.5	11,676.7	31.5	8,853.2	23.9	9,985.0	27.0	1,1482.6	31.0
Developed	1,578.0	4.3	1,894.3	5.1	1,668.2	4.5	1,142.3	3.1	1,998.4	5.4
Water/ Wetlands	1,016.5	2.8	327.6	0.9	562.2	1.5	682.0	1.8	1,086.7	2.9
Forests	372.1	1.0	152.5	0.4	307.5	0.8	958.8	2.6	441.8	1.2
Shrub/Scrub	67.5	0.2	9.7	<0.1	22.7	<0.1	2,251.6	6.1	93.3	0.3
Barren	14.7	<0.1	NA	NA	15.1	<0.1	9.7	<0.1	7.8	<0.1

National Land Cover Database 2011

Table 4. Comparison of suitable whooping crane habitat within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix and Hutchinson counties, South Dakota, and adjacent t areas.

Area	Number of Basins	Total Acres	Mean Score[1]	Score Range
Project Area	262	490.1	9.4	6–16
North	270	517.2	9.8	6–18
South	157	285.9	8.4	5–14
East	244	395.6	9.7	6–16
West	284	1,239.8	9.8	6–17

[1] A score of 12 or higher represents potentially suitable whooping crane habitat. Data Derived From: Potentially Suitable Habitat Assessment, Watershed Institute 2012.

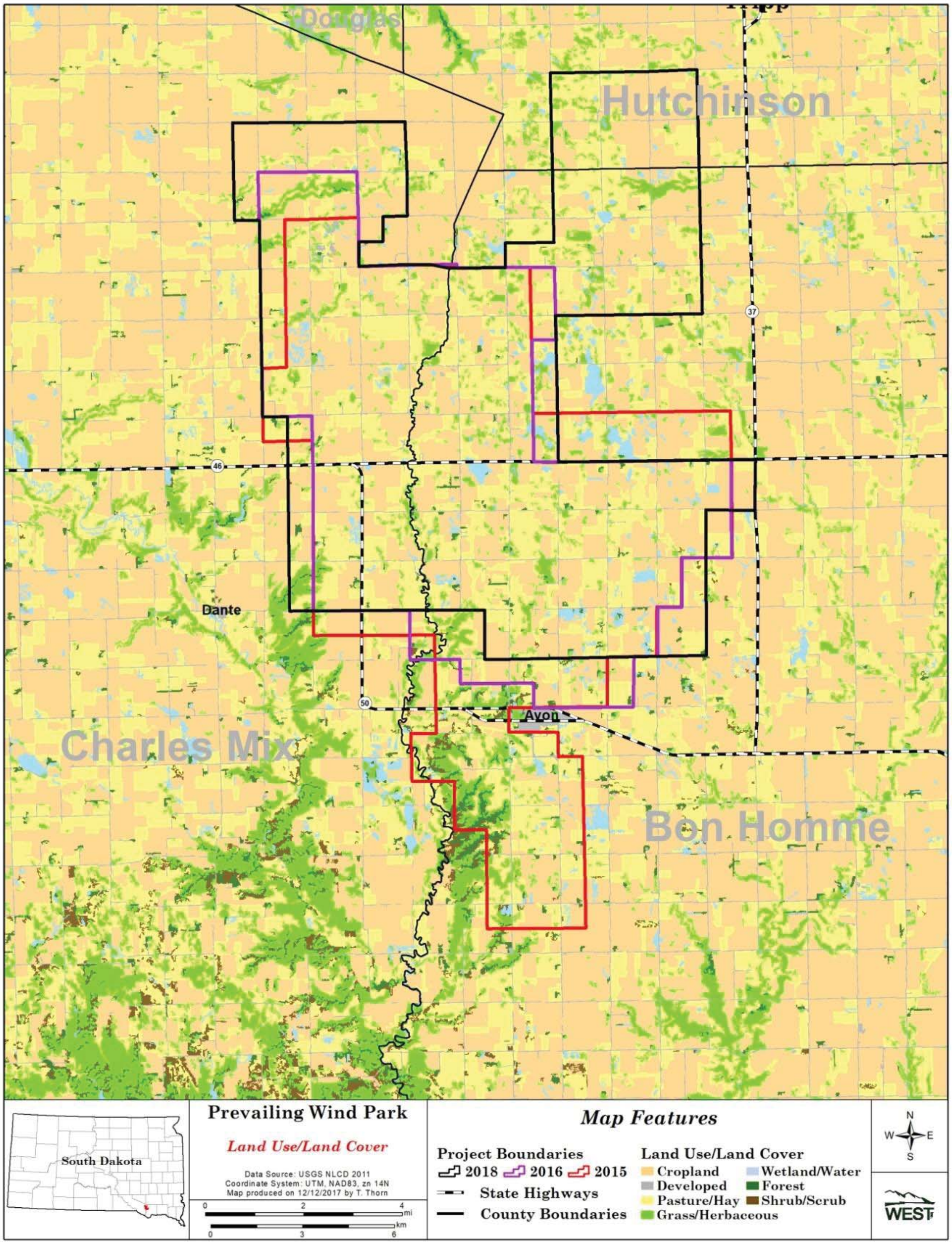

Figure 4. Land use/cover type comparisons for whooping crane habitat assessment within the 2016 Prevailing Wind Park Project in Bon Homme, Charles Mix, and Hutchinson counties, South Dakota, and adjacent areas.

2.2.2 Avian Use Surveys

Year-round avian-use surveys were conducted by WEST during 2015 – 2016 (Year 1) and 2016 – 2017 (Year 2) to address issues posed under Tier 3, following guidance in the WEG (USFWS 2012) and ECPG (USFWS 2013), within the Project area. The primary objectives of the avian use studies were to: 1) assess the relative abundance and spatial distribution of species in the Project area during an entire year, with emphasis on eagles, other raptors, and federally and state-listed species; and 2) identify and assess the potential risk of adverse impacts from the Project to sensitive species or groups (Derby et al. 2018a, 2018b; Appendices C1 and C2).

During Years 1 and 2, sixteen points were surveyed for 60 minutes (min; Figures 5 and 6) with all bird species observed in the first 20 min being recorded and only eagles and federally and state-listed species being recorded during the remaining 40 min (Appendices C1 and C2). The metric used for mean bird use was number of birds per plot (100-m [328-ft]) radius plot for small birds and 800-m [2,625-ft] radius plot for large birds) per 20-min survey. Surveys were conducted twice per month in the spring (March 4 – May 20) and fall (September 9 – November 28), and monthly during winter (November 29 – March 3) and summer (May 21 – September 8). Surveys were carried out during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed roughly the same number of times.

A total of 271 fixed-point avian use surveys were conducted during 18 visits during Year 1, while 205 surveys were conducted during 13 visits in Year 2 (Appendices C1 and C2). Bird diversity (the number of unique species observed for the entire 60-min survey) was lower in Year 1 (72) than Year 2 (90). No federally or state-listed species were observed during Year 1 surveys, and one state-listed species (peregrine falcon [*Falco peregrinus*]) was observed during Year 2 surveys. Additionally, seven and thirteen state sensitive species were observed during fixed-point surveys and incidentally during Years 1 and 2, respectively.

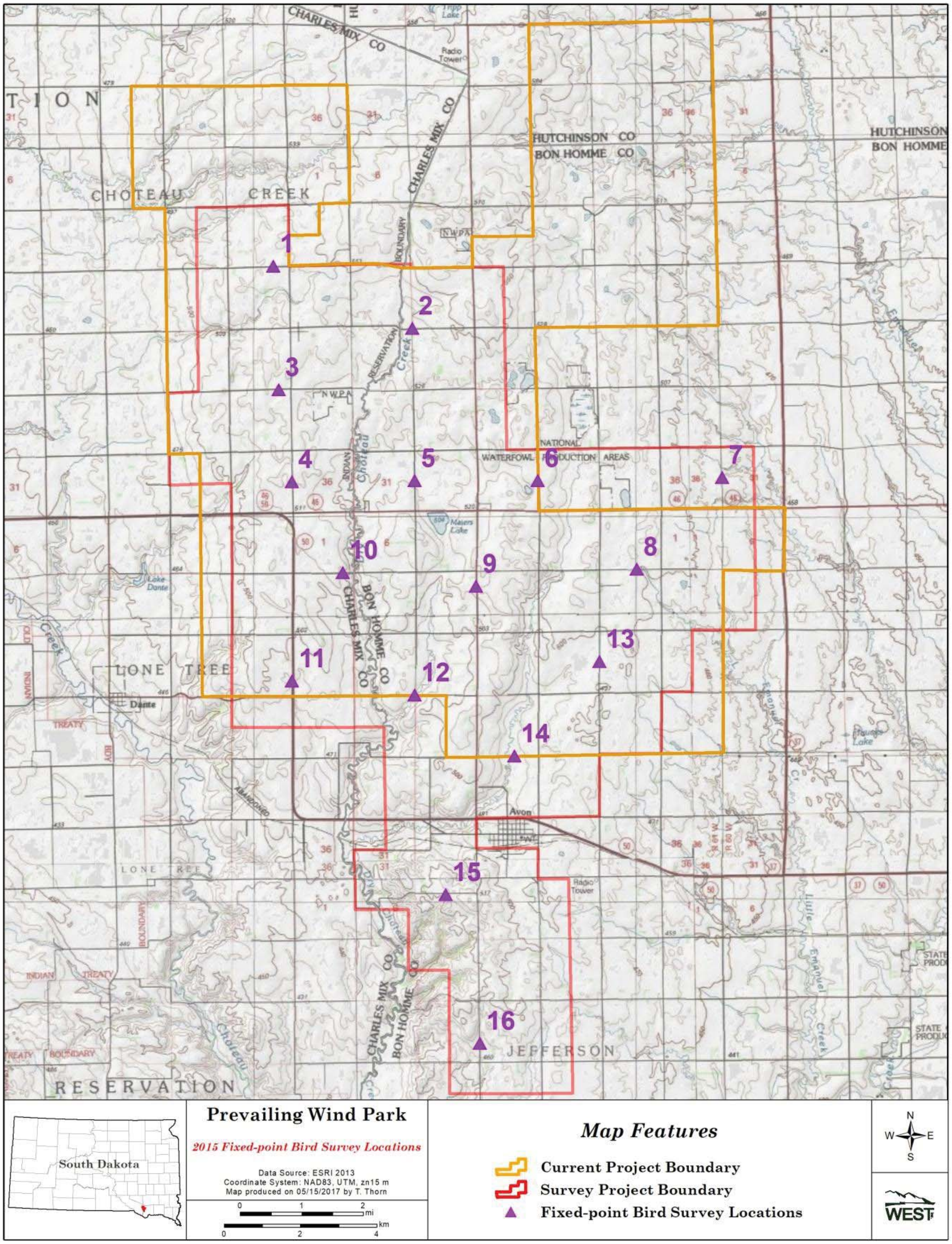

Figure 5. Location of the fixed-points selected for the Year 1 fixed-point avian use surveys conducted from 2015 – 2016 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

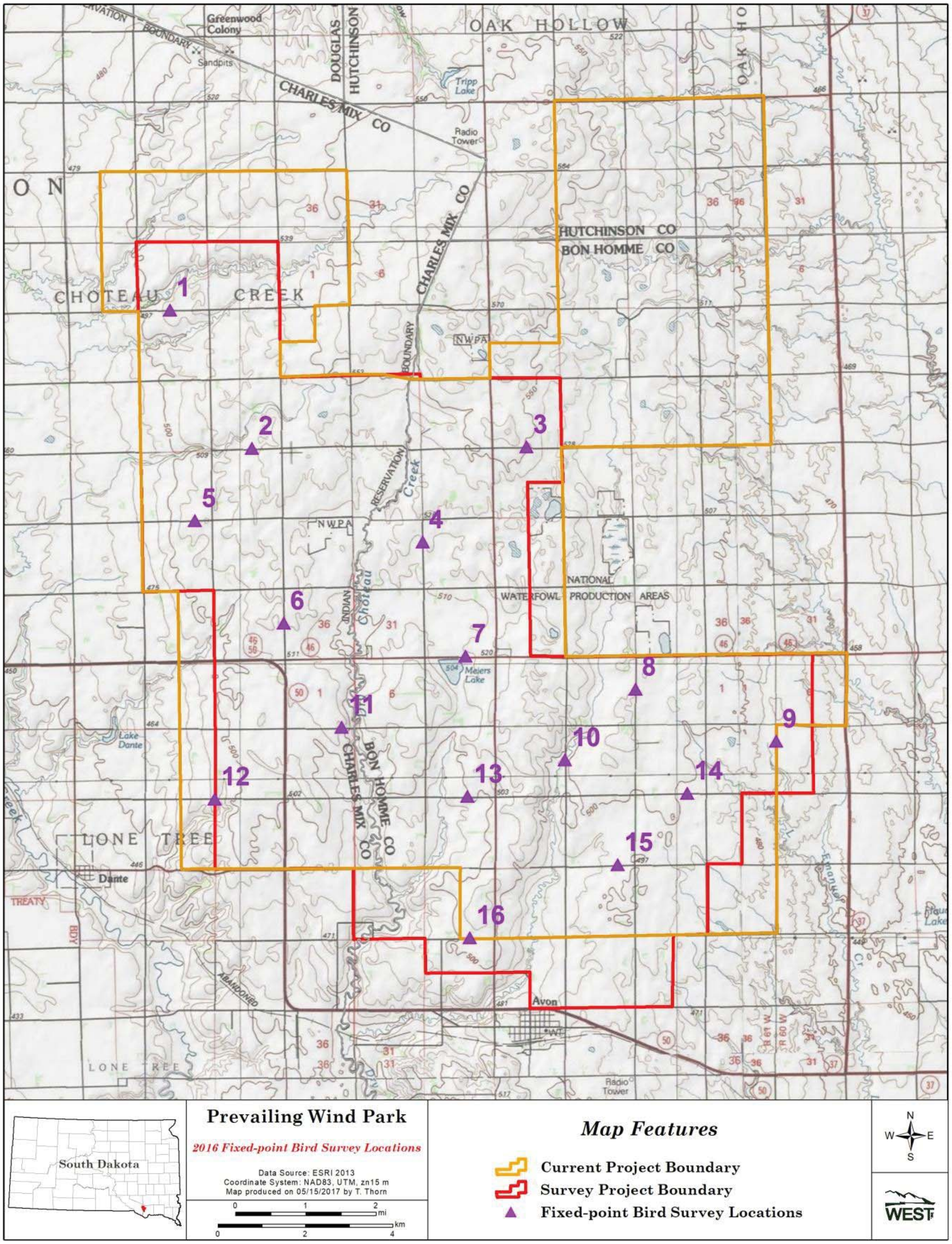

Figure 6. Location of the fixed-points selected for the Year 2 fixed-point avian use surveys conducted from 2016 – 2017 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

During Year 1, large bird use was highest during spring (30.43 birds800-m plot/20-min survey), whereas small bird use was highest during fall (15.71 birds/100-m plot/20-min survey; Appendix C1). Annual mean diurnal raptor use during Year 1 was 0.31 raptors/800-m plot/20-min survey with the highest mean use during the fall (0.52; Appendix C1). Four bald eagles were observed during the Year 1 fixed-point avian use surveys (Appendix C1). Eagles were observed for 15 min of which 11 min were risk minutes (eagles flew below 200 m above ground level and within 800 m of the observer; Appendix C1). Three other bald eagles were observed incidentally.

Year 2 avian use was similar to Year 1 for large and small birds; however, more eagles were observed during Year 2. Large bird use was highest during spring (36.38 birds/800-m plot/20-min survey), whereas small bird use was highest during fall (35.73 birds/100-m plot/20-min survey; Appendix C2). Annual mean diurnal raptor use was 0.33 raptors/800-m plot/20-min survey during Year 2 with the highest mean diurnal raptor use during fall (0.55; Appendix C2). Twenty bald eagles and one unidentified eagle were observed during Year 2 fixed-point avian use surveys. Bald eagles were observed for 135 min of which 70 min were risk minutes; the unidentified eagle was observed for eight minutes, all of which were risk minutes (Appendix C2). Most of the observations (nine) and minutes (72 total and 43 risk minutes) came from survey point nine during the spring migration on March 9, 2017. One golden eagle was observed incidentally during Year 2. Further detailed information pertaining specifically to eagles is discussed in the Eagle Conservation Plan developed for the Project.

Mean raptor use during Year 1 was compared with other wind energy facilities that implemented similar protocols and had data covering similar seasons, ranking 34th from the highest use compared to 47 other wind energy facilities in North America (Appendix C1). Mean raptor use during Year 2 ranked 33rd from the highest use compared to the other 47 wind energy facilities in North America (Appendix C2). Publicly available data containing both mean raptor use and raptor fatality information in the Midwest are scarce, while data having this information for four seasons is even rarer. Annual raptor use at the adjacent Beethoven Wind Energy Project (Beethoven; an operating wind energy facility immediately north of the Project area) was 0.10 raptors/plot/20-min survey (WEST 2015). Raptor fatality rates reported at other South Dakota wind energy facilities have ranged from 0–0.20 fatalities/MW/year. At the Grand Ridge I Project in Illinois, mean raptor use was 0.20 raptors/800-m plot/20-min survey, and no raptor fatalities were recorded (Derby et al. 2010a). Raptor fatality rates throughout the Midwest have ranged from zero at numerous facilities to 0.47 fatalities/MW/year at Buffalo Ridge, Phase I (Johnson et al. 2000a).

2.2.3 Raptor Nest Surveys

The objective of the raptor nest surveys was to locate and record raptor nests that may be subject to disturbance and displacement effects by wind energy facility construction and operation. As part of agency-approved baseline survey efforts, aerial surveys for raptor nests were completed in 2015 and 2016 by a qualified biologist before leaf out when raptors would be actively tending to a nest or incubating eggs (Derby 2015, 2016a); Appendices D1 and D2). Aerial surveys were conducted in accordance with the guidance provided in the USFWS Inventory and Monitoring Protocols (Pagel et al. 2010) and focused on locating large, stick nest structures in suitable raptor nesting substrate (trees, transmission lines, cliff faces, etc.) within the proposed Project and a 1.6-km (1-mi) buffer. Additionally, a second buffer was surveyed out to 16.1 km (10 mi) beyond the Project boundary to document any eagle nests.

Nests were classified as “occupied” if any of the following were observed at the nest structure: 1) an adult in an incubating position; 2) eggs; 3) nestlings or fledglings; 4) occurrence of a pair of adults (or, sometimes sub-adults); 5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor was observed or had been observed early in the breeding season; or 6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath. A nest that did not meet the above criteria for “occupied” was classified as “unoccupied”.

During April 11, 12, and 15, 2015, 71 raptor nests representing three species were documented within the Project area and 16.1 km (10.0 mi) buffer (Figure 7; Derby 2015; Appendix D1). No bald eagle nests were located within the Project area, but eight bald eagle nests (seven occupied and one unoccupied) were documented during the survey (Figure 7). The closest bald eagle nest was observed approximately 0.8 km (0.5 mi) north of the 2015 Project boundary. Three of the seven active bald eagle nests observed in 2015 corresponded to known historic nest locations (PW-EN2, PW-EN3, PW-EN6; Figure 7). Additionally, three occupied great horned owl (*Bubo virginianus*) and five red-tailed hawk (*Buteo jamaicensis*) nests were recorded during raptor nest surveys conducted in 2015.

During the April 21, 2016, aerial raptor nest survey, 50 occupied and/or unoccupied raptor nests representing three species were documented within the Project area and associated 16.1- km (10-mi) buffer (Figure 7 and 8; Appendix D2). No eagle nests were documented within the Project area, but six eagle nests (three unoccupied and three occupied) were located during the 2016 survey (Figure 8); three of these were known historic bald eagle nests (PW-EN1, PW-EN2, PW-EN6). The closest active bald eagle nest was observed approximately 0.8 km (0.5 mi) from the 2016 Project boundary (Figure 8). Other raptor species identified during aerial raptor nest surveys conducted in 2016 included three occupied great horned owl nests and ten occupied red-tailed hawk nests (Figure 8); additionally, 31 unknown raptor nests (two occupied; 29 unoccupied) were documented during the 2016 survey (Derby 2016a; Appendix D2).

Available upon request.

Available upon request.

2.2.4 Acoustic Bat Surveys

No general bat survey was conducted within the Project area during Tier 3 surveys; however, an acoustic bat survey was completed by WEST at Beethoven, located north and adjacent to the Project area, in 2014. Bat surveys at Beethoven recorded an average of 11.49±5.36 bat passes per detector-night (WEST 2015). For all detector locations, 85.4% of bat passes were classified as low-frequency (e.g., big brown bats [*Eptesicus fuscus*], hoary bats [*Lasiurus cinereus*], and silver-haired bats [*Lasionycteris noctivagans*]), while only 14.6% were classified as high frequency (e.g., eastern red bats [*Lasiurus borealis*] and *Myotis* species); summer bat activity at Beethoven was higher than fall bat activity with peak activity the week of July 7 – July 14, 2014 (WEST 2015).

As a means to compare bat activity rates across projects with different sampling periods as well as to compare rates during what historically has been the period of higher fatality rates, WEST uses a standardized “fall migration period” in reviewing bat activity rates. The pre-construction bat activity rate recorded by ground detectors at Beethoven during the fall migration period (2.04±0.99 bat passes per detector-night; WEST 2015) was very low compared to activity rates at other facilities in the Midwest (Table 5), and throughout North America, from studies conducted with similarly-collected data. Bat activity rates are not available for other wind energy projects in North and South Dakota (Table 5). Reported bat fatality rates at Beethoven (2.69 bats/MW/year; WEST 2016) were within the range of other regional projects in the Midwest region of North America, where reported bat fatalities have ranged from 0.16–2.81 bat fatalities/MW/year (Table 5). Based on the location of the Project, habitats present, activity rates recorded during studies at nearby Beethoven, and bat fatality rates at Beethoven and other Midwest wind energy facilities, estimated direct impacts to bats at the Project is expected to be similar to Beethoven and low compared to bat fatality rates at other projects across the country.

Table 5. Wind energy facilities in the Midwest with comparable activity and fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	Number of Turbines	Total Megawatts
Cedar Ridge, WI (2009)	9.97[C,D,E,F]	7/16/07-9/30/07	30.61	41	67.60
Blue Sky Green Field, WI (2008; 2009)	7.70[d]	7/24/07-10/29/07	24.57	88	145.00
Cedar Ridge, WI (2010)	9.97[C,D,E,F]	7/16/07-9/30/07	24.12	41	68.00
Fowler I, II, III, IN (2011)			20.19	355	600.00
Fowler I, II, III, IN (2010)			18.96	355	600.00
Forward Energy Center, WI (2008-2010)	6.97	8/5/08-11/08/08	18.17	86	129.00
Harrow, Ont (2010)			11.13	24 (four 6-turb facilities)	39.60
Top of Iowa, IA (2004)	35.70	5/26/04-9/24/04	10.27	89	80.00
Pioneer Prairie I, IA (Phase II; 2011-2012)			10.06	62	102.30
Fowler I, IN (2009)			8.09	162	301.00
Crystal Lake II, IA (2009)			7.42	80	200.00
Top of Iowa, IA (2003)			7.16	89	80.00
Kewaunee County, WI (1999-2001)			6.45	31	20.46
Ripley, Ont (2008)			4.67	38	76.00
Winnebago, IA (2009-2010)			4.54	10	20.00
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	2.20[c]	6/15/01-9/15/01	4.35	143	107.25
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	2.20[c]	6/15/01-9/15/01	3.71	138	103.50
Crescent Ridge, IL (2005-2006)			3.27	33	49.50
Fowler I, II, III, IN (2012)			2.96	355	600.00
Elm Creek II, MN (2011-2012)			2.81	62	148.80
Buffalo Ridge II, SD (2011-2012)			2.81	105	210.00
Buffalo Ridge, MN (Phase III; 1999)			2.72	138	103.50
Buffalo Ridge, MN (Phase II; 1999)			2.59	143	107.25
Moraine II, MN (2009)			2.42	33	49.50
Buffalo Ridge, MN (Phase II; 1998)			2.16	143	107.25
PrairieWinds ND1 (Minot), ND (2010)			2.13	80	115.50
Grand Ridge I, IL (2009-2010)			2.1	66	99.00
Barton I & II, IA (2010-2011)			1.85	80	160.00
Fowler III, IN (2009)			1.84	60	99.00
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.90[C]	6/15/02-9/15/02	1.81	138	103.50
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.90[C]	6/15/02-9/15/02	1.64	143	107.25
Rugby, ND (2010-2011)			1.60	71	149.00
Elm Creek, MN (2009-2010)			1.49	67	100.00
Wessington Springs, SD (2009)			1.48	34	51.00
PrairieWinds ND1 (Minot), ND (2011)			1.39	80	115.50

Table 5. Wind energy facilities in the Midwest with comparable activity and fatality data for bats.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	Number of Turbines	Total Megawatts
PrairieWinds SD1, SD (2011-2012)			1.23	108	162.00
NPPD Ainsworth, NE (2006)			1.16	36	20.50
PrairieWinds SD1, SD (2012-2013)			1.05	108	162.00
Buffalo Ridge, MN (Phase I; 1999)			0.74	73	25.00
Wessington Springs, SD (2010)			0.41	34	51.00
Buffalo Ridge I, SD (2009-2010)			0.16	24	50.40

[A]. = Bat passes per detector-night.

[B] = Number of fatalities per megawatt per year.

[C] = Activity rate was averaged across phases and/or years.

[D] = Activity rate based on pre-construction monitoring; data for all other activity and fatality rates were collected concurrently.

[E] = Activity rate calculated by WEST from data presented in referenced report.

[F] = Activity rate based on data collected at various heights all other activity rates are from ground-based units only.

Data from the following sources:

Wind Energy Facility	Activity Reference	Fatality Reference	Wind Energy Facility	Activity Reference	Fatality Reference
Barton I & II, IA (10-11)		Derby et al. 2011b	Fowler I, II, III, IN (10)		Good et al. 2011
Blue Sky Green Field, WI (08; 09)	Gruver 2008	Gruver et al. 2009	Fowler I, II, III, IN (11)		Good et al. 2012
Buffalo Ridge, MN (Phase I; 99)		Johnson et al. 2000b	Fowler I, II, III, IN (12)		Good et al. 2013
Buffalo Ridge, MN (Phase II; 98)		Johnson et al. 2000b	Grand Ridge I, IL (09-10)		Derby et al. 2010a
Buffalo Ridge, MN (Phase II; 99)		Johnson et al. 2000b	Harrow, Ont (10)		NRSI 2011
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Kewaunee County, WI (99-01)		Howe et al. 2002
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Moraine II, MN (09)		Derby et al. 2010e
Buffalo Ridge, MN (Phase III; 99)		Johnson et al. 2000b	NPPD Ainsworth, NE (06)		Derby et al. 2007
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Pioneer Prairie I, IA (Phase II; 11-12)		Chodachek et al. 2012
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	PrairieWinds ND1 (Minot), ND (10)		Derby et al. 2011d
Buffalo Ridge I, SD (09-10)		Derby et al. 2010c	PrairieWinds ND1 (Minot), ND (11)		Derby et al. 2012e
Buffalo Ridge II, SD (11-12)		Derby et al. 2012a	PrairieWinds SD1 (Crow Lake), SD (11-12)		Derby et al. 2012c
Cedar Ridge, WI (09)	BHE Environmental 2008	BHE Environmental 2010	PrairieWinds SD1 (Crow Lake), SD (12-13)		Derby et al. 2013
Cedar Ridge, WI (10)	BHE Environmental 2008	BHE Environmental 2011	Ripley, Ont (08)		Jacques Whitford 2009
Crescent Ridge, IL (05-06)		Kerlinger et al. 2007	Rugby, ND (10-11)		Derby et al. 2011c
Elm Creek, MN (09-10)		Derby et al. 2010d	Top of Iowa, IA (03)		Jain 2005
Elm Creek II, MN (11-12)		Derby et al. 2012b	Top of Iowa, IA (04)	Jain 2005	Jain 2005
Forward Energy Center, WI (08-10)	Watt and Drake 2011	Grodsky and Drake 2011	Wessington Springs, SD (09)		Derby et al. 2010b
Fowler I, IN (09)		Johnson et al. 2010a	Wessington Springs, SD (10)		Derby et al. 2011a
Fowler III, IN (09)		Johnson et al. 2010b	Winnebago, IA (09-10)		Derby et al. 2010g

2.2.5 Northern Long-Eared Bat Presence/Absence Surveys

In 2015, the northern long-eared bat was listed as federally threatened. During the summers of 2015 and 2016, acoustic surveys were implemented at the Project to determine the probable presence/absence of the species within the Project area (Derby et al. 2016, Derby 2017; Appendices E1 and E2). Surveys were conducted following the survey recommendations found in the USFWS's *Northern Long-eared Bat Interim Conference and Planning Guidance* and *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS (USFWS 2014, 2015a, 2016). Consistent with survey guidelines and based on total wooded acres within the Project area as defined in 2015 (total of 477.5 ha [1,180 ac] of woodland), acoustic surveys were completed at 20 locations (two detector stations per site) for a total of 104 detector nights (Derby et al. 2016; Appendix E1) from July 21 – August 10, 2015 (Figure 10). Presence/absence surveys conducted in the summer of 2016 were based on the Project boundary as provided by Prevailing Winds, LLC in 2016. Based on this redefined boundary, there were approximately 178 ha (440 ac) of wooded habitat within the Project boundary (Table 1); therefore, eight locations were surveyed for two nights each, for a total of 16 detector-nights, from July 12 – August 4 (Figure 10; Derby 2017).

Based on the Bat Call Identification (Allen 2012) analysis, in 2015, nine locations recorded potential northern long-eared bat calls with a p-value less than 0.05 for the maximum-likelihood estimation; therefore, data from these nine stations were included in qualitative analysis (USFWS 2014, Derby et al. 2016). Qualitative identification verified the presence of northern long-eared bats at one station on six nights and at another station on one night; however, qualitative analysis did not verify the presence of this bat species at the remaining seven stations with probable northern long-eared bat calls (Appendix E1). Based on echolocation call analysis, using Kaleidoscope version 4.0.0 (Wildlife Acoustics 2017) and qualitative identification, following the acoustic survey guidelines issued by the USFWS (2016), no northern long-eared bat calls were recorded during the 2016 survey (Derby 2017; Appendix E2).

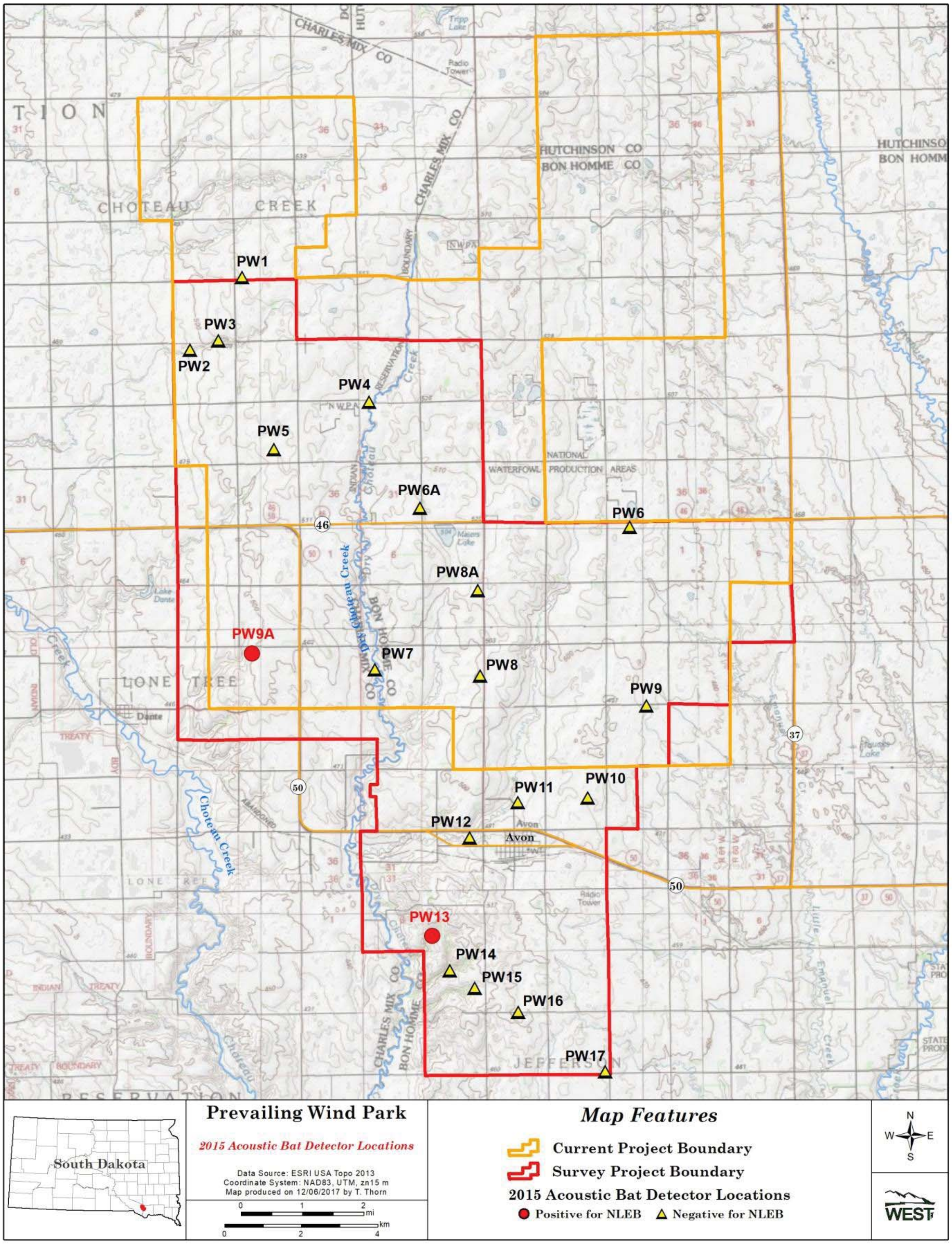

Figure 9. Locations of acoustic bat detectors and those confirmed positive for northern long-eared bats during acoustic surveys conducted in 2015 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

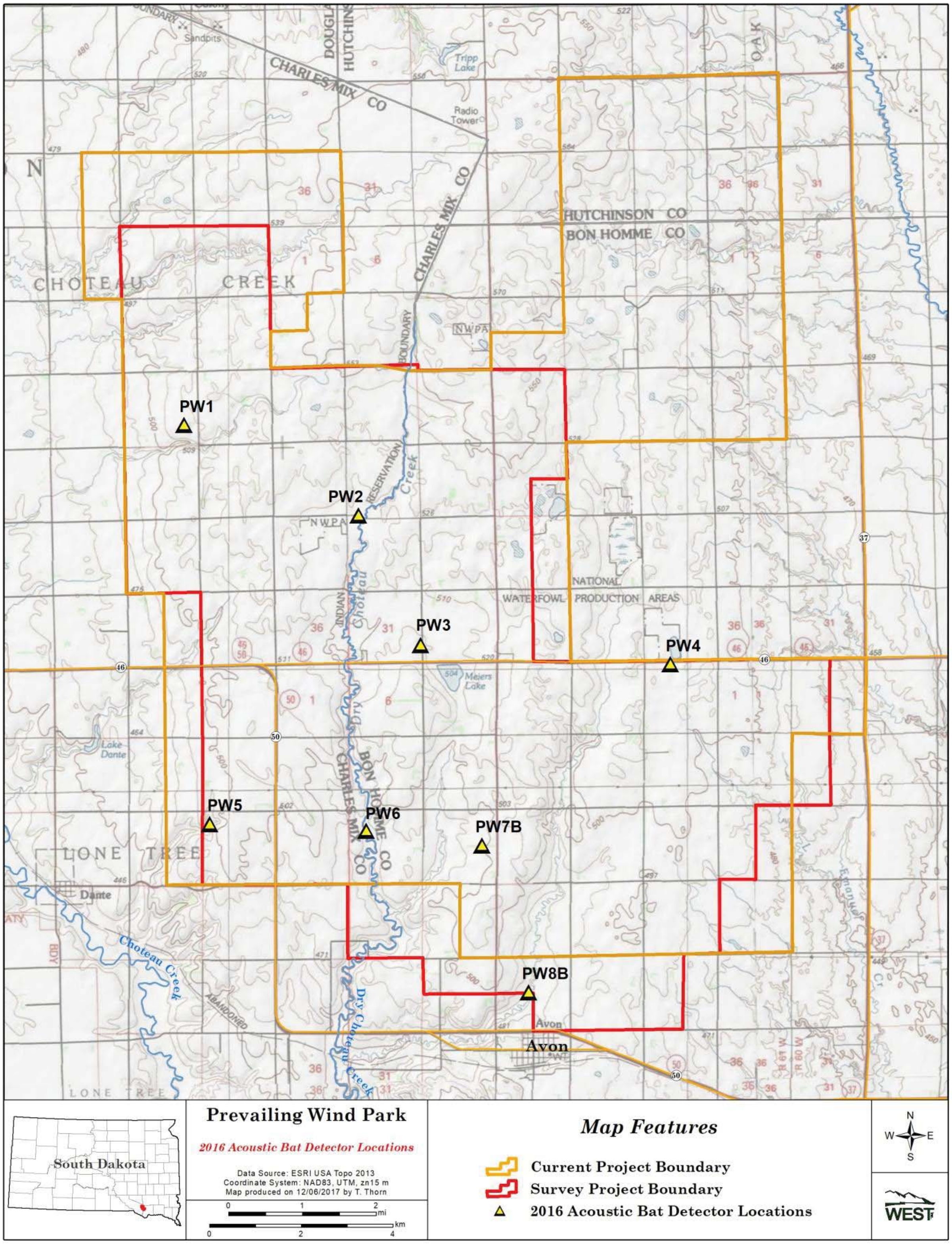

Figure 10. Locations of acoustic bat detectors during acoustic surveys conducted in 2016 at the Prevailing Wind Park Project in Bon Homme, Hutchinson, and Charles Mix counties, South Dakota.

2.2.6 Summary of Tier 3 Questions

1. *Do field studies indicate that species of concern are present on or likely to use the proposed site?*

While there is whooping crane habitat available within the Project area, the Project area does not have unique features compared to the surrounding landscape. Due to the close proximity of the Project to the whooping crane corridor, whooping cranes could potentially migrate through the Project area. Bald eagles nests were observed during spring surveys and individuals were observed during fixed-point counts in spring, fall, and winter, indicating eagles may utilize the Project area year-round; additionally, one golden eagle was observed incidentally during Year 2 surveys. One state-listed bird species (peregrine falcon) was observed during avian use surveys conducted at the Project and several special status bird species, including ferruginous hawk (*Buteo regalis*) and Swainson's hawk (*Buteo swainsoni*) were observed during these surveys. The federally threatened northern long-eared bat was recorded in two locations during the 2015 acoustic survey, but none were found during surveys in 2016, including at one point where one call was classified as a NLEB in 2015.

2. *Do field studies indicate potential for significant adverse impacts on the affected populations of species of habitat fragmentation concern?*

Approximately 42% of the Project area is composed of grassland/pasture land that may contain native grasses. If construction takes place in grassland areas, it is possible that some grassland and/or shrub-dependent species could be displaced. Grassland dependent species observed during fixed-point avian use surveys and incidentally included ferruginous hawk, golden eagle, and bobolink (*Dolichonys oryzivorous*). Project development is being planned to minimize impacts and disturbances to grasslands by siting in cropland to the greatest extent practicable.

3. *What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed Project?*

No whooping cranes have been observed in the Project area. Site-specific data indicate whooping cranes may migrate over the Project, but site characteristics are similar to the surrounding area. Although large groups of sandhill cranes (*Antigone canadensis*) were observed incidentally during both years of fixed-point avian use surveys at the Project; no whooping cranes were observed during baseline studies. No sandhill or whooping cranes have been reported as fatalities from wind energy centers within the migration corridor; therefore impacts to whooping cranes are expected to be low (Derby et al. 2012d). One juvenile peregrine falcon, a state-listed species, was observed using grassland habitats within the Project area. Peregrine falcons have been reported in the general region where the Project is located and negative impacts from Project development are not expected due to the lack of suitable nesting habitat for this species.

The Canada goose (*Branta canadensis*), European starling (*Sturnus vulgaris*), sandhill crane, Franklin's gull (*Leucophaeus pipixcan*), snow goose (*Chen caerulescens*), common grackle (*Quiscalus quiscula*), and red-winged blackbird (*Agelaius phoeniceus*) were observed most often during Years 1 and 2 fixed-point avian use surveys. None of the above species are listed as federal or state-threatened or endangered. However, bald and golden eagles, both protected by the BGEPA, were observed during surveys and incidentally. Impacts are expected to be low for migratory bird species and population-level impacts are not expected.

While eagles are known to nest in the immediate area, no eagle nests were observed within the Project area. One eagle nest is within 1.6 km (1 mile) of the current Project boundary and approximately 3.2 km (2 mile) from the nearest turbine. Due to the proximity of the eagle nest, eagle use of the Project area is possible. Other eagle nests have been documented south of the Project along the Missouri River, and those individuals may utilize resources in the Project. Bald eagles were observed in spring, fall, and winter; however, eagle use of the Project was low.

As described in previous sections, northern long-eared bats were detected in two locations during acoustic surveys conducted in 2015, but were not detected during 2016 surveys.

4. *What are the potential risks of adverse impacts of the proposed Project to individuals and local populations of species of concern and their habitats?*

Where practicable, Project siting has avoided grasslands to limit impacts to wildlife species. Non-cropland vegetation may need to be cleared for construction of facilities, but habitat impacts are not expected to be significant. Most turbines will be located in cropland, which is of low habitat value for most wildlife species. The most likely impacts would be to individual birds and bats that may collide with wind turbines or other Project facilities; however, significant adverse impacts are not anticipated.

5. *How can developers mitigate identified significant adverse impacts?*

No significant impacts to species of concern are expected. Placement of turbines in cultivated crop fields and away from forested and native grassland areas will minimize impacts to sensitive bird and bat species. Project design alterations and best management practices have been developed based on the results from Tier 3 studies, information available in the WEG, and other studies at wind energy facilities. These steps to avoid and reduce impacts are described in Section 3 below.

6. *Are there studies that should be initiated at this stage that would be continued in either Tier 4 or Tier 5?*

Prevailing Wind plans to conduct Tier 4 post-construction monitoring studies for the Project as detailed in Section 4.

2.2.7 Summary of Potential Adverse Impacts

Overall impacts to bird species are expected to be low. The Project is located within a mix of grass/pasture land and cropland. Placement of turbines in grasslands or pasture lands could displace grassland-dependent species and other bird species that can occur in large blocks of grassland. Placement of turbines within mostly cultivated crop fields will limit impacts on birds and displacement of nesting birds.

Whooping cranes may utilize the Project area; however, no whooping or sandhill crane fatalities have been recorded at wind energy facilities in the migratory corridor and no impacts to whooping cranes are expected (Derby et al. 2012d). Overall diurnal raptor use was relatively low throughout the Project area during Years 1 and 2 (0.31 and 0.33 raptors/800-m plot/20-min survey, respectively) and pre-construction raptor use data is shown to generally correlate with post-construction raptor fatality rates at other wind energy projects. Post-construction monitoring at existing wind energy facilities in South Dakota has indicated that impacts to raptors in the region are low; therefore, impacts to raptors are likely to be low at the Project. Bald eagles were observed within the Project area during both years; however more eagles were observed during Year 2. One active bald eagle nest was located 1.6 km (1 mi) east of the Project boundary or 3.2 km (2 mi) from nearest turbine and other bald eagle nests were located within 16.1 km (10 mi) of the Project. Observed eagle use was low within the Project area which suggests minimal potential impacts to eagles.

Based on the Project's location in an agricultural setting, any impacts to bat species will likely be low and fall within the range of other wind energy projects in North and South Dakota and the Midwest region. However, it is difficult to predict what the actual level of bat mortality may be. Based on the location of the Project, limited bat roosting habitat, low bat activity recorded during acoustic surveys, and fatality data from other facilities close to the Project area, low levels of bat mortality could occur from the Project, and significant adverse impacts are not anticipated. The post-construction fatality monitoring surveys planned for the Project (see Section 4) are designed to provide empirical data on actual bat fatalities that can be compared to the pre-construction survey data.

3.0 POST-CONSTRUCTION: TIER 4

According to the WEG, "during post-construction tiers (including Tier 4), developers are assessing whether actions taken in earlier tiers to avoid and minimize impacts are successfully achieving the goals and, when necessary, taking additional steps to compensate for impacts" (USFWS 2012). The specific questions to be investigated in Tier 4 are:

- What are the bird and bat fatality rates within the Project area?
- What are the fatality rates of species of concern?
- How do the estimated fatality rates compare to the predicted fatality rates?
- Do bird and bat fatalities vary within the Project area in relation to site characteristics?

- How do the bird and bat fatality rates compare to the fatality rates from existing projects in similar landscapes with similar species composition and use?
- What is the composition of fatalities in relation to migrating and resident birds and bats at the Project?
- Do fatality data suggest the need for measures to reduce Project impacts?

After the field surveys and analysis are completed in accordance with the protocol described below, Prevailing Wind will review the efforts and make a determination pursuant to the WEG "Decision Framework for Tier 4a Fatality Monitoring" (USFWS 2012) to determine the need for further monitoring or if any measures are needed to reduce impacts.

3.1 Formal Avian and Bat Fatality Monitoring

Prevailing Wind has developed a post-construction monitoring plan with the intent to focus on the WEG Tier 4a questions for the Project. Fatality monitoring will provide information on the impact of the Project on birds and bats and give an indication of whether any specific turbines or Project facilities are responsible for a significant proportion of fatalities. As pre-construction surveys did not indicate significant potential impacts for birds or bats, current plans for the post-construction fatality monitoring are to conduct one year of general bird and bat fatality monitoring.

Fatality monitoring will begin after all the turbines have been commissioned and are fully operational, and will be conducted by a third party biologist. The duration and intensity of carcass searches, the number of selected turbines, and the levels of searcher efficiency and carcass removal trials will be consistent with general wind industry standard practices as described in the WEG. Impacts to avian and bat species are anticipated to be within the overall range of other Midwestern facilities, particularly those within North and South Dakota. The objective of the monitoring will be to determine if the avian or bat fatality rates are lower, similar to, or higher than other regional and national studies.

Fatality monitoring procedures will consist of the following components: 1) standardized carcass searches of selected turbines and/or turbine pads and roads, 2) searcher efficiency trials to estimate the percentage of carcasses found by searchers, and 3) carcass removal trials to estimate the length of time that a carcass remains in the field for possible detection. Fatality estimates for the monitoring period will be provided for a minimum of three categories: 1) bats, 2) all birds, and 3) raptors. The primary purpose of the proposed fatality monitoring is to document bat fatalities and large bird (e.g., raptor) fatalities.

Estimates of facility-related fatalities will be based on:

- Observed number of carcasses found during standardized searches during the monitoring year, for which the cause of death is either unknown or is probably facility-related.

- Non-removal rates, expressed as the estimated average probability a carcass is expected to remain in the study area and be available for detection by the searchers during removal trials.
- Searcher efficiency, expressed as the proportion of planted carcasses found by searchers during searcher efficiency trials.
- Percent of area searched at each turbine (i.e., takes into consideration road and pad sampling) and percentage of carcasses found at varying distances from turbine.

3.2 Incidental Monitoring

3.2.1 On-Site Staff Training

All operations personnel will be trained to identify potential wildlife interactions and the proper response. An incidental reporting process will be developed for operations personnel ensuring they can document bird or bat casualties within the Project area during routine maintenance work and at other times. In addition to incidental fatality reporting, operations personnel will be trained to identify bald and golden eagles, to be sensitive to relative use rates of eagles, and to look for eagle casualties while driving between turbines and conducting turbine maintenance.

3.2.2 Injured Wildlife Handling and Reporting Protocol

Any injured wildlife observed during operations of the Project will be left in place until Prevailing Wind's primary biological/ecological representative has been contacted. Prevailing Wind will then decide the most appropriate course of action depending on the condition and species of injured animal discovered. All injured native birds, including federally or state-listed species, will be promptly delivered to the appropriate rehabilitation center or other approved facility as specified in state and federal permits; or as directed by necessary law enforcement personnel.

3.3 Post-Construction Results and Recommendations Reporting Protocol

Prevailing Wind will prepare a report summarizing the results of the monitoring and assessment completed, as described in Sections 3.1 and 3.2.

Specific to the formal avian and bat fatality monitoring, this report will include turbine-specific information on found carcasses, along with estimated fatality rates for birds and bats. Fatality estimates will be calculated for bats, all birds, and raptors, at a minimum. Seasonal estimates for both birds and bats will also be reported. Estimated fatality rates will be calculated using the total number of carcasses found, along with data from searcher efficiency and carcass removal trials. The report will include an analysis that provides a comparison of fatality estimates, searcher efficiency, and scavenger removal rates between the cleared plots and road and pad searches. All species found as fatalities will be reported and if any federally listed or state-listed species are found they will be reported immediately to the proper agency personnel.

4.0 RESEARCH: TIER 5

In addition to the Tiers 1–4 described above, the WEG contain a Tier 5 *“Other Post-Construction Studies*” section. In general, the studies identified in Tier 5 are research-related and “will not be necessary for most wind energy projects” (USFWS 2012). Given that the Project’s pre-construction studies indicate that the Project is not likely to cause significant adverse impacts, no Tier 5 studies are planned.

5.0 ADAPTIVE MANAGEMENT AND OPERATIONS MEASURES

Within the WEG, the Department of the Interior defines adaptive management as “an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process” (USFWS 2012). The WEG further note that adaptive management at most wind energy facilities is unlikely to be needed if they are sited in accordance with the tiered approach. Nevertheless, Prevailing Wind recognizes the value of applying this approach to its Project activities that include some uncertainty. As such, Prevailing Wind has incorporated an adaptive approach for the conservation of wildlife potentially impacted by the Project.

Section 2.0 of this BBCS describes the tiered approach used to study wildlife conditions and predict Project impacts. Based on Project siting, response to pre-construction monitoring actions (turbines sited mostly in cultivated areas), and results to date of overall biological monitoring, the anticipated bat and bird mortality is expected to be within the overall range for other projects in the region and no significant adverse impacts on birds and bats are anticipated from the Project. Estimated avian and bat fatality rates reported at the nearby Beethoven were 2.69 bat fatalities/MW/study period, 1.43 bird fatalities, and 0.07 raptor fatalities. Additional available studies from Midwestern projects have reported estimated fatality rates ranging from 0.16–2.81 bats/MW/year (Table 5), 0.27–8.25 birds/MW/year (Table 6), and 0–0.47 raptors/MW/year (Table 7). To confirm the anticipated impacts, post-construction fatality surveys will be conducted after the facility is fully functioning, using a third party biologist according to the methods set forth in Section 3.

Table 6. Wind energy facilities in the Midwest with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate^A	Number of Turbines	Total Megawatts
Wessington Springs, SD (2009)	8.25	34	51.00
Blue Sky Green Field, WI (2008; 2009)	7.17	88	145.00
Cedar Ridge, WI (2009)	6.55	41	67.60
Buffalo Ridge, MN (Phase III; 1999)	5.93	138	103.50
Moraine II, MN (2009)	5.59	33	49.50
Barton I & II, IA (2010-2011)	5.5	80	160.00
Buffalo Ridge I, SD (2009-2010)	5.06	24	50.40
Buffalo Ridge, MN (Phase I; 1996)	4.14	73	25.00

Table 6. Wind energy facilities in the Midwest with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate^A	Number of Turbines	Total Megawatts
Winnebago, IA (2009-2010)	3.88	10	20.00
Rugby, ND (2010-2011)	3.82	71	149.00
Cedar Ridge, WI (2010)	3.72	41	68.00
Elm Creek II, MN (2011-2012)	3.64	62	148.80
Buffalo Ridge, MN (Phase II; 1999)	3.57	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	3.14	73	25.00
Ripley, Ont (2008)	3.09	38	76.00
Fowler I, IN (2009)	2.83	162	301.00
Buffalo Ridge, MN (Phase I; 1997)	2.51	73	25.00
Buffalo Ridge, MN (Phase II; 1998)	2.47	143	107.25
PrairieWinds SD1, SD (2012-2013)	2.01	108	162.00
Buffalo Ridge II, SD (2011-2012)	1.99	105	210.00
Kewaunee County, WI (1999-2001)	1.95	31	20.46
NPPD Ainsworth, NE (2006)	1.63	36	20.50
PrairieWinds ND1 (Minot), ND (2011)	1.56	80	115.50
Elm Creek, MN (2009-2010)	1.55	67	100.00
PrairieWinds ND1 (Minot), ND (2010)	1.48	80	115.50
Buffalo Ridge, MN (Phase I; 1999)	1.43	73	25.00
PrairieWinds SD1, SD (2011-2012)	1.41	108	162.00
Wessington Springs, SD (2010)	0.89	34	51.00
Top of Iowa, IA (2004)	0.81	89	80.00
Grand Ridge I, IL (2009-2010)	0.48	66	99.00
Top of Iowa, IA (2003)	0.42	89	80.00
Pioneer Prairie I, IA (Phase II; 2011-2012)	0.27	62	102.30

^{A}. = Number of bird fatalities per megawatt per year.

Data from the following sources:

Wind Energy Facility	Fatality Reference	Wind Energy Facility	Fatality Reference
Barton I & II, IA (10-11)	Derby et al. 2011b	Grand Ridge, IL (09-10)	Derby et al. 2010a
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Kewaunee County, WI (99-01)	Howe et al. 2002
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000b	Moraine II, MN (09)	Derby et al. 2010e
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000b	NPPD Ainsworth, NE (06)	Derby et al. 2007
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000b	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011d
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012e
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012c
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013
Buffalo Ridge I, SD (09-10)	Derby et al. 2010c	Ripley, Ont (08)	Jacques Whitford 2009
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Rugby, ND (10-11)	Derby et al. 2011c
Cedar Ridge, WI (09)	BHE Environmental 2010	Top of Iowa, IA (03)	Jain 2005
Cedar Ridge, WI (10)	BHE Environmental 2011	Top of Iowa, IA (04)	Jain 2005
Elm Creek, MN (09-10)	Derby et al. 2010d	Wessington Springs, SD (09)	Derby et al. 2010b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Wessington Springs, SD (10)	Derby et al. 2011a
Fowler I, IN (09)	Johnson et al. 2010a	Winnebago, IA (09-10)	Derby et al. 2010f

Table 7. Wind energy facilities in the Midwest with fatality data for raptors.

Wind Energy Facility	Raptor Fatality Estimate^A	Number of Turbines	Total Megawatts
Buffalo Ridge, MN (Phase I; 1999)	0.47	73	25.00
Moraine II, MN (2009)	0.37	33	49.50
Winnebago, IA (2009-2010)	0.27	10	20.00
Buffalo Ridge I, SD (2009-2010)	0.2	24	50.40
Cedar Ridge, WI (2009)	0.18	41	67.60
Top of Iowa, IA (2004)	0.17	89	80.00
Cedar Ridge, WI (2010)	0.13	41	68.00
Ripley, Ont (2008)	0.10	38	76.00
Wessington Springs, SD (2010)	0.07	34	51.00
NPPD Ainsworth, NE (2006)	0.06	36	20.50
Wessington Springs, SD (2009)	0.06	34	51.00
Rugby, ND (2010-2011)	0.06	71	149.00
PrairieWinds ND1 (Minot), ND (2011)	0.05	80	115.50
PrairieWinds ND1 (Minot), ND (2010)	0.05	80	115.50
PrairieWinds SD1, SD (2012-2013)	0.03	108	162.00
Kewaunee County, WI (1999-2001)	0	31	20.46
Buffalo Ridge, MN (Phase I; 1996)	0	73	25.00
Buffalo Ridge, MN (Phase I; 1997)	0	73	25.00
Buffalo Ridge, MN (Phase I; 1998)	0	73	25.00
Top of Iowa, IA (2003)	0	89	80.00
Grand Ridge I, IL (2009-2010)	0	66	99.00
Elm Creek, MN (2009-2010)	0	67	100.00
Pioneer Prairie I, IA (Phase II; 2011-2012)	0	62	102.30
Buffalo Ridge, MN (Phase III; 1999)	0	138	103.50
Buffalo Ridge, MN (Phase II; 1998)	0	143	107.25
Buffalo Ridge, MN (Phase II; 1999)	0	143	107.25
Blue Sky Green Field, WI (2008; 2009)	0	88	145.00
Elm Creek II, MN (2011-2012)	0	62	148.80
Barton I & II, IA (2010-2011)	0	80	160.00
PrairieWinds SD1, SD (2011-2012)	0	108	162.00
Buffalo Ridge II, SD (2011-2012)	0	105	210.00
Fowler I, IN (2009)	0	162	301.00

^{A} = Number of raptor fatalities per megawatt per year

Data from the following sources:

Wind Energy Facility	Fatality Reference	Wind Energy Facility	Fatality Reference
Barton I & II, IA (10-11)	Derby et al. 2011b	Grand Ridge, IL (09-10)	Derby et al. 2010a
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Kewaunee County, WI (99-01)	Howe et al. 2002
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000b	Moraine II, MN (09)	Derby et al. 2010e
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000b	NPPD Ainsworth, NE (06)	Derby et al. 2007
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000b	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011d
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000b	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012e
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012c
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000b	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013
Buffalo Ridge I, SD (09-10)	Derby et al. 2010c	Ripley, Ont (08)	Jacques Whitford 2009
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Rugby, ND (10-11)	Derby et al. 2011c
Cedar Ridge, WI (09)	BHE Environmental 2010	Top of Iowa, IA (03)	Jain 2005
Cedar Ridge, WI (10)	BHE Environmental 2011	Top of Iowa, IA (04)	Jain 2005
Elm Creek, MN (09-10)	Derby et al. 2010d	Wessington Springs, SD (09)	Derby et al. 2010b
Elm Creek II, MN (11-12)	Derby et al. 2012b	Wessington Springs, SD (10)	Derby et al. 2011a
Fowler I, IN (09)	Johnson et al. 2010a	Winnebago, IA (09-10)	Derby et al. 2010f

5.1 Unexpected Avian, Bat, and/or Habitat Impacts

Based on the results of the Tier 4 monitoring program described in the sections above, adaptive management measures could be considered to further avoid, minimize, or compensate for unanticipated and significant Project impacts to wildlife. Examples for considering an adaptive response may include:

- Mortality of a bald or golden eagle (to be addressed via the Eagle Conservation Plan), northern long-eared bat, whooping crane or species listed as endangered/threatened under the federal ESA;
- Significant levels of mortality of non-listed species of birds or bats above those outlined in the tables above; or
- New occurrence of an eagle nest or listed species occupancy during operations.

Prevailing Wind would also consider adaptive management responses if additional species become listed under federal or state-protected species regulations.

6.0 IMPLEMENTATION OF THE BBCS

6.1 Document Availability

This BBCS will be maintained by Prevailing Wind's appropriate management staff member and a copy of the BBCS will be kept on-site throughout operations of the Project.

6.2 Reporting

In accordance with the BBCS, annual reports for post-construction Tier 4 efforts will be developed and submitted to appropriate agency representatives for review. Reporting of finding any listed species fatality will be done immediately to the USFWS for the life of the Project. Prevailing Wind will also coordinate any adaptive management changes needed with agency personnel.

7.0 REFERENCES

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APPENDIX M - SHADOW FLICKER ANALYSIS

Shadow Flicker Analysis

Prevailing Wind Park, LLC

Prevailing Wind Park
Project No. 105644

Revision 6a
10/04/2018

Shadow Flicker Analysis

prepared for

Prevailing Wind Park, LLC
Prevailing Wind Park
Bon Homme/Charles Mix/Hutchinson Counties, SD

Project No. 105644

Revision 6a
10/04/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
Developer	Prevailing Wind Park, LLC
GE	General Electric
kg/m^3	Kilograms per cubic meter
m/s	Meters per second
MW	Megawatt
Project	Prevailing Wind Park
Project Site	Location of Prevailing Wind Park in South Dakota
Study	Shadow Flicker Analysis

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REVISION HISTORY

Rev	Issue Date	Release Notes
0	03-Apr-2018	Original release
1	09-Apr-2018	Revised wind turbine layout, incorporated client comments
2	11-Apr-2018	Added REC-138
3	16-Apr-2018	Revised wind turbine layout
4	27-Apr-2018	Revised wind turbine layout
5	25-May-2018	Included obstacles at select locations; added participant status to receptors
5a	27-May-2018	Revised Table 3-1, added Table 3-2
5b	28-May-2018	Incorporated client comments
5c	29-May-2018	Incorporated client comments
6	03-Oct-2018	Updated for new turbine layout; added receptor locations; GE3.8-137 layout
6a	04-Oct-2018	Incorporated client comments

1.0 INTRODUCTION

1.1 Study Overview

Burns & McDonnell Engineering Company, Inc. (“Burns & McDonnell”) was retained by Prevailing Wind Park, LLC (“Developer”) to conduct a shadow flicker analysis (the “Study”) for the proposed Prevailing Wind Park (the “Project”). The objective of the Study was to estimate the annual frequency of shadow flicker on occupied residences caused by Project wind turbines. No attempt was made in this Study to examine or opine on health effects related to shadow flicker.

1.2 Project Overview

The proposed Prevailing Wind Park will be located in Bon Homme, Charles Mix, and Hutchinson Counties in South Dakota, approximately 10 miles east of the town of Wagner and approximately 75 miles southwest of the city of Sioux Falls, South Dakota (the “Project Site”). The Project will consist of up to 61 wind turbines with a maximum nameplate capacity of up to 219.6 megawatts (“MW”), although output at the point of interconnection will be limited to a maximum of 200 MW. The General Electric (“GE”) 3.8-137 with a 111.5-meter hub height turbine model was considered as part of this Study.

A map showing the general location and configuration of the Project Site is included as Appendix A. For purposes of this Study, a total of 62 turbine positions were evaluated, although only up to 61 turbines are expected to be installed.

1.3 Shadow Flicker Overview

Shadow flicker occurs when wind turbine blades pass in front of the sun to create recurring shadows on an object. Such shadows occur only under very specific conditions, including sun position, wind direction, time of day, and other similar factors.

The intensity of shadow flicker varies significantly with distance, and as separation between a turbine and receptor increases, shadow flicker intensity correspondingly diminishes. Shadow flicker intensity for distances greater than 10 rotor diameters (i.e., 1370 meters) is generally low and considered imperceptible. At such distances, shadow flicker is typically only caused at sunrise or sunset, when cast shadows are sufficiently long.

Shadow flicker impacts are not currently regulated in applicable state or federal law, nor are there requirements in the current Charles Mix County (SD) or Hutchinson County (SD) ordinances. Section 1741 of the Bon Homme County (SD) zoning ordinance states the following:

> *When determined appropriate by the County, a Shadow Flicker Control System shall be installed upon all turbines which will cause a perceived shadow effect upon a habitable residential dwelling. Such system shall limit blade rotation at those times when shadow flicker exceeds thirty (30) minutes per day or thirty (30) hours per year at perceivable shadow flicker intensity as confirmed by the Zoning Administrator are probable.*

In addition to providing the modeling results, this report identifies those receptors that may experience shadow flicker more than 30 hours per year and/or 30 minutes per day.

1.4 Site Visit

Burns & McDonnell visited the Project Site in September 2018 to visually confirm the location of occupied receptors for this Study. Beyond this visit, the contents of this evaluation are based exclusively upon desktop analysis by Burns & McDonnell.

2.0 MODELING PARAMETERS AND INPUTS

2.1 Modeling Overview

Shadow flicker was modeled at the Project Site using WindPRO, an industry-leading software package for the design and planning of wind energy projects. This package models the sun's path with respect to every turbine location during every minute over a complete year. Any shadow flicker caused by each turbine is then aggregated for each receptor for the entire year.

The following sections are summaries of the inputs utilized in the WindPRO model for this Study.

2.2 Turbine Coordinates

Shadow flicker intensity is partially dependent upon the distance from a receptor to the turbine causing the shadow. The Developer-provided coordinates of each turbine are presented in Appendix B, and the location of each turbine is presented graphically in Appendix A. For purposes of this Study, a total of 62 turbine positions were evaluated, although only up to 61 turbines are expected to be installed.

2.3 Turbine Dimensions

The size of a wind turbine, including both hub height and rotor diameter, contributes to the length and width of the shadows that may be cast by that turbine. The GE 3.8-137 wind turbine generators were each modeled with a rotor diameter of 137 meters and a hub height of 111.5 meters.

2.4 Receptors

A quantity of 149 receptors were modeled at the Project Site, including two (2) cemeteries. The coordinates of each receptor are presented in Appendix B and the location of each receptor is presented graphically in Appendix A. Coordinates for each receptor were provided by Developer, although Burns & McDonnell visited the Project Site in September 2018 to visually confirm the location of occupied receptors for this Study.

Each receptor was modeled in "green house" mode within the WindPRO model. This approach provides a conservative estimate of the amount of time when shadow flicker could occur by modeling each receptor as having windows on all sides and effectively causing the home to be susceptible to flicker effects in all directions.

2.5 Terrain

The WindPRO model utilizes topography data to place turbines and receptors at the proper elevations. This information is also used by the model to consider any natural land features between a turbine and a receptor that may block shadows from being seen at a receptor.

Publicly-available terrain data was downloaded from the National Elevation Dataset, a product of the United States Geological Survey. The 10-meter resolution digital elevation model DEM was exported at 10-foot intervals for use in the WindPRO model. Elevations were assigned by Burns & McDonnell to each turbine and each receptor using this data.

2.6 Obstacles

Obstacles located between a receptor and a turbine, such as trees or buildings, may significantly reduce or eliminate the duration and/or intensity of shadow flicker. Burns & McDonnell included obstacles in the WindPRO model, including trees and outbuildings, for only those receptors that exceeded 30 hours per year and/or 30 minutes per day. Such receptors are indicated by an asterisk (*) in Appendix B and Appendix F, respectively. No obstacles were considered or modeled for any other receptors.

WindPRO models obstacles utilizing a cubic volume, where each obstacle is assigned a height, width, depth, and porosity level. The obstacles near the applicable receptors were reviewed by Burns & McDonnell and the type and characteristics of each obstacle were visually estimated using publicly-available desktop aerial imagery. Trees and groups of trees were assumed to be 12 meters tall, barns and other outbuildings were assumed to be 4 meters tall, and grain bins were assumed to be 6 meters tall. Only obstacles in reasonably close proximity to a receptor were considered (i.e., those that might be expected to influence flicker durations).

Burns & McDonnell did not make any in-person verifications regarding the existence, size, or influence of obstacles. The obstacles were modeled exclusively through desktop analysis of aerial imagery.

2.7 Turbine Operation

Shadow flicker is contingent upon the movement of the turbine blades. Shadow flicker can only occur when the turbine is in operation (i.e., when the turbine blades are rotating). Moreover, shadow flicker is generally most notable when a turbine is facing a receptor, as this results in the widest-possible shadow being cast. To more accurately reflect the periods of operation of each Project wind turbine, on-site hub-height wind data was provided by Developer and used to indicate the periods when the turbines are inactive due to wind speeds below the turbine cut-in speed or above the turbine cut-out speed, at which time the turbine rotor is not in motion and no shadow flicker will occur.

Project Site-specific wind data was also utilized to model the actual orientation of the turbines relative to each receptor. The Developer-provided wind data includes data collected by an on-site meteorological mast between September 2013 and September 2018. The provided data is shown in Appendix C.

Power curves for the proposed turbines were provided by Developer. These power curves were added to the WindPRO model to more accurately reflect the turbine's operational characteristics. The Developer-provided power curves are shown in Appendix E.

2.8 Flicker Relevance

At distances beyond 10 rotor diameters, shadow flicker effects are generally considered low, as shadows diffuse and become imperceptible. Thus, a distance equal to 10 times the rotor diameter of each turbine (i.e., 1370 meters) was modeled as the maximum distance at which shadow flicker was considered relevant; receptors greater than this distance from a given turbine were not evaluated. The proximity of this buffer relative to each receptor is presented graphically in Appendix A.

2.9 Sun Angle

The sun's path with respect to each turbine location is calculated by the WindPRO model to determine the cast shadow paths during every minute over a complete year. However, at very low sun angles, the light must pass through more atmosphere and becomes too diffused to form a coherent shadow. Thus, a value of three (3) degrees was utilized for the height at which the sun would not cause noticeable flicker.

2.10 Sun Obstruction

The percentage of the turbine blade covering the sun disc is calculated by the WindPRO model to determine the size of shadow cast during every minute over a complete year. By default, the WindPRO model calculates shadow flicker only when at least 20 percent of the sun disc is covered by the turbine blades. When less than 20 percent of the sun disc is masked by the blades, the shadow will be too diffuse to cause a coherent shadow.

2.11 Environment

Shadow flicker is only caused when the sun is shining. Sunshine probability data (see Appendix D) was obtained by Burns & McDonnell from www.city-data.com. This data represents the percentage of hours each month that the sun is expected to be shining during daylight hours, with consideration given for cloud cover, rainy days, fog, or other similar occurrences that may diminish the potential occurrence or severity of shadow flicker.

3.0 RESULTS

Using the inputs and parameters defined in Section 2.0, the WindPRO model was used to calculate shadow flicker for the receptors at the Project Site. Table 3-1 presents a summary of these results by landowner status for the applicable receptor. Detailed tables are included within Appendix F that present shadow flicker durations by receptor, including estimated hours per year and maximum minutes per day. Additionally, maps are provided in Appendix G which illustrate the shadow flicker vectors (in hours per year) caused by each Project turbine.

Table 3-1: Summary of Results

Landowner Status	No. of Turbines	No. of Receptors	No. of Receptors, Flicker $\geq$ 30 hr/yr	No. of Receptors, Flicker $\geq$ 30 min/day
Participating	62	48	2	13
Non-participating		101	1	14

The following is a set of key observations from the results of the Study:

- With the current layout, 3 of the 149 known receptors exceed 30 hours per year of shadow flicker. Additionally, 25 of the 149 known receptors exceed 30 minutes per day of shadow flicker, although approximately one quarter (7 of 25) exceed this daily threshold by only 5 or fewer minutes and more than half (13 of 25) exceed this daily threshold by only 10 or fewer minutes. Refer to Appendix F for a complete listing of results.
- The majority of observed shadow flicker on each receptor occurs during early morning and/or late afternoon and evening hours (see Appendix H).
- For purposes of this Study, a total of 62 turbine positions were evaluated, although Burns & McDonnell understands that only up to 61 turbines are expected to be installed. Depending on the turbine location(s) that are eliminated, flicker durations at impacted receptors are likely to decrease from those presented herein.
- The Study was performed using a conservative modeling approach with Project Site-specific conditions. For example, the Study modeled each receptor as a “green house”, meaning each receptor was modeled as having windows on all sides and effectively causing the home to be susceptible to flicker effects in all directions. Further, the majority of the receptor locations were modeled as if no obstacles were present, including trees or buildings, which may significantly reduce or eliminate the duration and/or intensity of shadow flicker at a receptor. Due to the conservative approach of the Study, the actual duration and intensity of shadow flicker experienced at each receptor is expected to be less than those reported in the Study.

- Notwithstanding any shadow flicker which may occur at the Project Site, mitigation techniques may be utilized to reduce these effects. Common techniques include planting vegetation, awning installation, and/or reduced turbine operation.

The following is an overview of the shadow flicker characteristics at receptors where obstacles were considered but impacts were not fully mitigated:

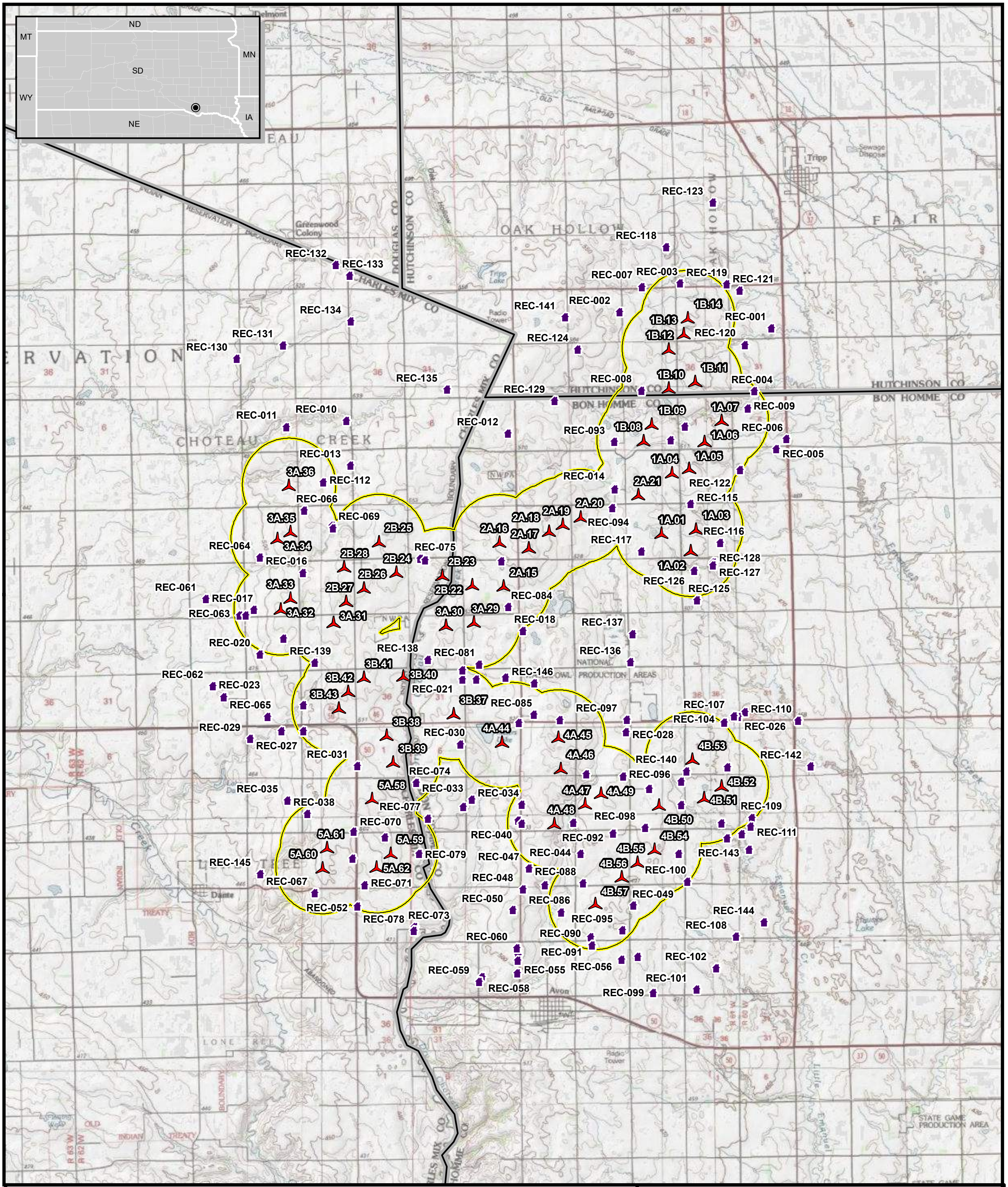
- REC-008 is receiving shadow flicker from 1B.10 to the east. While there are a few buildings in the vicinity, the area to the east is largely exposed to this source. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-009 is receiving shadow flicker from 1A.07 to the southwest. The area to the west-southwest is generally exposed, with insufficient geometry to fully mitigate shadow flicker. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-014 is receiving shadow flicker from 2A.21 to the southeast. While obstacles exist to the east of the receptor it is largely exposed to shadow flicker to the southeast. A reduction in flicker duration of approximately 6 hours/year was observed when considering obstacles at this receptor.
- REC-015 is receiving shadow flicker from 2A.21 to the southeast. This receptor is largely exposed to shadow flicker to the east and southeast. A reduction in flicker duration of approximately 7 hours/year was observed when considering obstacles at this receptor.
- REC-017 is receiving shadow flicker from 3A.32 to the east and 3A.33 to the northeast. Some trees and buildings reduce shadow impact, but the greatest exposure to shadow flicker is from the east where the receptor is partially exposed. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-024 is receiving shadow flicker from 3B.43 to the east. The receptor is largely exposed to the south and partially to the southeast. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-031 receiving shadow flicker from 3B.39 to the east. The receptor is largely exposed to the east. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-032 is receiving shadow flicker from 4B.50 to the southeast. Some buildings to the south reduce flicker, however the receptor is largely exposed to the south. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.

- REC-040 is receiving shadow flicker from 4A.48 to the east. Some obstacles are in line of flicker impact, but the area to the east-southeast is largely exposed. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-041 is receiving shadow flicker from 4A.48 to the west. While several obstacles are within close proximity to this receptor, there is direct exposure to the west. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-042 is receiving shadow flicker from 4B.50 to the southwest, from 4B.51 to the southeast, and from 4B.52 to the east-southeast. This receptor has several obstacles nearby to the north but is largely exposed to the east, west, and south. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-045 is receiving shadow flicker from 4B.54 to the west. While several obstacles are in the vicinity, the geometry of the obstacles is insufficient to fully reduce flicker impact. A reduction in flicker duration of approximately 3.5 hours/year was observed when considering obstacles at this receptor.
- REC-046 is receiving shadow flicker from 5A.60 and 5A.61 to the west and from 5A.59 and 5A.62 to the east. Several obstacles are in the vicinity; however, the receptor is largely exposed to the south and east. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-051 is receiving shadow flicker from 4B.57 to the northeast. This receptor is largely exposed to the east. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-070 is receiving shadow flicker form 5A.61 to the southwest. While some obstacles are in the vicinity, the geometry is insufficient to fully reduce flicker impacts to the west and southwest. A reduction in flicker duration of approximately 5.5 hours/year and 24 minutes/day was observed when considering obstacles at this receptor.
- REC-075 is receiving shadow flicker from 2B.23 to the southeast. While there are several obstacles in the vicinity, the receptor is exposed to the southeast. A reduction in flicker duration of approximately 23 hours/year and 22 minutes/day was observed when considering obstacles at this receptor.
- REC-076 is receiving shadow flicker from 2B.23 to the southeast and 2B.24 to the southwest and is largely exposed to the east and south, with some exposure to the west. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.

- REC-082 is receiving shadow from 2B.22 to the southwest. This receptor has several obstacles in the vicinity but is partially exposed to the southwest. A reduction in flicker duration of approximately 13 hours/year and 6 minutes/day when considering obstacles at this receptor.
- REC-089 is receiving shadow flicker from 4A.46 to the northwest and 4A.49 to the southeast. While there are several obstacles in the vicinity, the geometry is insufficient to fully mitigate shadow flicker impacts. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-093 is receiving shadow flicker from 1B.08 to the east and 1B.09 to the northeast. This receptor is largely exposed to the east and south. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-094 is receiving shadow flicker from 2A.20 to the southwest and 2A.21 to the northeast. This receptor has some obstacles in the vicinity, but there remains sparse coverage to the east, south, and southeast. A reduction in flicker duration of approximately 6 hours/year was observed when considering obstacles at this receptor.
- REC-096 is receiving shadow flicker from 4B.50 to the southeast and 4A.49 to the southwest. Several obstacles are in the vicinity, but there remains exposure to the east and southeast. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-112 is receiving shadow flicker from 3A.36 to the east where there are some obstacles present; however, the geometry is insufficient to fully mitigate shadow flicker impact. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-113 is receiving shadow flicker from 1B.08 to the east. This receptor is exposed to the east and south. A reduction in flicker duration of approximately 11 hours/year and 33 minutes /day was observed when considering obstacles at this receptor.
- REC 114 is receiving shadow flicker from 1B.08 to the southwest, 1A.06 to the southeast, and 1B.09 to the east and is exposed to the east, with some exposure to the west and partial exposure to the south. A reduction in flicker duration of approximately 8 hours/year and 10 minutes/day was observed when considering obstacles at this receptor.

APPENDIX A - PROJECT SITE LAYOUT

Path: \\bmcd\dfs\Clients\BTS\SPowerDC\105644_PrvWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P_ShadowFlicker.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter



LEGEND

▭ County Boundary

⅄ Wind Turbine

⌂ Receptor

▭ Wind Turbine Buffer (1370m)

REFERENCE

0 1.5 3

MILES

0 1.5 3

KILOMETERS

N

PREVAILING WIND PARK
Project Site Layout - GE 3.8-137 Flicker Buffer

LOCATION:	Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT:	Prevailing Wind Park, LLC
PROJ. NO.:	105644
CREATED:	10/03/2018

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APPENDIX B - INFRASTRUCTURE COORDINATES

Table B-1: Turbine Coordinates

Turbine Number	Easting [m]	Northing [m]
1A.01	579,956	4,775,946
1A.02	580,807	4,775,443
1A.03	580,970	4,776,074
1A.04	580,259	4,777,725
1A.05	580,759	4,777,855
1A.06	581,221	4,778,640
1A.07	581,719	4,779,255
1B.08	579,428	4,778,668
1B.09	579,671	4,779,153
1B.10	580,170	4,780,211
1B.11	580,939	4,780,407
1B.12	580,170	4,781,359
1B.13	580,604	4,781,811
1B.14	580,727	4,782,275
2A.15	575,324	4,774,400
2A.16	575,201	4,775,693
2A.17	576,064	4,775,521
2A.18	576,650	4,776,014
2A.19	577,060	4,776,210
2A.20	577,580	4,776,426
2A.21	579,275	4,777,079
2B.22	574,404	4,774,437
2B.23	573,519	4,774,711
2B.24	572,179	4,774,804
2B.25	571,662	4,775,700
2B.26	571,219	4,774,346
2B.27	570,700	4,773,949
2B.28	570,639	4,774,959
3A.29	574,452	4,773,338
3A.30	573,634	4,773,249
3A.31	570,336	4,773,327
3A.32	568,781	4,773,724
3A.33	569,071	4,774,045
3A.34	568,691	4,775,793
3A.35	569,074	4,775,995

Turbine Number	Easting [m]	Northing [m]
3A.36	569,026	4,777,349
3B.37	573,856	4,770,651
3B.38	571,896	4,770,015
3B.39	572,076	4,769,232
3B.40	572,380	4,771,753
3B.41	571,220	4,771,721
3B.42	570,763	4,771,308
3B.43	570,487	4,770,821
4A.44	575,275	4,769,819
4A.45	576,925	4,769,963
4A.46	576,997	4,769,043
4A.47	577,718	4,768,001
4A.48	576,805	4,767,428
4A.49	578,173	4,768,318
4B.50	579,886	4,767,974
4B.51	581,200	4,768,190
4B.52	581,716	4,768,536
4B.53	580,860	4,769,311
4B.54	579,755	4,766,668
4B.55	579,255	4,766,296
4B.56	578,787	4,765,862
4B.57	578,011	4,765,079
5A.58	571,464	4,768,160
5A.59	572,004	4,766,553
5A.60	570,006	4,766,129
5A.61	570,143	4,766,716
5A.62	571,597	4,766,151

Notes:
[1] All coordinates presented in UTM NAD83 Zone 14N (meters)
[2] All coordinates provided by Developer in "PWIND - 62x GE38137 111p5m v180925-02" on 20180925

Table B-2: Receptor Coordinates

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status
REC-001	583,179	4,781,949	Hutchinson	Non-participating
REC-002	578,731	4,782,429	Hutchinson	Participating
REC-003	580,507	4,783,274	Hutchinson	Non-participating
REC-004	582,679	4,780,105	Hutchinson	Non-participating
REC-005	583,327	4,778,397	Bon Homme	Non-participating
REC-006	583,615	4,778,695	Bon Homme	Non-participating
REC-007	579,386	4,783,172	Hutchinson	Non-participating
REC-008*	579,365	4,780,123	Hutchinson	Non-participating
REC-009*	582,486	4,779,597	Bon Homme	Non-participating
REC-010	570,706	4,779,233	Charles Mix	Non-participating
REC-011	568,955	4,779,050	Charles Mix	Non-participating
REC-012	575,451	4,778,870	Bon Homme	Non-participating
REC-013	570,834	4,777,924	Charles Mix	Non-participating
REC-014*	578,568	4,777,265	Bon Homme	Non-participating
REC-015*	578,579	4,777,228	Bon Homme	Non-participating
REC-016	569,438	4,774,776	Charles Mix	Participating
REC-017*	568,000	4,773,684	Charles Mix	Non-participating
REC-018	575,894	4,773,069	Bon Homme	Participating
REC-019	568,870	4,772,838	Charles Mix	Participating
REC-020	568,171	4,772,373	Charles Mix	Non-participating
REC-021	574,123	4,771,642	Bon Homme	Participating
REC-022	574,118	4,771,913	Bon Homme	Non-participating
REC-023	567,115	4,771,132	Charles Mix	Non-participating
REC-024*	569,456	4,770,886	Charles Mix	Non-participating
REC-025	582,410	4,770,691	Bon Homme	Participating
REC-026	582,206	4,770,538	Bon Homme	Non-participating
REC-027	569,451	4,770,123	Charles Mix	Non-participating
REC-028	578,916	4,770,107	Bon Homme	Participating
REC-029	567,890	4,769,897	Charles Mix	Non-participating
REC-030	574,058	4,769,738	Bon Homme	Non-participating
REC-031*	571,038	4,769,100	Charles Mix	Non-participating
REC-032*	579,595	4,768,434	Bon Homme	Participating
REC-033	574,388	4,768,112	Bon Homme	Non-participating
REC-034*	575,857	4,767,969	Bon Homme	Non-participating
REC-035	568,988	4,768,088	Charles Mix	Non-participating

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status
REC-036	574,140	4,767,903	Bon Homme	Non-participating
REC-037*	580,535	4,767,956	Bon Homme	Participating
REC-038	569,571	4,767,694	Charles Mix	Non-participating
REC-039*	575,754	4,767,512	Bon Homme	Non-participating
REC-040*	575,854	4,767,409	Bon Homme	Non-participating
REC-041*	577,366	4,767,429	Bon Homme	Participating
REC-042*	580,535	4,768,650	Bon Homme	Non-participating
REC-043	582,314	4,767,105	Bon Homme	Non-participating
REC-044	577,582	4,766,535	Bon Homme	Participating
REC-045*	580,460	4,766,528	Bon Homme	Participating
REC-046*	570,892	4,766,384	Charles Mix	Participating
REC-047	576,072	4,766,099	Bon Homme	Non-participating
REC-048	575,888	4,765,484	Bon Homme	Non-participating
REC-049	579,136	4,765,004	Bon Homme	Non-participating
REC-050	575,594	4,764,878	Bon Homme	Participating
REC-051*	577,015	4,764,806	Bon Homme	Participating
REC-052	571,035	4,764,976	Charles Mix	Non-participating
REC-053	575,752	4,763,554	Bon Homme	Non-participating
REC-054	579,261	4,763,509	Bon Homme	Non-participating
REC-055	575,738	4,763,383	Bon Homme	Non-participating
REC-056	578,784	4,763,423	Bon Homme	Non-participating
REC-057	575,729	4,763,021	Bon Homme	Non-participating
REC-058	574,690	4,762,906	Bon Homme	Non-participating
REC-059	574,609	4,762,765	Bon Homme	Non-participating
REC-060	575,719	4,763,759	Bon Homme	Non-participating
REC-061	566,590	4,774,005	Charles Mix	Non-participating
REC-062	566,795	4,771,446	Charles Mix	Non-participating
REC-063	567,576	4,773,523	Charles Mix	Non-participating
REC-064	568,170	4,775,222	Charles Mix	Non-participating
REC-065	568,402	4,770,548	Charles Mix	Non-participating
REC-066	569,475	4,776,605	Charles Mix	Participating
REC-067	569,782	4,765,374	Charles Mix	Non-participating
REC-068	570,301	4,776,152	Charles Mix	Non-participating
REC-069	570,321	4,776,086	Charles Mix	Non-participating
REC-070*	570,931	4,767,169	Charles Mix	Non-participating
REC-071	571,247	4,765,598	Charles Mix	Non-participating

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status
REC-072	571,848	4,767,001	Charles Mix	Participating
REC-073	572,712	4,764,371	Charles Mix	Non-participating
REC-074	572,760	4,768,610	Bon Homme	Non-participating
REC-075*	572,875	4,775,184	Charles Mix	Participating
REC-076*	573,024	4,775,138	Charles Mix	Non-participating
REC-077	573,104	4,767,559	Bon Homme	Non-participating
REC-078	572,690	4,764,270	Charles Mix	Non-participating
REC-079*	572,840	4,766,532	Charles Mix	Participating
REC-080	574,527	4,771,635	Bon Homme	Participating
REC-081	574,606	4,772,084	Bon Homme	Participating
REC-082*	575,265	4,775,117	Bon Homme	Participating
REC-083	575,384	4,771,696	Bon Homme	Participating
REC-084	575,460	4,773,772	Bon Homme	Participating
REC-085*	576,210	4,770,611	Bon Homme	Participating
REC-086	576,538	4,765,598	Bon Homme	Participating
REC-087	576,971	4,770,447	Bon Homme	Participating
REC-088	577,660	4,765,661	Bon Homme	Participating
REC-089*	577,747	4,768,860	Bon Homme	Participating
REC-090	577,878	4,764,079	Bon Homme	Non-participating
REC-091	577,916	4,763,844	Bon Homme	Non-participating
REC-092	578,532	4,767,119	Bon Homme	Participating
REC-093*	578,576	4,778,619	Bon Homme	Participating
REC-094*	578,515	4,776,677	Bon Homme	Participating
REC-095	578,804	4,764,275	Bon Homme	Non-participating
REC-096*	578,828	4,768,793	Bon Homme	Non-participating
REC-097	578,943	4,770,455	Bon Homme	Non-participating
REC-098	579,475	4,767,289	Bon Homme	Non-participating
REC-099	579,721	4,762,442	Bon Homme	Participating
REC-100	580,720	4,765,706	Bon Homme	Non-participating
REC-101	580,992	4,762,541	Bon Homme	Non-participating
REC-102	581,560	4,763,175	Bon Homme	Non-participating
REC-103	581,721	4,767,420	Bon Homme	Participating
REC-104	581,794	4,770,381	Bon Homme	Non-participating
REC-105*	581,891	4,769,063	Bon Homme	Non-participating
REC-106	581,883	4,766,985	Bon Homme	Participating
REC-107	582,090	4,770,568	Bon Homme	Non-participating

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status
REC-108	582,148	4,764,102	Bon Homme	Participating
REC-109	582,610	4,767,583	Bon Homme	Non-participating
REC-110	583,963	4,770,430	Bon Homme	Non-participating
REC-111	582,578	4,767,332	Bon Homme	Non-participating
REC-112*	570,034	4,777,429	Charles Mix	Non-participating
REC-113*	580,226	4,778,670	Bon Homme	Participating
REC-114*	580,644	4,779,066	Bon Homme	Participating
REC-115	580,813	4,776,798	Bon Homme	Participating
REC-116*	581,676	4,775,654	Bon Homme	Participating
REC-117	579,368	4,775,404	Bon Homme	Participating
REC-118	580,095	4,784,337	Hutchinson	Non-participating
REC-119	581,868	4,783,246	Hutchinson	Non-participating
REC-120	582,411	4,781,467	Hutchinson	Non-participating
REC-121	582,256	4,783,055	Hutchinson	Non-participating
REC-122	582,261	4,777,793	Bon Homme	Participating
REC-123	581,461	4,785,646	Hutchinson	Non-participating
REC-124	577,505	4,781,336	Hutchinson	Non-participating
REC-125	580,996	4,773,976	Bon Homme	Non-participating
REC-126	580,916	4,774,830	Bon Homme	Participating
REC-127*	581,474	4,775,076	Bon Homme	Participating
REC-128	581,468	4,774,997	Bon Homme	Participating
REC-129	576,816	4,779,814	Bon Homme	Non-participating
REC-130	567,502	4,781,060	Charles Mix	Non-participating
REC-131	568,850	4,781,446	Charles Mix	Non-participating
REC-132	570,408	4,783,811	Charles Mix	Non-participating
REC-133	570,806	4,783,497	Charles Mix	Non-participating
REC-134	570,845	4,782,153	Charles Mix	Non-participating
REC-135	573,665	4,780,153	Charles Mix	Non-participating
REC-136	579,049	4,772,150	Bon Homme	Non-participating
REC-137	579,104	4,772,978	Bon Homme	Non-participating
REC-138*	573,105	4,772,224	Bon Homme	Participating
REC-139	569,781	4,772,134	Charles Mix	Non-participating
REC-140	580,689	4,768,952	Bon Homme	Non-participating
REC-141	577,130	4,782,270	Hutchinson	Non-participating
REC-142	584,340	4,769,093	Bon Homme	Non-participating
REC-143	582,522	4,766,643	Bon Homme	Non-participating

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status
REC-144	582,964	4,764,514	Bon Homme	Non-participating
REC-145	568,186	4,765,929	Charles Mix	Non-participating
REC-146	576,221	4,771,527	Bon Homme	Participating
REC-147	575,778	4,770,361	Bon Homme	Participating
REC-148	568,806	4,770,128	Charles Mix	Non-participating
REC-149	567,763	4,773,526	Charles Mix	Non-participating

Notes:

[1] All coordinates presented in UTM NAD83 Zone 14N (meters)
[2] Coordinates provided by Developer in "RECEPTORS-OCCUPIED.KMZ" and through field investigation data provided 20180920
[3] Participating status provided by Developer in "Prevailing Winds - Homes on Leased Land" dated 20180516
[4] * Indicates receptor that was analyzed with obstacles.

APPENDIX C - ON-SITE FREQUENCY DISTRIBUTION

Table C-1: Onsite Frequency Distribution, 111.5 magl

Bin	Wind Direction [degrees]											
[m/s]	**0**	**30**	**60**	**90**	**120**	**150**	**180**	**210**	**240**	**270**	**300**	**330**
0	11.63	9.15	7.94	7.92	7.53	7.80	8.96	5.46	5.14	5.35	10.68	12.43
1	11.51	9.25	11.54	9.35	8.16	4.89	3.58	8.52	9.42	9.91	10.83	10.20
2	20.70	20.13	20.43	17.93	15.71	12.23	10.56	15.50	18.48	21.81	17.68	17.72
3	33.22	34.35	34.95	33.11	29.54	23.68	20.09	29.61	31.54	34.00	27.44	29.54
4	52.15	56.03	57.94	55.29	52.65	35.96	28.99	46.16	45.04	55.74	46.51	48.70
5	72.48	70.20	75.20	70.95	67.65	50.49	38.48	52.72	57.06	64.37	57.02	66.18
6	81.89	83.87	81.78	85.27	89.90	69.52	50.15	62.29	68.49	78.41	65.81	71.98
7	96.59	95.00	98.95	97.99	102.77	81.21	57.90	72.27	81.10	84.11	76.67	81.19
8	102.03	89.37	95.39	101.36	101.50	88.94	76.50	77.23	90.82	89.96	84.70	86.32
9	104.00	95.04	105.73	95.63	101.91	103.82	97.70	99.43	98.02	93.31	87.28	87.37
10	91.57	103.26	106.21	98.09	107.43	111.11	107.15	107.33	109.89	102.07	92.31	92.86
11	90.03	91.21	95.97	96.93	95.27	114.82	130.43	109.07	110.93	99.29	95.28	86.57
12	72.68	71.41	72.31	78.47	80.22	97.90	124.26	102.86	90.53	86.11	87.42	81.99
13	55.36	56.78	53.37	59.24	59.95	78.28	104.76	87.84	71.31	62.37	69.16	65.63
14	40.54	40.48	33.32	40.20	39.37	55.87	69.60	59.70	50.90	49.04	54.02	47.97
15	26.30	27.72	22.60	26.65	21.13	36.25	35.80	31.98	30.57	26.73	37.69	36.57
16	19.06	18.47	13.08	15.28	9.32	19.23	22.26	18.43	15.66	18.46	25.87	26.87
17	11.91	12.71	6.83	7.28	6.69	7.58	10.69	7.61	7.57	10.26	20.54	20.48
18	7.90	10.59	5.39	4.48	4.71	4.06	6.00	3.14	4.30	6.27	14.83	13.39
19	4.72	6.88	3.08	2.84	3.40	1.52	3.19	2.30	3.12	2.14	8.86	10.20
20	2.26	4.50	2.50	1.45	1.01	0.64	0.68	1.54	1.78	2.07	6.90	6.91
21	1.57	1.50	1.73	1.40	0.96	0.54	0.30	0.56	1.11	1.50	4.82	4.08
22	0.62	0.63	0.58	0.53	0.25	0.20	0.13	0.70	0.82	1.07	3.11	3.07
23	0.46	0.25	0.48	0.05	0.30	0.15	0.21	0.63	0.97	0.71	2.22	1.69
24	0.26	0.04	0.29	0.19	0.15	0.20	0.04	0.63	0.15	0.14	1.47	0.98
25	0.16	0.04	0.14	0.05	0.05	0.15	0.26	0.77	0.15	0.00	1.04	0.74
26	0.00	0.13	0.14	0.00	0.00	0.10	0.21	0.28	0.07	0.07	0.39	0.40
27	0.03	0.13	0.10	0.00	0.00	0.29	0.04	0.21	0.00	0.07	0.14	0.25
28	0.00	0.04	0.00	0.00	0.00	0.29	0.04	0.28	0.00	0.00	0.04	0.09
29	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.14	0.00	0.00	0.00	0.06
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.15	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	**1012**	**1009**	**1008**	**1008**	**1008**	**1008**	**1009**	**1005**	**1005**	**1005**	**1011**	**1012**

Notes:

[1] All data provided by Developer via “Prevailing Winds Site Average.windog”

[2] All data presented in milles for period from September 20, 2013 to September 13, 2018

[3] All data presented at 111.5 magl

APPENDIX D - SUNSHINE PROBABILITY DATA

Figure D-1: Monthly Sunshine Probability for Wagner, South Dakota

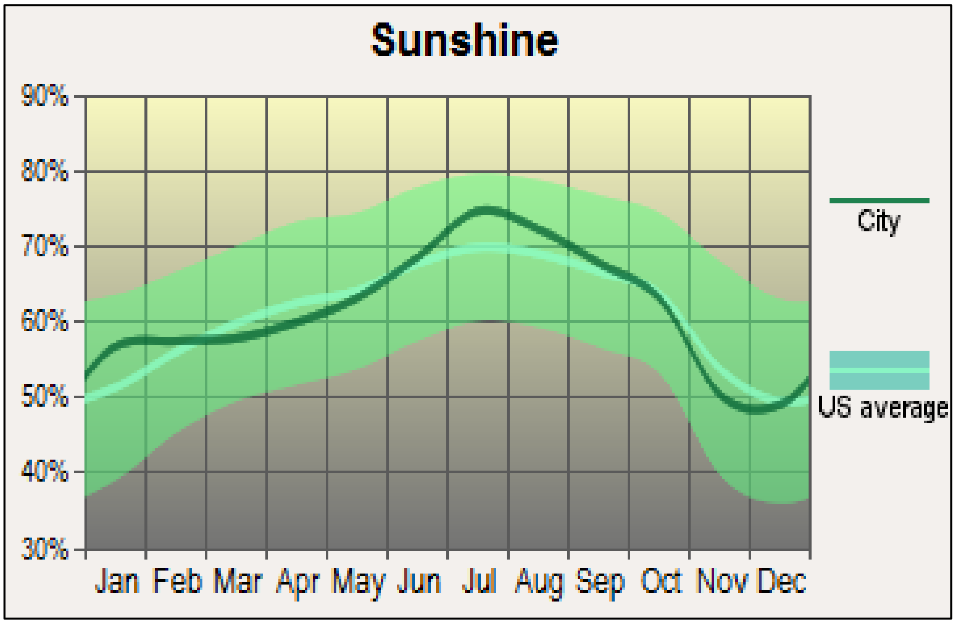


Table D-1: Monthly Sunshine Probability for Wagner, South Dakota

Month	Avg Sunshine Probability
January	58%
February	58%
March	59%
April	60%
May	63%
June	69%
July	74%
August	72%
September	68%
October	65%
November	50%
December	50%

Notes:
[1] Data source: http://www.city-data.com/city/Wagner-South-Dakota.html
[2] Data location: Wagner, South Dakota
[3] Data in Table D-1 estimated from source data in Figure D-1

APPENDIX E - POWER CURVE

Table E-1: GE 3.8-137 Power Curve Values

Wind Speed [m/s]	Power [kW]
0.0	0
1.0	0
2.0	0
3.0	14
4.0	179
5.0	434
6.0	786
7.0	1269
8.0	1906
9.0	2648
10.0	3284
11.0	3776
12.0	3830
13.0	3830
14.0	3830
15.0	3830
16.0	3830
17.0	3830
18.0	3830
19.0	3830
20.0	3830
21.0	3830
22.0	3830
23.0	3830
24.0	3830
25.0	3830

Notes:

[1] Power curve for air density of 1.16 kg/m3 and site-specific TI band

[2] All data provided by Developer via "Site Specific Power Curve - PCD_1206271_PrevailingWind_3.8-137_EN_r01"

APPENDIX F - FLICKER RESULTS BY RECEPTOR

Table F-1: Flicker Duration by Receptor

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status	Flicker Duration [hour/year]	Flicker Duration [max min/day]
REC-001	583,179	4,781,949	Hutchinson	Non-participating	0.00	0
REC-002	578,731	4,782,429	Hutchinson	Participating	0.00	0
REC-003	580,507	4,783,274	Hutchinson	Non-participating	0.00	0
REC-004	582,679	4,780,105	Hutchinson	Non-participating	5.67	27
REC-005	583,327	4,778,397	Bon Homme	Non-participating	0.00	0
REC-006	583,615	4,778,695	Bon Homme	Non-participating	0.00	0
REC-007	579,386	4,783,172	Hutchinson	Non-participating	0.00	0
REC-008*	579,365	4,780,123	Hutchinson	Non-participating	11.02	39
REC-009*	582,486	4,779,597	Bon Homme	Non-participating	9.22	38
REC-010	570,706	4,779,233	Charles Mix	Non-participating	0.00	0
REC-011	568,955	4,779,050	Charles Mix	Non-participating	0.00	0
REC-012	575,451	4,778,870	Bon Homme	Non-participating	0.00	0
REC-013	570,834	4,777,924	Charles Mix	Non-participating	0.00	0
REC-014*	578,568	4,777,265	Bon Homme	Non-participating	12.22	43
REC-015*	578,579	4,777,228	Bon Homme	Non-participating	12.83	44
REC-016	569,438	4,774,776	Charles Mix	Participating	4.80	27
REC-017*	568,000	4,773,684	Charles Mix	Non-participating	19.87	40
REC-018	575,894	4,773,069	Bon Homme	Participating	0.00	0
REC-019	568,870	4,772,838	Charles Mix	Participating	0.00	0
REC-020	568,171	4,772,373	Charles Mix	Non-participating	0.00	0
REC-021	574,123	4,771,642	Bon Homme	Participating	0.00	0
REC-022	574,118	4,771,913	Bon Homme	Non-participating	0.00	0
REC-023	567,115	4,771,132	Charles Mix	Non-participating	0.00	0
REC-024*	569,456	4,770,886	Charles Mix	Non-participating	6.20	31
REC-025	582,410	4,770,691	Bon Homme	Participating	0.00	0
REC-026	582,206	4,770,538	Bon Homme	Non-participating	0.00	0
REC-027	569,451	4,770,123	Charles Mix	Non-participating	0.00	0
REC-028	578,916	4,770,107	Bon Homme	Participating	0.00	0
REC-029	567,890	4,769,897	Charles Mix	Non-participating	0.00	0
REC-030	574,058	4,769,738	Bon Homme	Non-participating	3.57	25
REC-031*	571,038	4,769,100	Charles Mix	Non-participating	6.43	31
REC-032*	579,595	4,768,434	Bon Homme	Participating	9.67	45
REC-033	574,388	4,768,112	Bon Homme	Non-participating	0.00	0
REC-034*	575,857	4,767,969	Bon Homme	Non-participating	0.00	0
REC-035	568,988	4,768,088	Charles Mix	Non-participating	0.00	0
REC-036	574,140	4,767,903	Bon Homme	Non-participating	0.00	0
REC-037*	580,535	4,767,956	Bon Homme	Participating	0.00	0
REC-038	569,571	4,767,694	Charles Mix	Non-participating	0.00	0
REC-039*	575,754	4,767,512	Bon Homme	Non-participating	0.00	0
REC-040*	575,854	4,767,409	Bon Homme	Non-participating	7.42	34
REC-041*	577,366	4,767,429	Bon Homme	Participating	22.70	55
REC-042*	580,535	4,768,650	Bon Homme	Non-participating	28.00	53
REC-043	582,314	4,767,105	Bon Homme	Non-participating	0.00	0
REC-044	577,582	4,766,535	Bon Homme	Participating	0.00	0

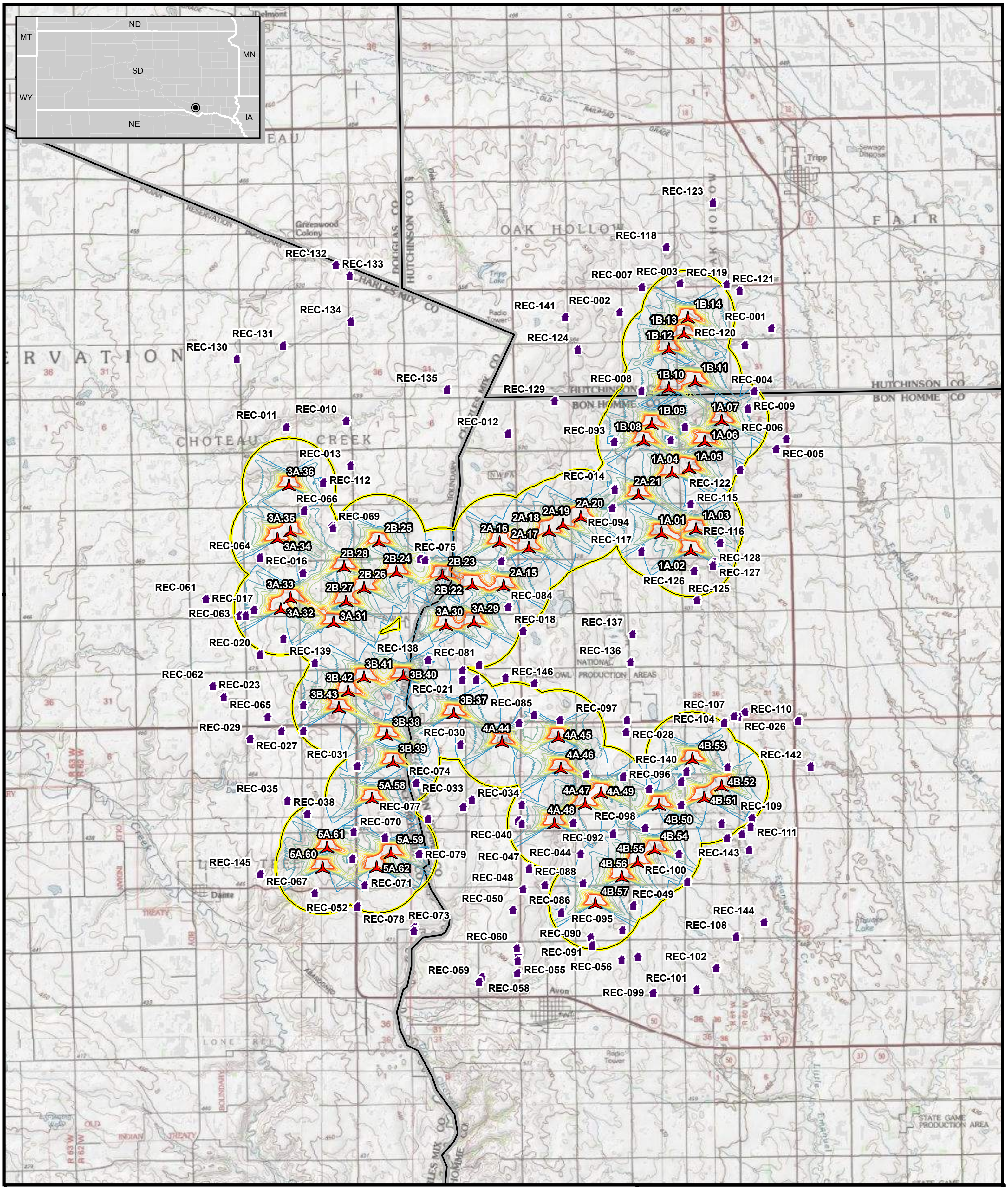
Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status	Flicker Duration [hour/year]	Flicker Duration [max min/day]
REC-045*	580,460	4,766,528	Bon Homme	Participating	18.48	45
REC-046*	570,892	4,766,384	Charles Mix	Participating	46.25	76
REC-047	576,072	4,766,099	Bon Homme	Non-participating	0.00	0
REC-048	575,888	4,765,484	Bon Homme	Non-participating	0.00	0
REC-049	579,136	4,765,004	Bon Homme	Non-participating	4.85	27
REC-050	575,594	4,764,878	Bon Homme	Participating	0.00	0
REC-051*	577,015	4,764,806	Bon Homme	Participating	8.20	32
REC-052	571,035	4,764,976	Charles Mix	Non-participating	0.00	0
REC-053	575,752	4,763,554	Bon Homme	Non-participating	0.00	0
REC-054	579,261	4,763,509	Bon Homme	Non-participating	0.00	0
REC-055	575,738	4,763,383	Bon Homme	Non-participating	0.00	0
REC-056	578,784	4,763,423	Bon Homme	Non-participating	0.00	0
REC-057	575,729	4,763,021	Bon Homme	Non-participating	0.00	0
REC-058	574,690	4,762,906	Bon Homme	Non-participating	0.00	0
REC-059	574,609	4,762,765	Bon Homme	Non-participating	0.00	0
REC-060	575,719	4,763,759	Bon Homme	Non-participating	0.00	0
REC-061	566,590	4,774,005	Charles Mix	Non-participating	0.00	0
REC-062	566,795	4,771,446	Charles Mix	Non-participating	0.00	0
REC-063	567,576	4,773,523	Charles Mix	Non-participating	5.02	27
REC-064	568,170	4,775,222	Charles Mix	Non-participating	0.00	0
REC-065	568,402	4,770,548	Charles Mix	Non-participating	0.00	0
REC-066	569,475	4,776,605	Charles Mix	Participating	0.00	0
REC-067	569,782	4,765,374	Charles Mix	Non-participating	0.00	0
REC-068	570,301	4,776,152	Charles Mix	Non-participating	3.13	24
REC-069	570,321	4,776,086	Charles Mix	Non-participating	3.20	24
REC-070*	570,931	4,767,169	Charles Mix	Non-participating	8.80	36
REC-071	571,247	4,765,598	Charles Mix	Non-participating	11.72	25
REC-072	571,848	4,767,001	Charles Mix	Participating	0.00	0
REC-073	572,712	4,764,371	Charles Mix	Non-participating	0.00	0
REC-074	572,760	4,768,610	Bon Homme	Non-participating	0.00	0
REC-075*	572,875	4,775,184	Charles Mix	Participating	20.17	42
REC-076*	573,024	4,775,138	Charles Mix	Non-participating	33.90	51
REC-077	573,104	4,767,559	Bon Homme	Non-participating	0.00	0
REC-078	572,690	4,764,270	Charles Mix	Non-participating	0.00	0
REC-079*	572,840	4,766,532	Charles Mix	Participating	0.00	0
REC-080	574,527	4,771,635	Bon Homme	Participating	0.00	0
REC-081	574,606	4,772,084	Bon Homme	Participating	0.00	0
REC-082*	575,265	4,775,117	Bon Homme	Participating	8.75	31
REC-083	575,384	4,771,696	Bon Homme	Participating	0.00	0
REC-084	575,460	4,773,772	Bon Homme	Participating	4.85	29
REC-085*	576,210	4,770,611	Bon Homme	Participating	0.00	0
REC-086	576,538	4,765,598	Bon Homme	Participating	0.00	0
REC-087	576,971	4,770,447	Bon Homme	Participating	0.00	0
REC-088	577,660	4,765,661	Bon Homme	Participating	5.57	28
REC-089*	577,747	4,768,860	Bon Homme	Participating	24.83	42

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status	Flicker Duration [hour/year]	Flicker Duration [max min/day]
REC-090	577,878	4,764,079	Bon Homme	Non-participating	0.00	0
REC-091	577,916	4,763,844	Bon Homme	Non-participating	0.00	0
REC-092	578,532	4,767,119	Bon Homme	Participating	3.78	24
REC-093*	578,576	4,778,619	Bon Homme	Participating	20.83	37
REC-094*	578,515	4,776,677	Bon Homme	Participating	12.23	38
REC-095	578,804	4,764,275	Bon Homme	Non-participating	0.00	0
REC-096*	578,828	4,768,793	Bon Homme	Non-participating	22.47	54
REC-097	578,943	4,770,455	Bon Homme	Non-participating	0.00	0
REC-098	579,475	4,767,289	Bon Homme	Non-participating	0.00	0
REC-099	579,721	4,762,442	Bon Homme	Participating	0.00	0
REC-100	580,720	4,765,706	Bon Homme	Non-participating	0.00	0
REC-101	580,992	4,762,541	Bon Homme	Non-participating	0.00	0
REC-102	581,560	4,763,175	Bon Homme	Non-participating	0.00	0
REC-103	581,721	4,767,420	Bon Homme	Participating	0.00	0
REC-104	581,794	4,770,381	Bon Homme	Non-participating	0.00	0
REC-105*	581,891	4,769,063	Bon Homme	Non-participating	0.00	0
REC-106	581,883	4,766,985	Bon Homme	Participating	0.00	0
REC-107	582,090	4,770,568	Bon Homme	Non-participating	0.00	0
REC-108	582,148	4,764,102	Bon Homme	Participating	0.00	0
REC-109	582,610	4,767,583	Bon Homme	Non-participating	0.00	0
REC-110	583,963	4,770,430	Bon Homme	Non-participating	0.00	0
REC-111	582,578	4,767,332	Bon Homme	Non-participating	0.00	0
REC-112*	570,034	4,777,429	Charles Mix	Non-participating	5.37	31
REC-113*	580,226	4,778,670	Bon Homme	Participating	5.92	31
REC-114*	580,644	4,779,066	Bon Homme	Participating	32.80	46
REC-115	580,813	4,776,798	Bon Homme	Participating	1.73	17
REC-116*	581,676	4,775,654	Bon Homme	Participating	0.00	0
REC-117	579,368	4,775,404	Bon Homme	Participating	0.00	0
REC-118	580,095	4,784,337	Hutchinson	Non-participating	0.00	0
REC-119	581,868	4,783,246	Hutchinson	Non-participating	0.00	0
REC-120	582,411	4,781,467	Hutchinson	Non-participating	0.00	0
REC-121	582,256	4,783,055	Hutchinson	Non-participating	0.00	0
REC-122	582,261	4,777,793	Bon Homme	Participating	0.00	0
REC-123	581,461	4,785,646	Hutchinson	Non-participating	0.00	0
REC-124	577,505	4,781,336	Hutchinson	Non-participating	0.00	0
REC-125	580,996	4,773,976	Bon Homme	Non-participating	0.00	0
REC-126	580,916	4,774,830	Bon Homme	Participating	0.00	0
REC-127*	581,474	4,775,076	Bon Homme	Participating	0.00	0
REC-128	581,468	4,774,997	Bon Homme	Participating	0.00	0
REC-129	576,816	4,779,814	Bon Homme	Non-participating	0.00	0
REC-130	567,502	4,781,060	Charles Mix	Non-participating	0.00	0
REC-131	568,850	4,781,446	Charles Mix	Non-participating	0.00	0
REC-132	570,408	4,783,811	Charles Mix	Non-participating	0.00	0
REC-133	570,806	4,783,497	Charles Mix	Non-participating	0.00	0
REC-134	570,845	4,782,153	Charles Mix	Non-participating	0.00	0

Receptor Name	Easting [m]	Northing [m]	County Name	Participating Status	Flicker Duration [hour/year]	Flicker Duration [max min/day]
REC-135	573,665	4,780,153	Charles Mix	Non-participating	0.00	0
REC-136	579,049	4,772,150	Bon Homme	Non-participating	0.00	0
REC-137	579,104	4,772,978	Bon Homme	Non-participating	0.00	0
REC-138*	573,105	4,772,224	Bon Homme	Participating	0.00	0
REC-139	569,781	4,772,134	Charles Mix	Non-participating	6.15	26
REC-140	580,689	4,768,952	Bon Homme	Non-participating	5.27	29
REC-141	577,130	4,782,270	Hutchinson	Non-participating	0.00	0
REC-142	584,340	4,769,093	Bon Homme	Non-participating	0.00	0
REC-143	582,522	4,766,643	Bon Homme	Non-participating	0.00	0
REC-144	582,964	4,764,514	Bon Homme	Non-participating	0.00	0
REC-145	568,186	4,765,929	Charles Mix	Non-participating	0.00	0
REC-146	576,221	4,771,527	Bon Homme	Participating	0.00	0
REC-147	575,778	4,770,361	Bon Homme	Participating	15.03	43
REC-148	568,806	4,770,128	Charles Mix	Non-participating	0.00	0
REC-149	567,763	4,773,526	Charles Mix	Non-participating	7.35	31

Notes:
[1] All coordinates presented in UTM NAD83 Zone 14N (meters)
[2] All results based on turbine layout in Table B-1
[3] * Indicates receptor that was analyzed with obstacles.

APPENDIX G - SHADOW FLICKER DURATION MAP



Path: \\bmcdfs\Clients\BTS\SPowerDC\105644_PrvWindStudies\Studies\Geospatial\DataFiles\ArcDocs\105644_PrevailingWinds_85x11P_ShadowFlicker.mxd • Coordinate System: NAD 1983 UTM Zone 14N • Units: Meter

LEGEND

- ▭ County Boundary
- ⅄ Wind Turbine
- ⌂ Receptor
- ▭ Wind Turbine Buffer (1370m)

Shadow Flicker Vectors [hours per year]

0 10 20 30 40 50 60 70 80 90 100

REFERENCE

0 1.5 3

MILES

0 1.5 3

KILOMETERS

N

PREVAILING WIND PARK

Shadow Flicker Duration [Hr/Yr] - GE 3.8-137 Layout

LOCATION:	Charles Mix/Bonne Homme/Hutchinson Cty, SD
CLIENT:	Prevailing Wind Park, LLC
PROJ. NO.:	105644
CREATED:	10/03/2018

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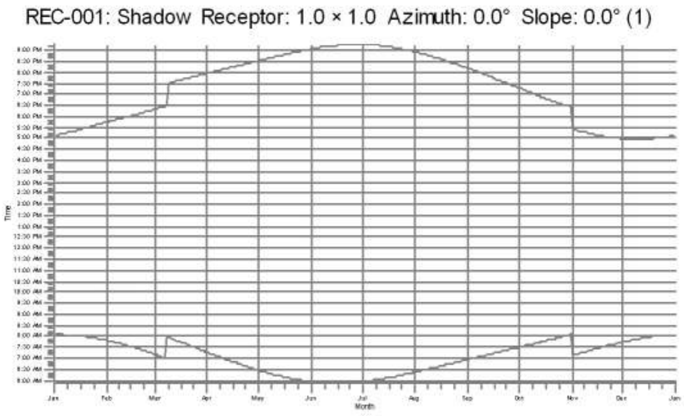
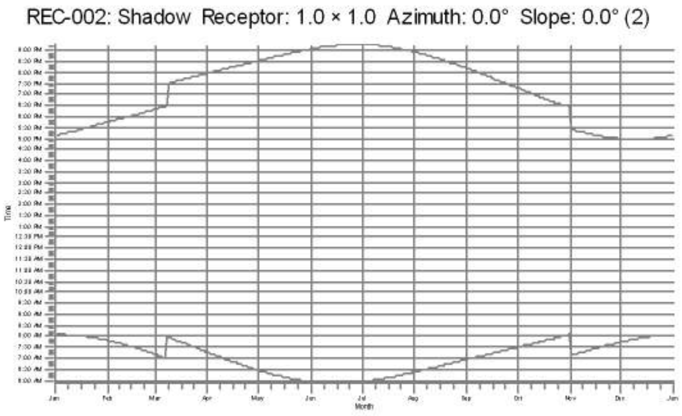
www.burnsmcd.com

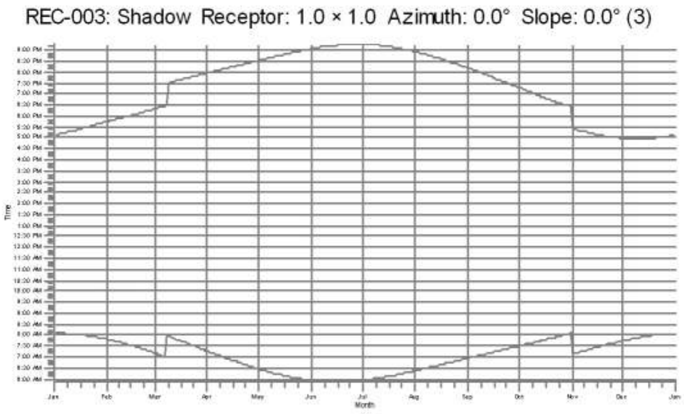
APPENDIX H - SHADOW FLICKER CALENDAR

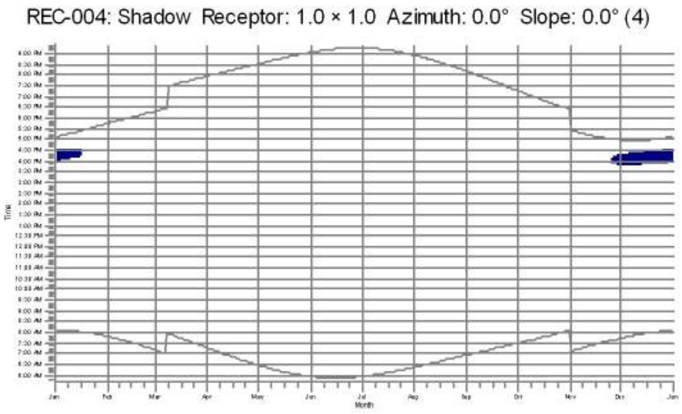
SHADOW - Calendar, graphical

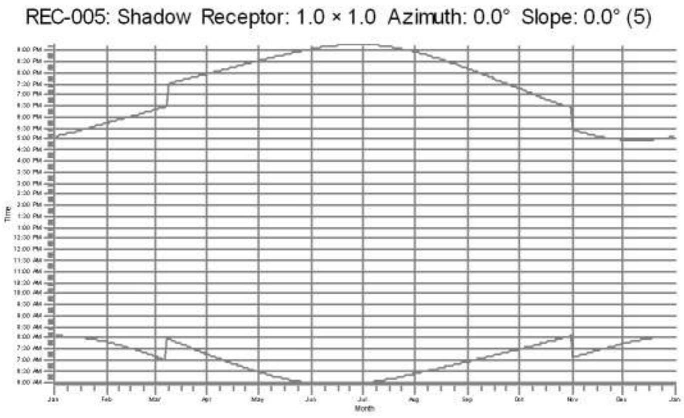
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

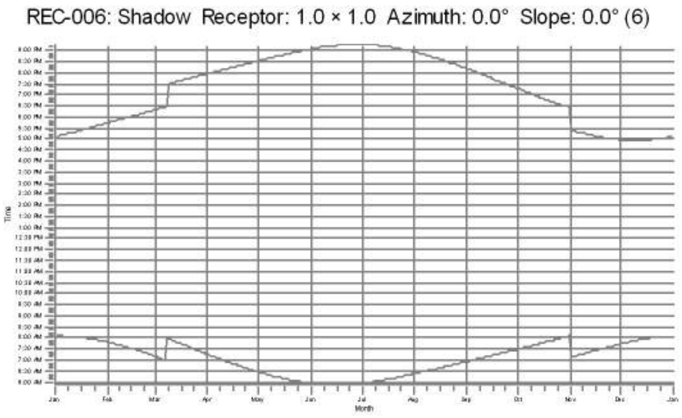

REC-001: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (1)


REC-002: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (2)


REC-003: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (3)


REC-004: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (4)


REC-005: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (5)


REC-006: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (6)

WTGs

■ 1A.07: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (295)

Project:

sPower Shadow Flicker

Description:

Burns & McDonnell has relied upon information provided by third-party sources to complete this study. While there is no reason to believe that the information provided is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

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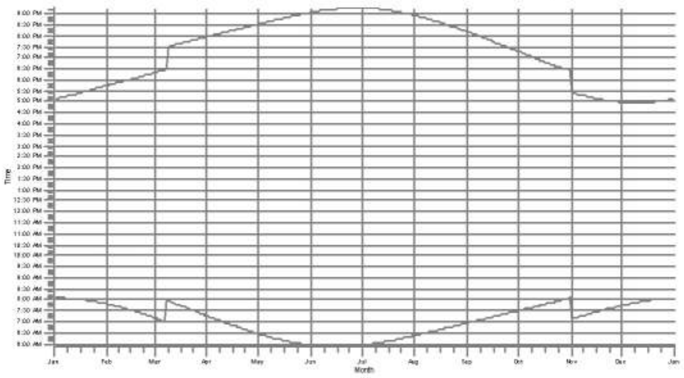
Calculated:

10/3/2018 3:53 PM/3.0.654

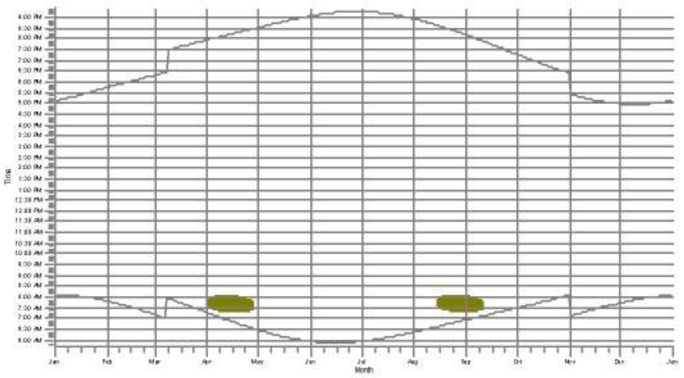
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

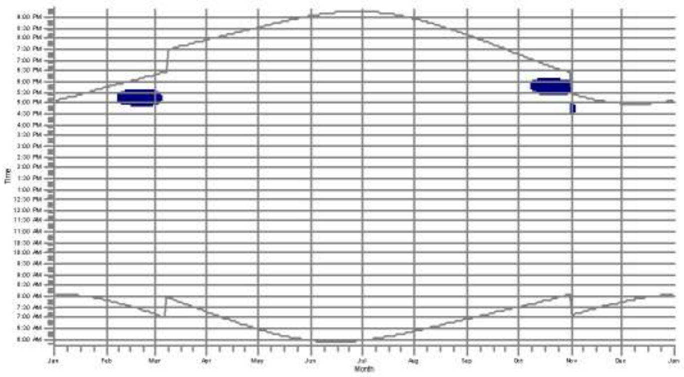
REC-007: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (7)



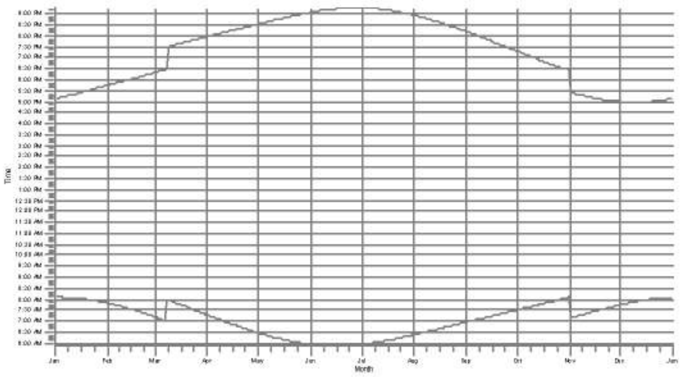
REC-008: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (8)



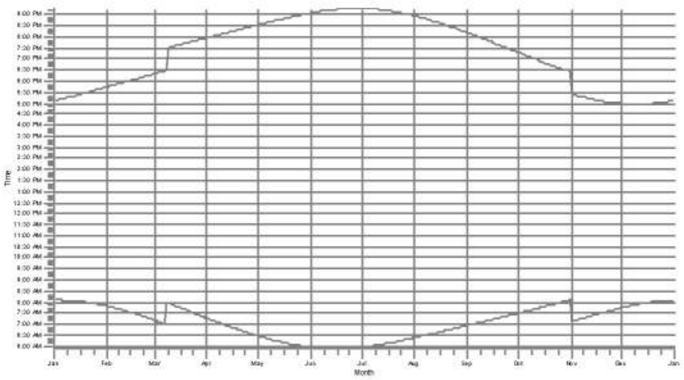
REC-009: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (9)



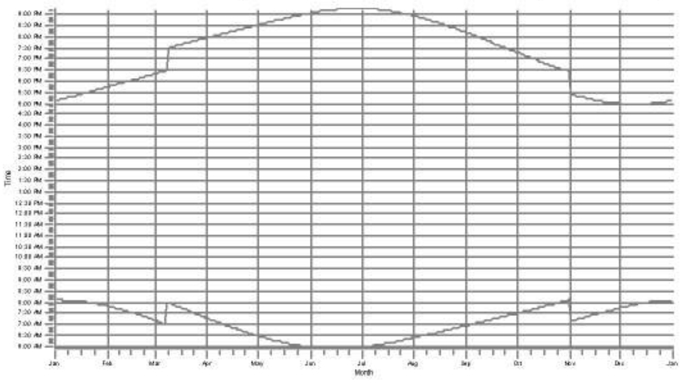
REC-010: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (10)



REC-011: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (11)



REC-012: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (12)



WTGs

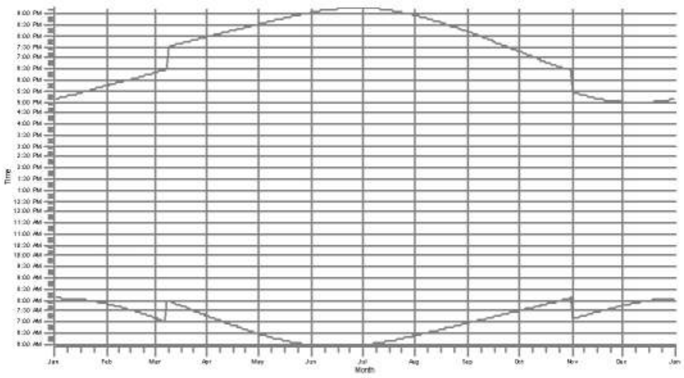
■ 1A.07: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (295)

■ 1B.10: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (298)

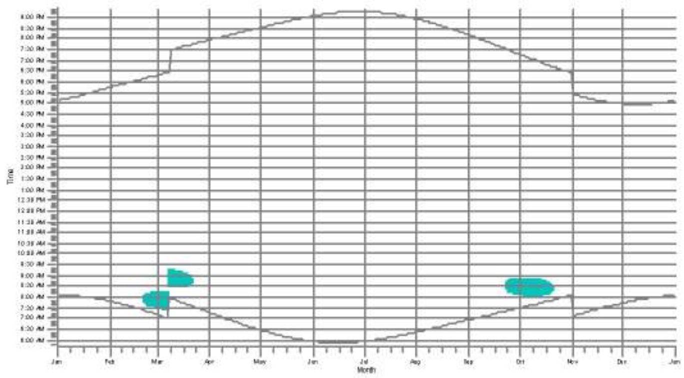
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

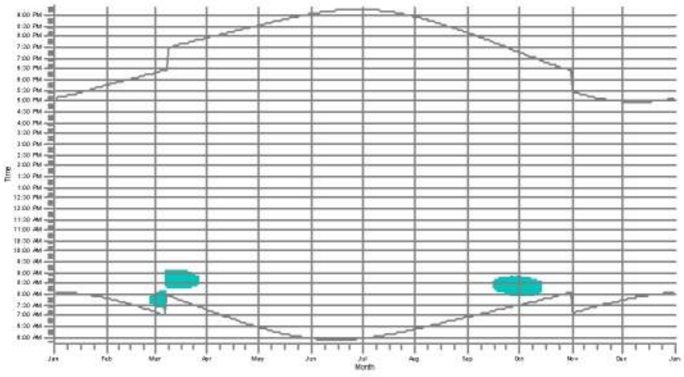
REC-013: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (13)



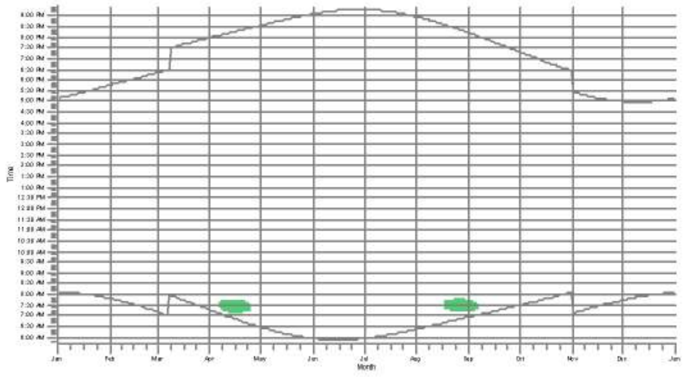
REC-014: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (14)



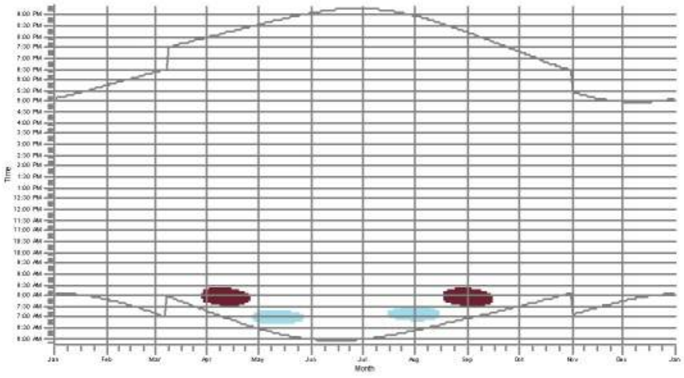
REC-015: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (15)



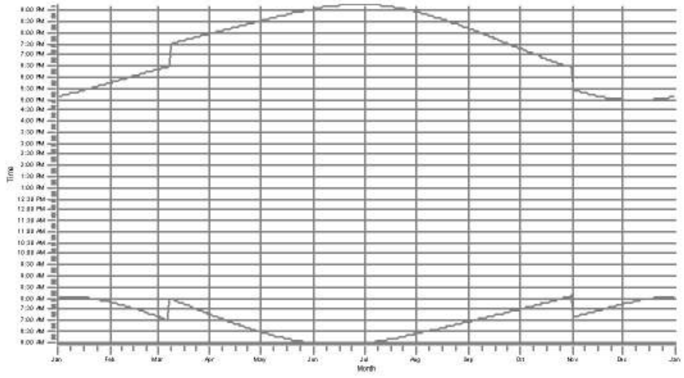
REC-016: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (16)



REC-017: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (17)



REC-018: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (18)



WTGs

- 🟦 2A.21: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (309)
- 🟩 2B.28: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (316)
- 🟥 3A.32: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (320)
- 🟦 3A.33: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (321)

Project:
sPower Shadow Flicker

Description:
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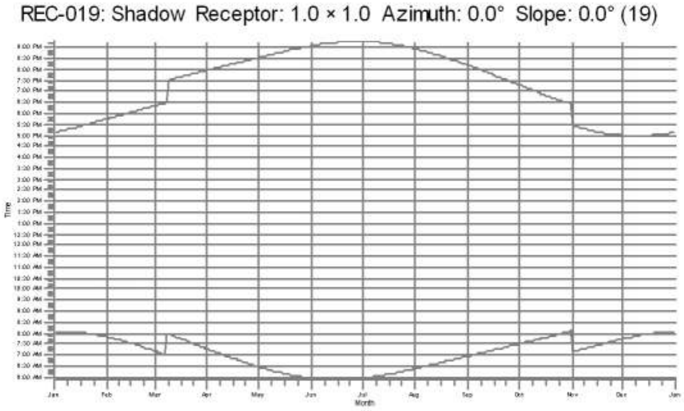
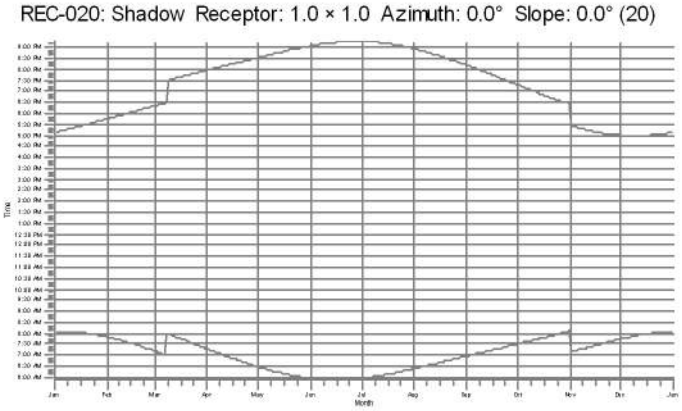
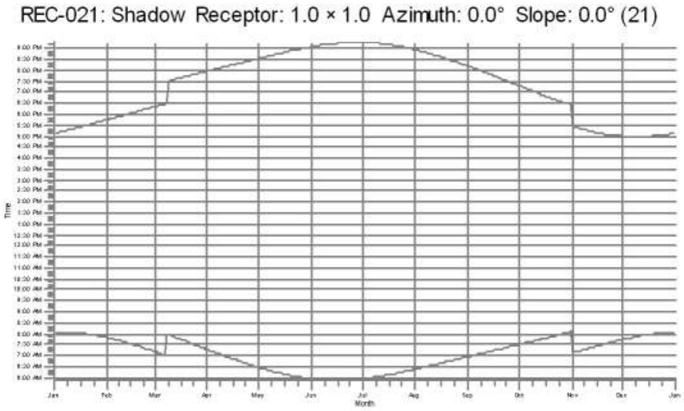
Calculated:
10/3/2018 3:53 PM/3.0.654

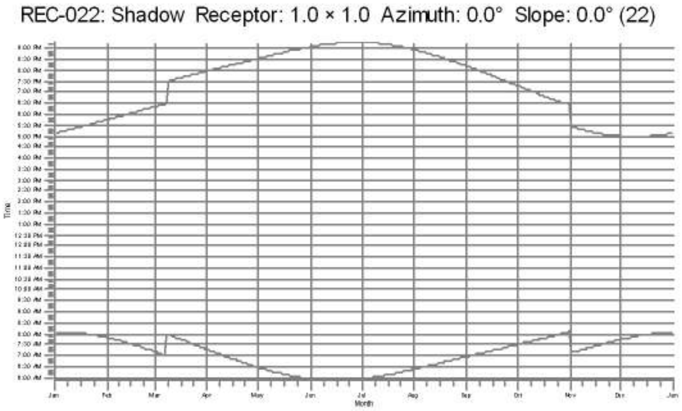
SHADOW - Calendar, graphical

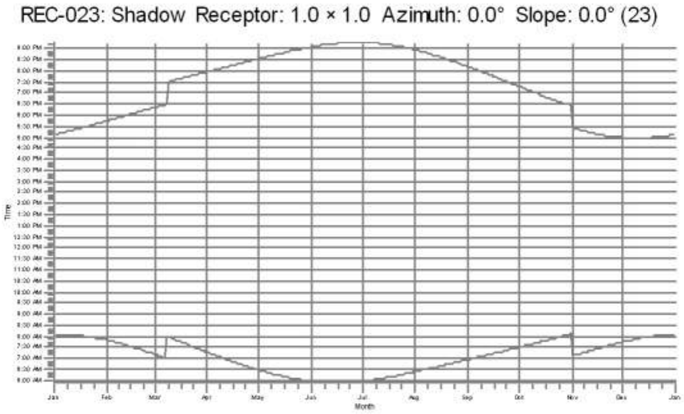
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

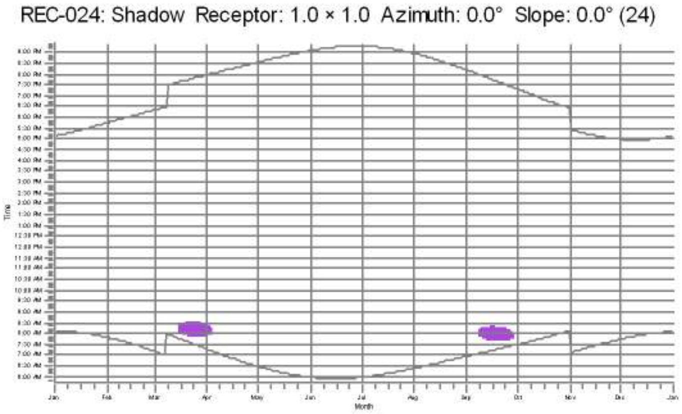

REC-019: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (19)


REC-020: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (20)


REC-021: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (21)


REC-022: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (22)


REC-023: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (23)

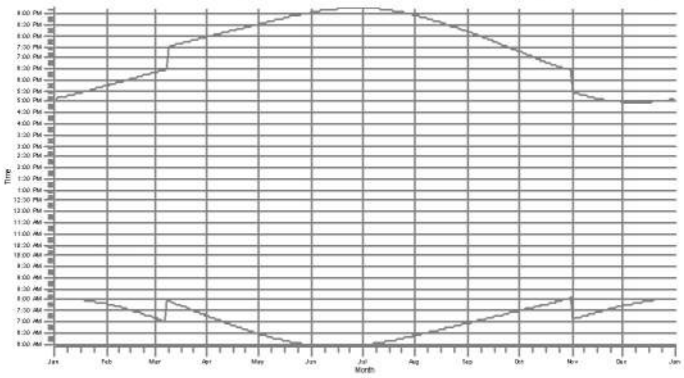

REC-024: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (24)

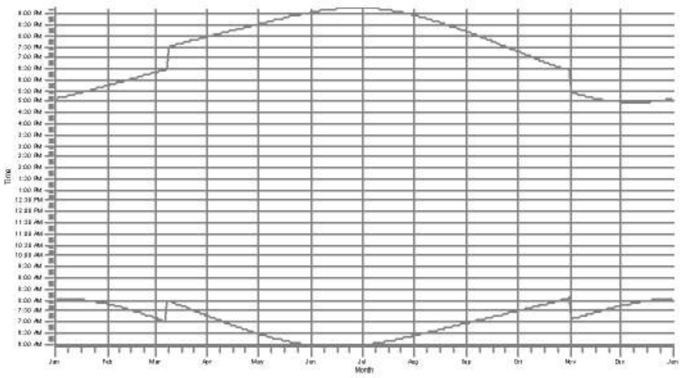
WTGs

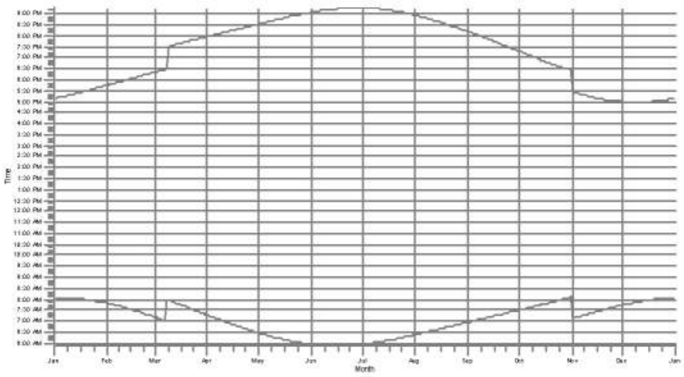
🟪 38.43: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (331)

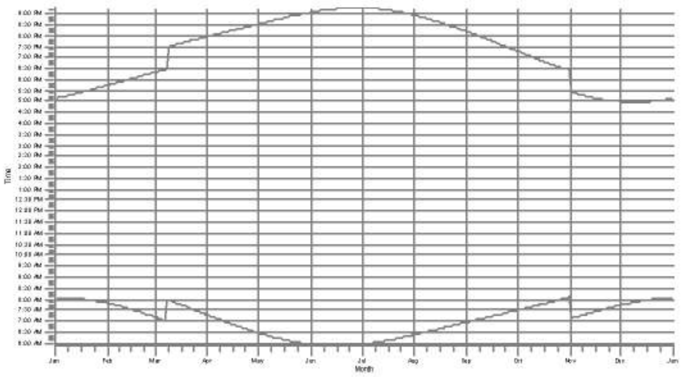
SHADOW - Calendar, graphical

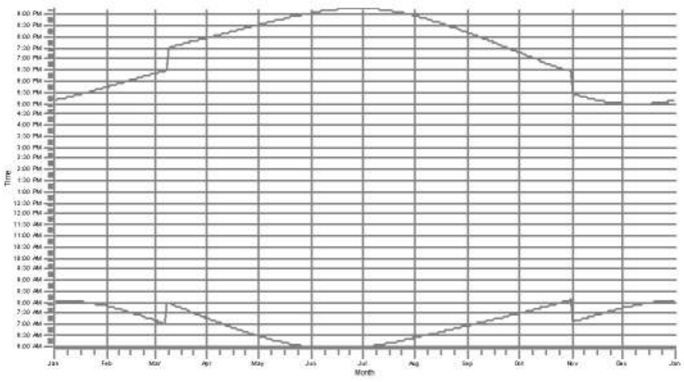
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

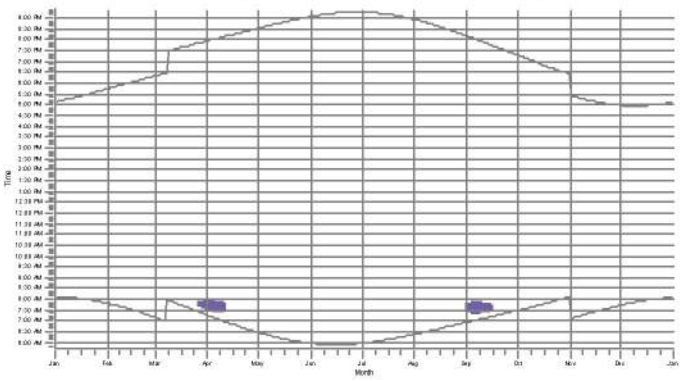

REC-025: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (25)


REC-026: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (26)


REC-027: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (27)


REC-028: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (28)


REC-029: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (29)


REC-030: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (30)

WTGs

▬ 4A.44: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (332)

Project:
sPower Shadow Flicker

Description:
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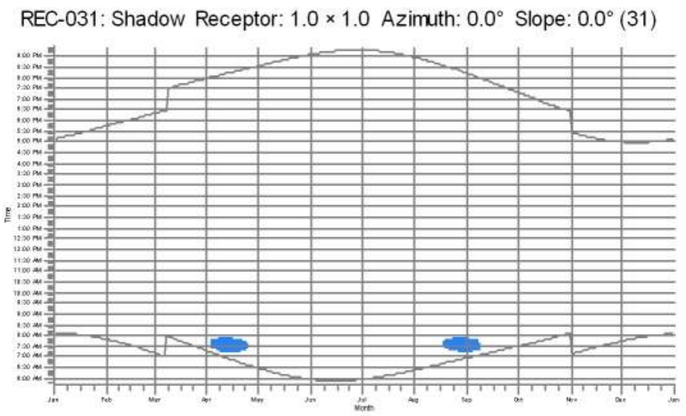
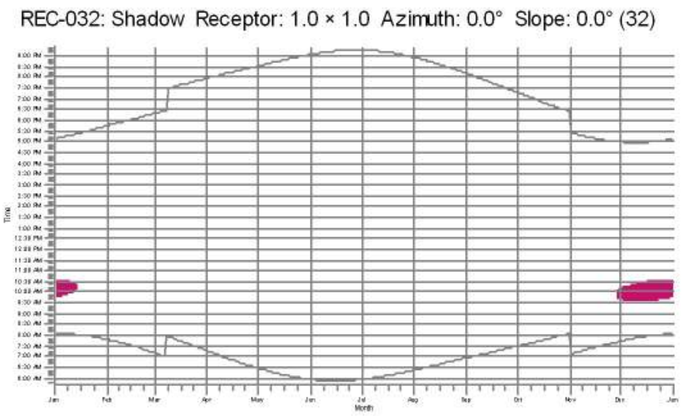
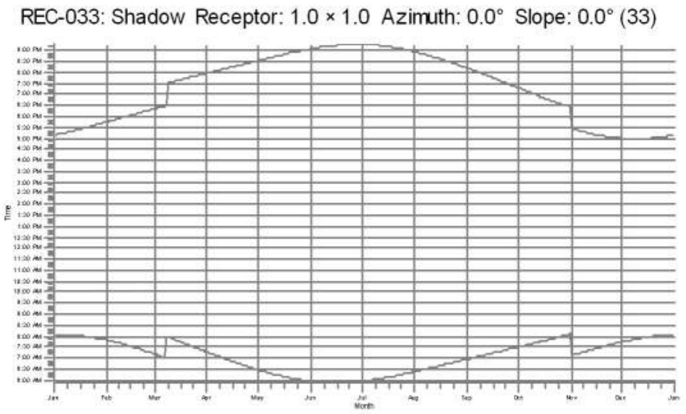
Calculated:
10/3/2018 3:53 PM/3.0.654

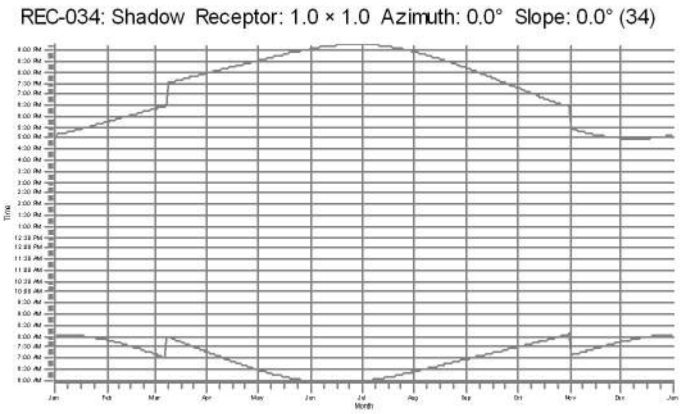
SHADOW - Calendar, graphical

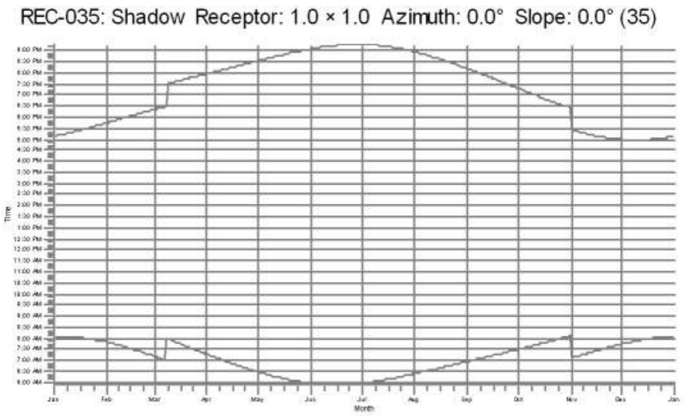
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

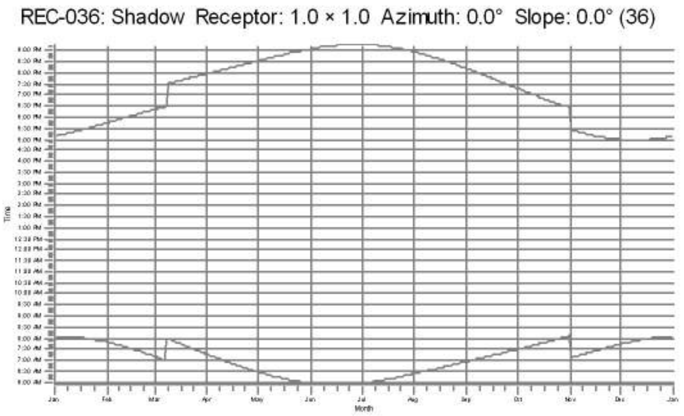

REC-031: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (31)


REC-032: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (32)


REC-033: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (33)


REC-034: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (34)


REC-035: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (35)


REC-036: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (36)

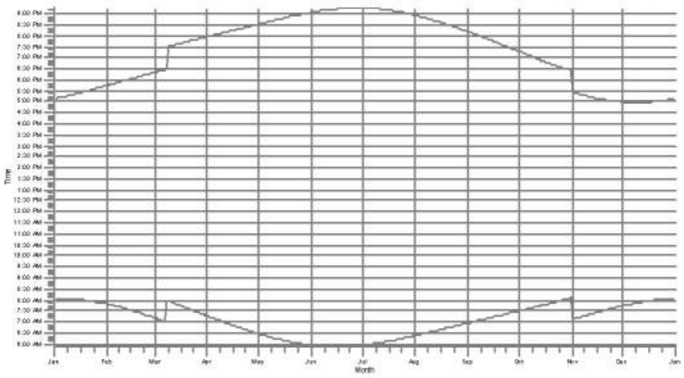
WTGs

🟦 3B.39: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (327)
🟥 4B.50: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (338)

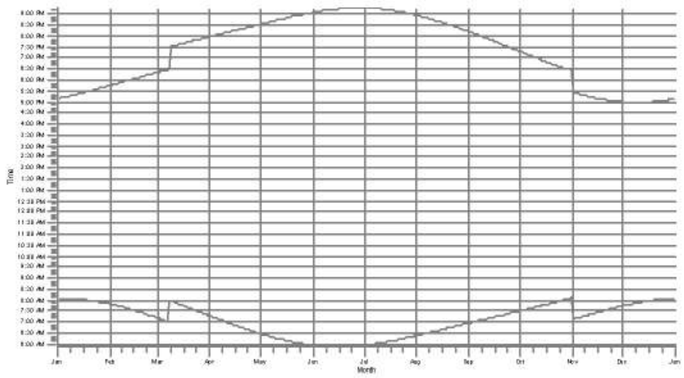
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

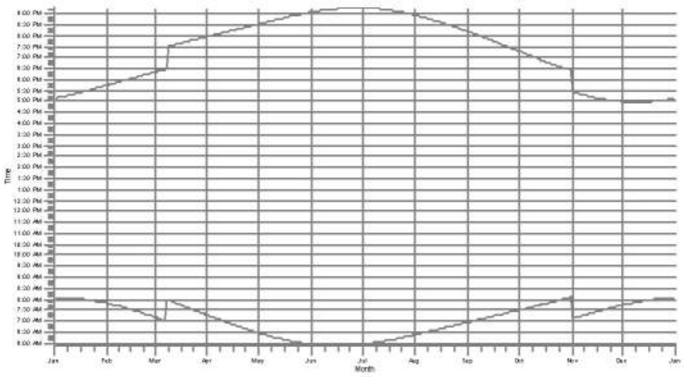
REC-037: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (37)



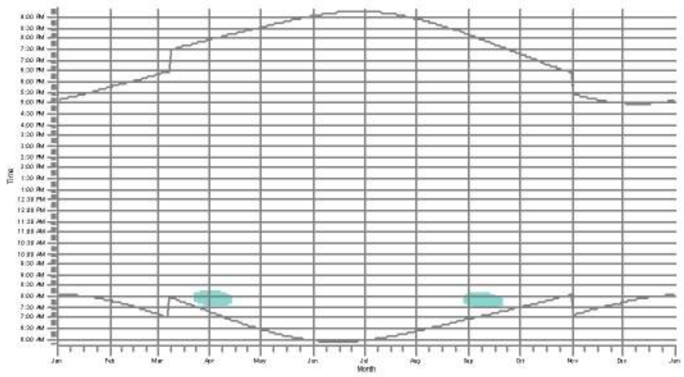
REC-038: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (38)



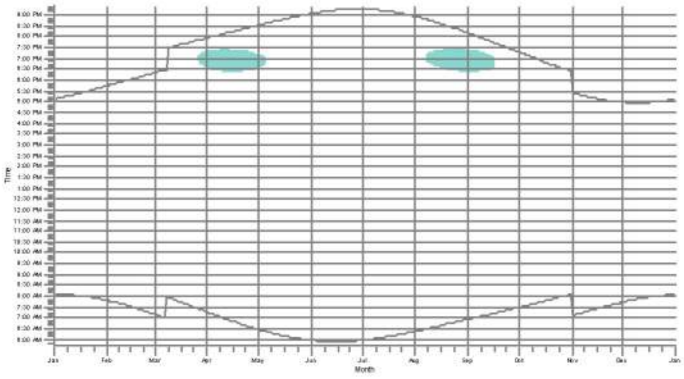
REC-039: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (39)



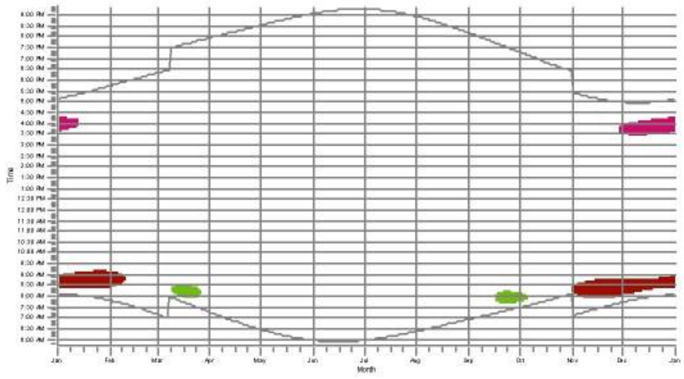
REC-040: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (40)



REC-041: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (41)



REC-042: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (42)



WTGs

🟦 4A.48: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (336)
🟪 4B.50: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (338)
🟥 4B.51: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (339)
🟩 4B.52: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (340)

Project:
sPower Shadow Flicker

Description:
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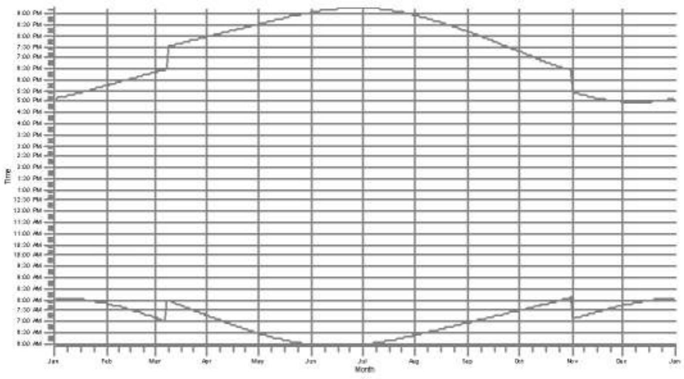
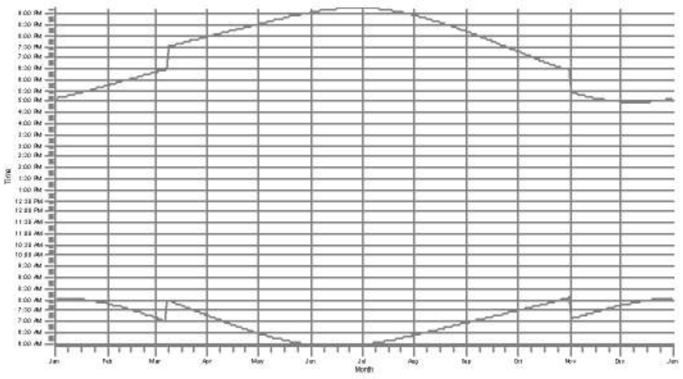
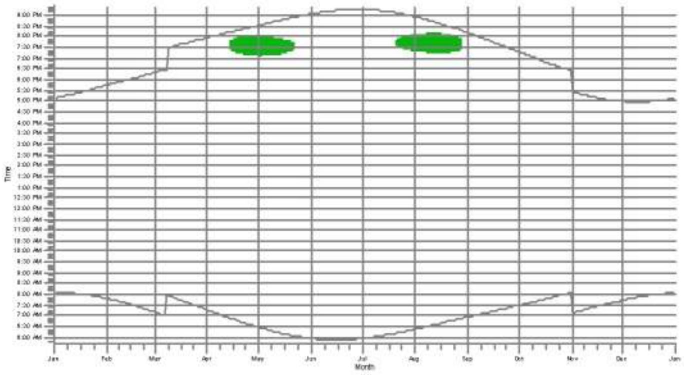
Calculated:
10/3/2018 3:53 PM/3.0.654

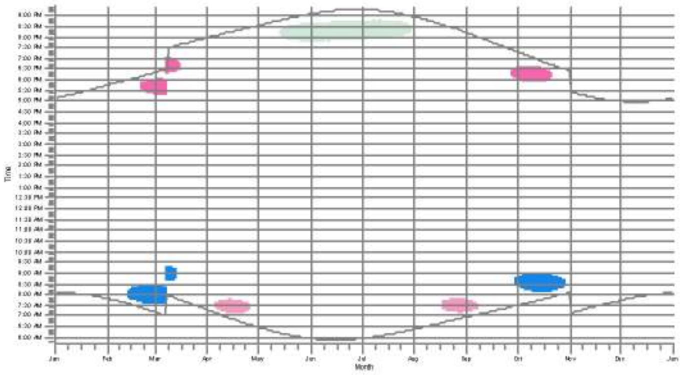
SHADOW - Calendar, graphical

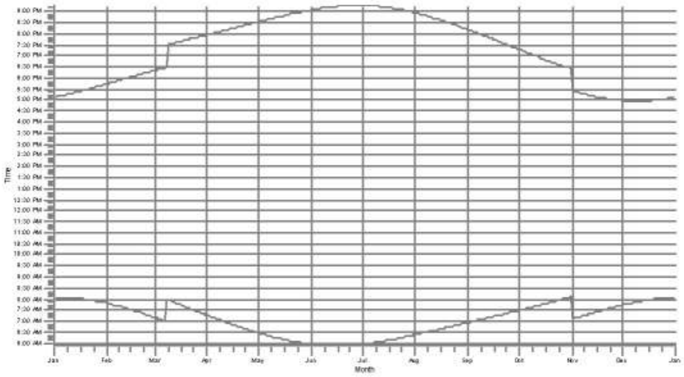
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

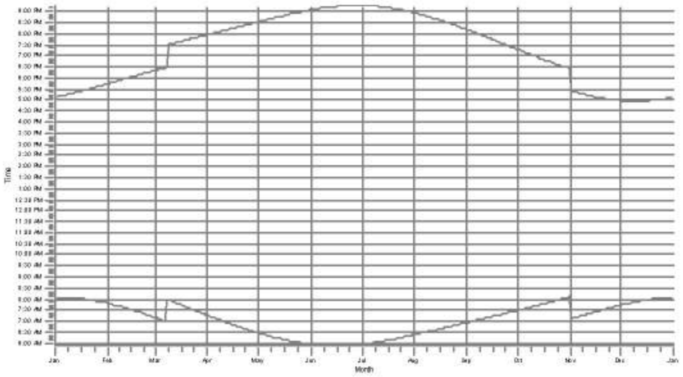

REC-043: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (43)


REC-044: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (44)


REC-045: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (45)


REC-046: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (46)


REC-047: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (47)


REC-048: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (48)

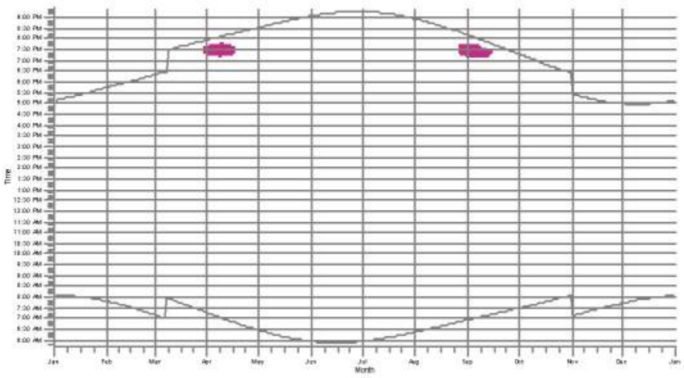
WTGs

🟩	4B.54: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (342)	🟥	5A.60: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (348)	🟦	5A.62: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (350)
▨	5A.59: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (347)	▨	5A.61: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (349)		

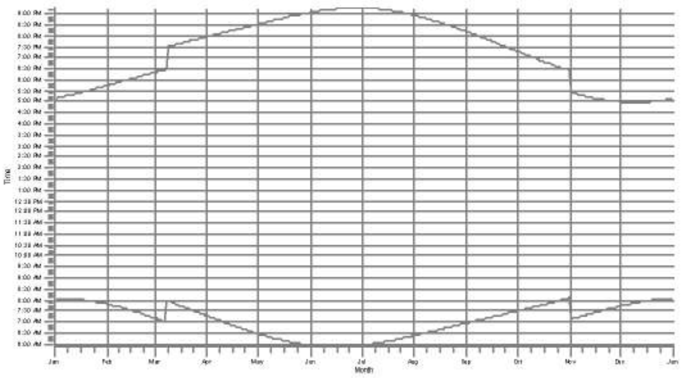
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

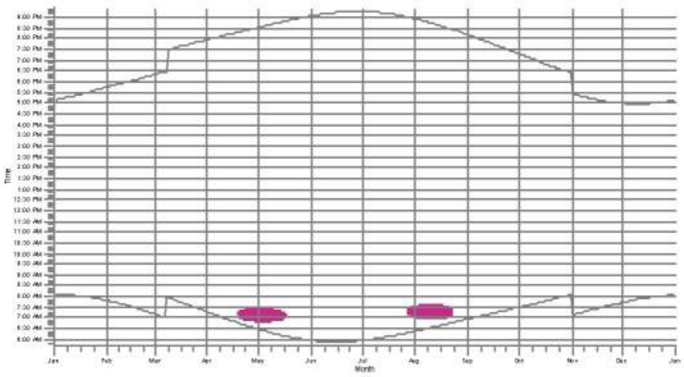
REC-049: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (49)



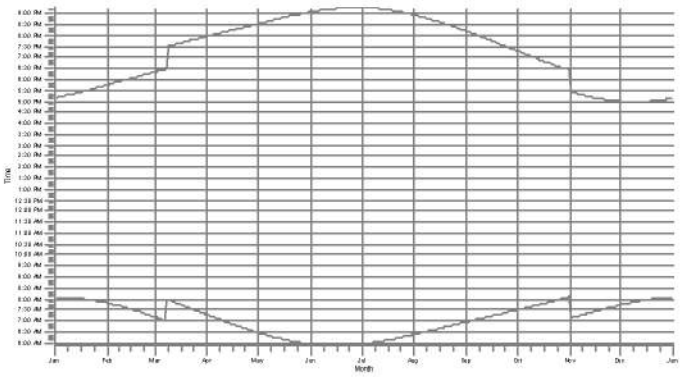
REC-050: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (50)



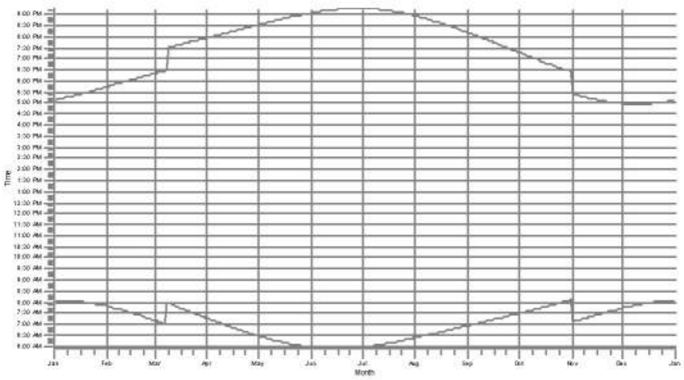
REC-051: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (51)



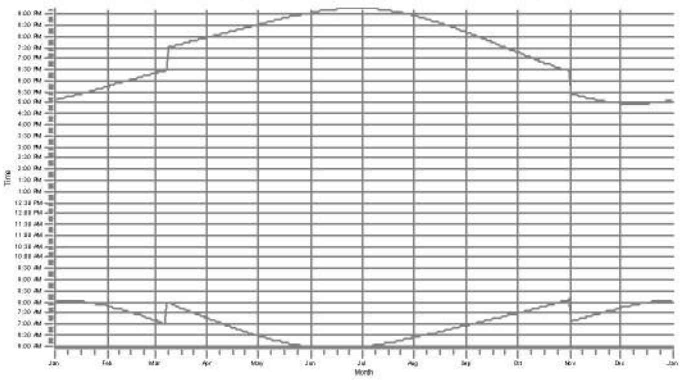
REC-052: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (52)



REC-053: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (53)



REC-054: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (54)



WTGs

🟪 4B.57: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (345)

Project:

sPower Shadow Flicker

Description:

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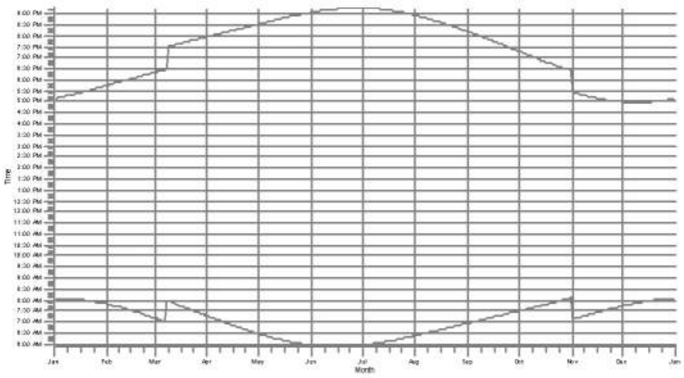
10/3/2018 3:53 PM/3.0.654

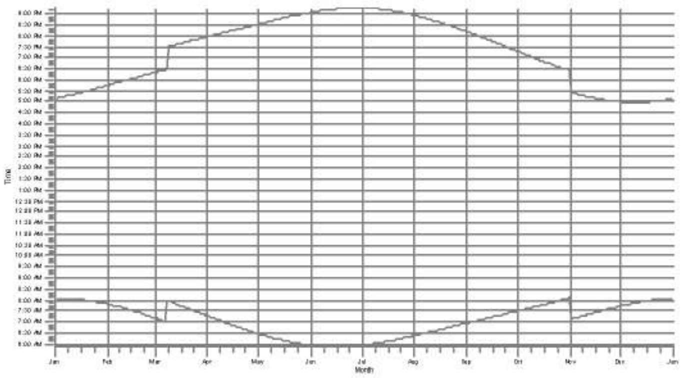
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

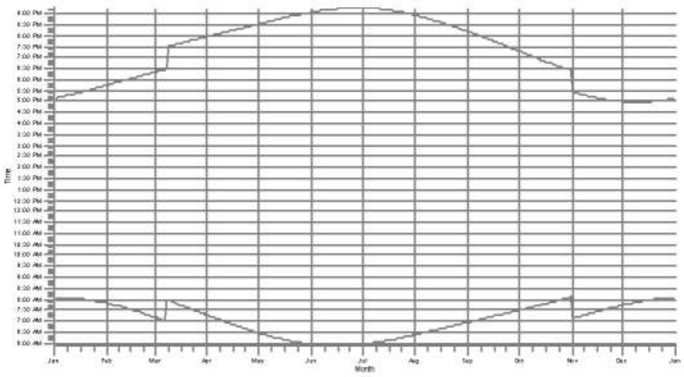
REC-055: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (55)



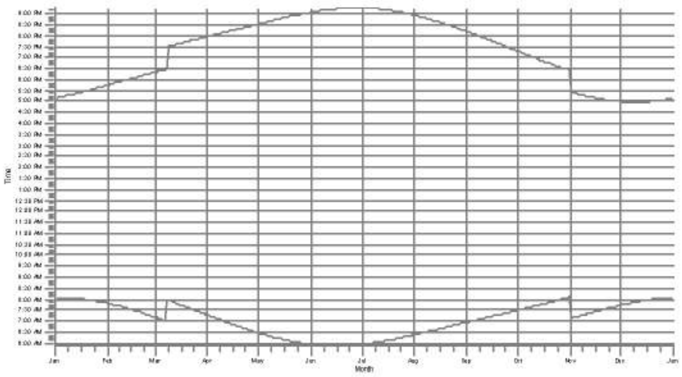
REC-056: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (56)



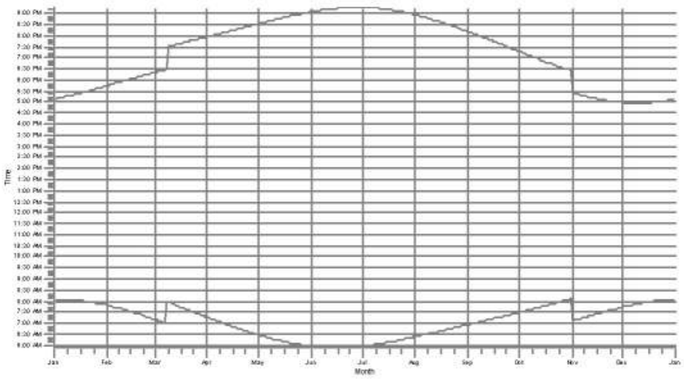
REC-057: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (57)



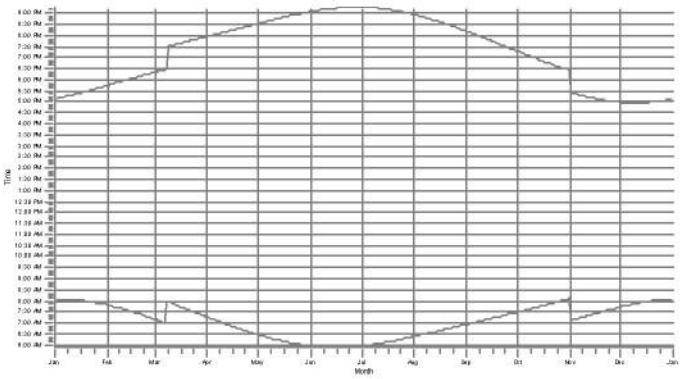
REC-058: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (58)



REC-059: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (59)



REC-060: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (60)



WTGs

Project:

sPower Shadow Flicker

Description:

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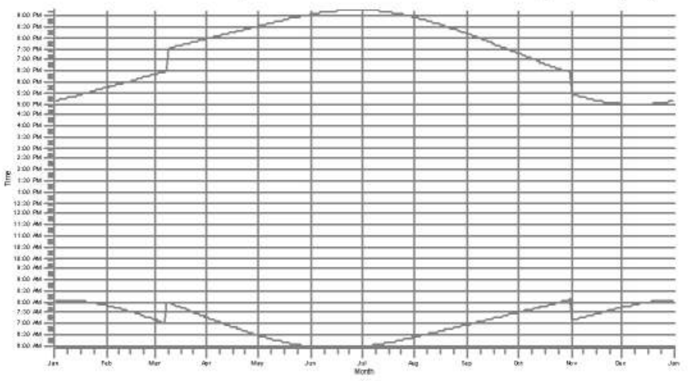
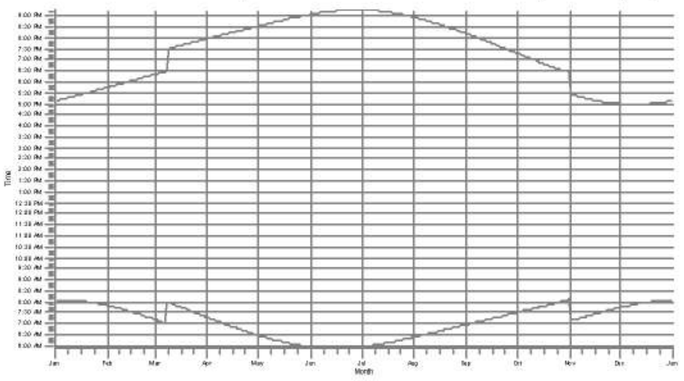
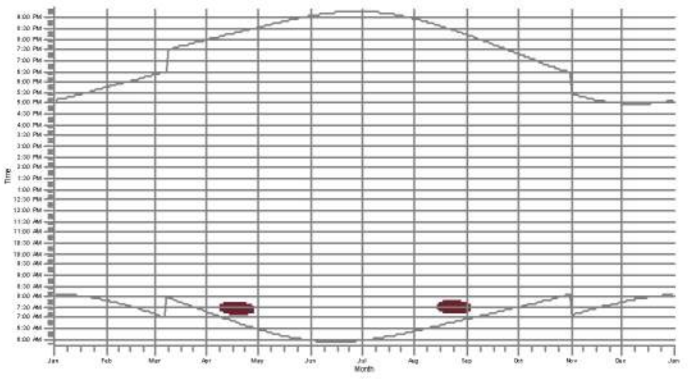
Calculated:
10/3/2018 3:53 PM/3.0.654

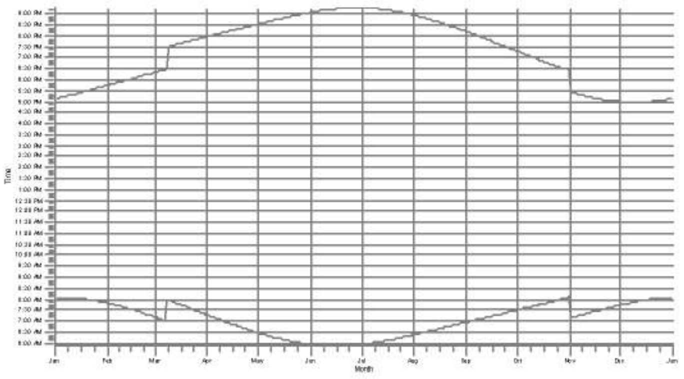
SHADOW - Calendar, graphical

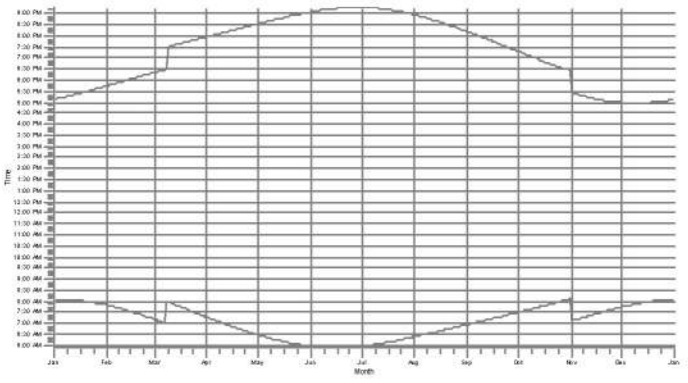
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

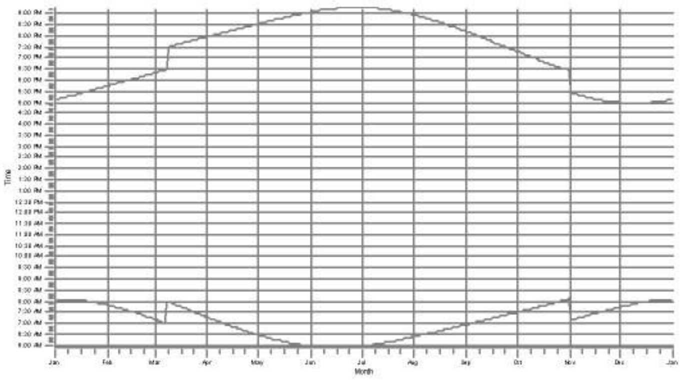

REC-061: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (61)


REC-062: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (62)


REC-063: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (63)


REC-064: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (64)


REC-065: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (65)

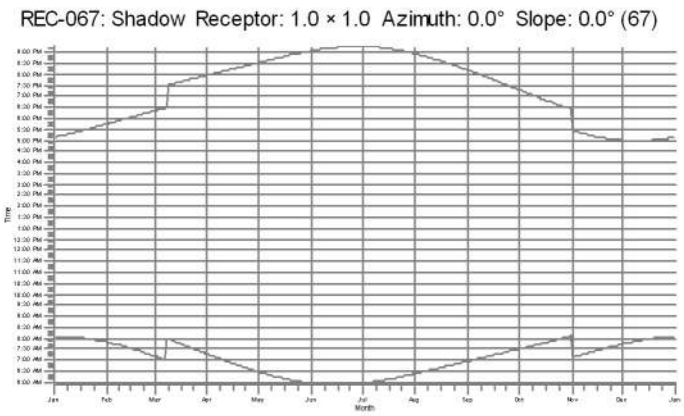

REC-066: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (66)

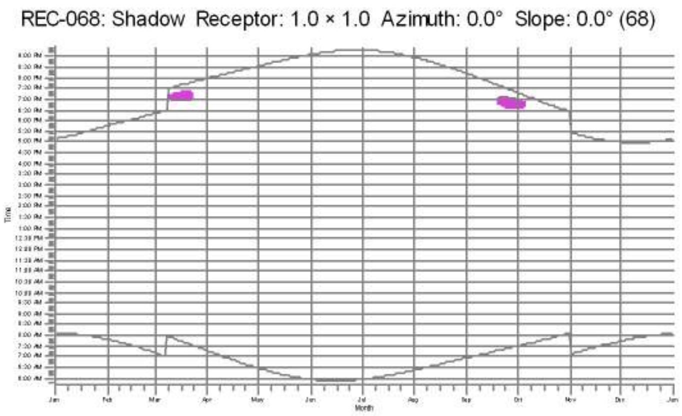
WTGs

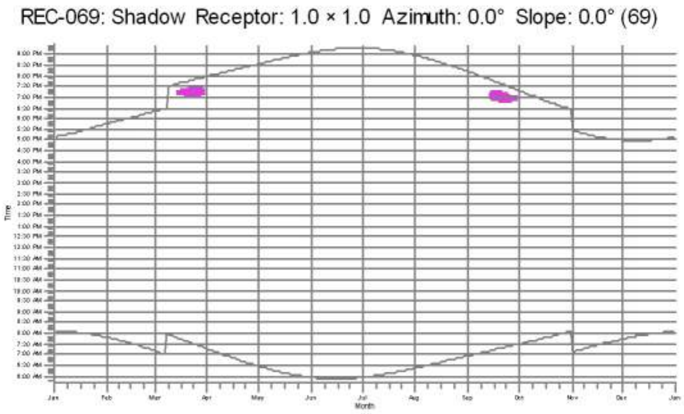
🟥 3A.32: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (320)

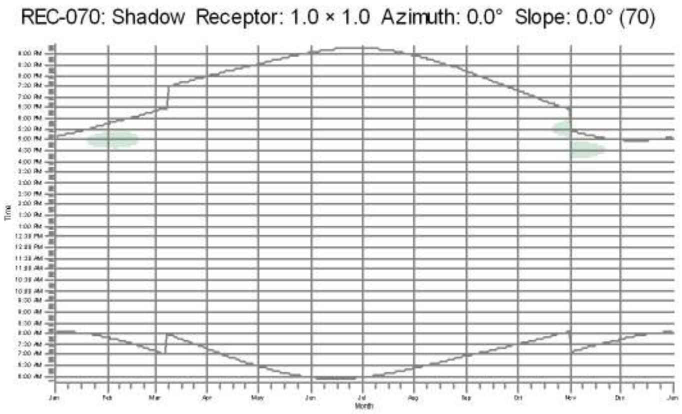
SHADOW - Calendar, graphical

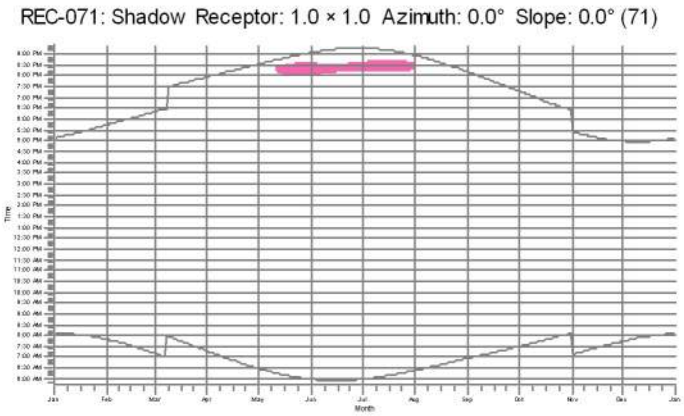
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

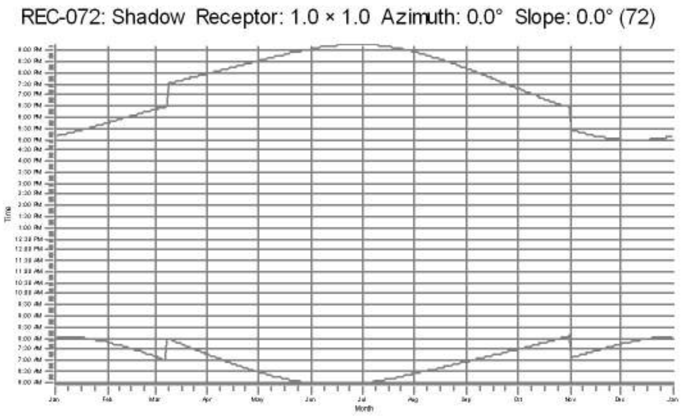










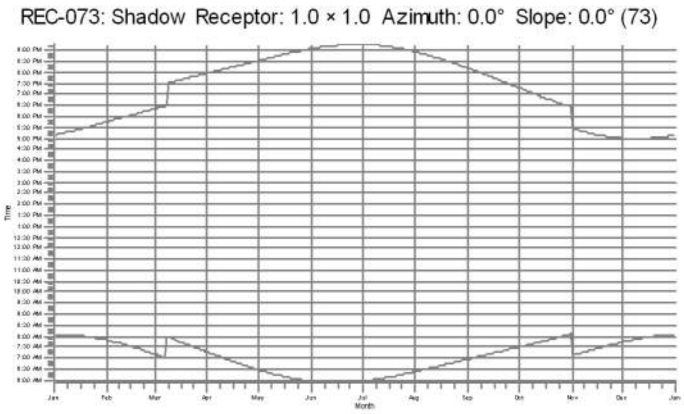


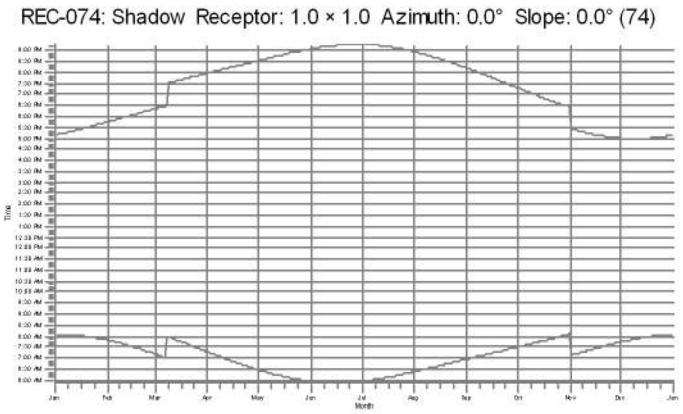
WTGs

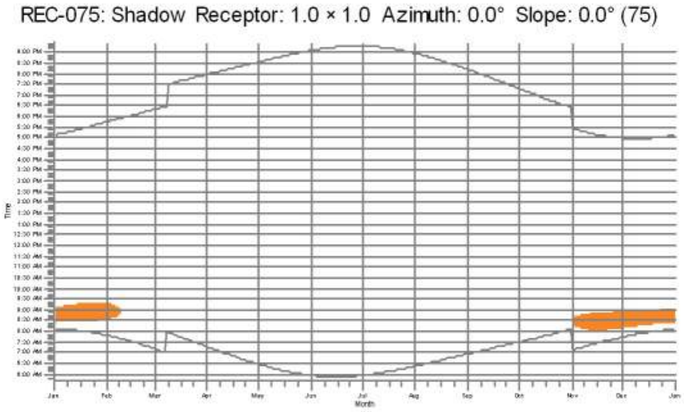
🟪 3A.35: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (323)
🟥 5A.60: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (348)
🟩 5A.61: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (349)

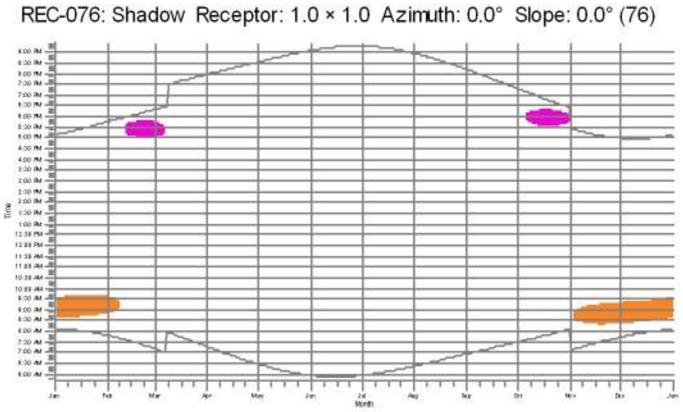
SHADOW - Calendar, graphical

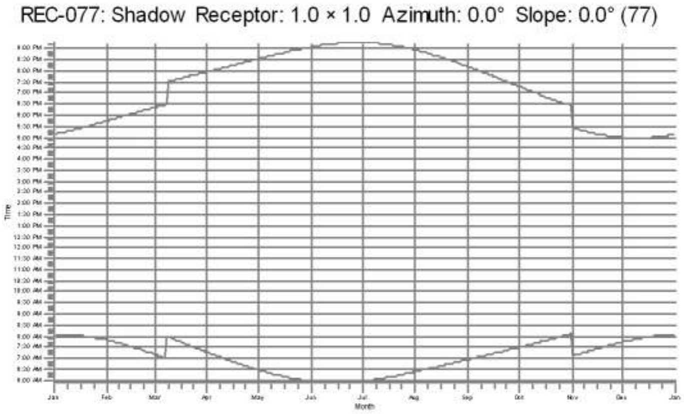
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

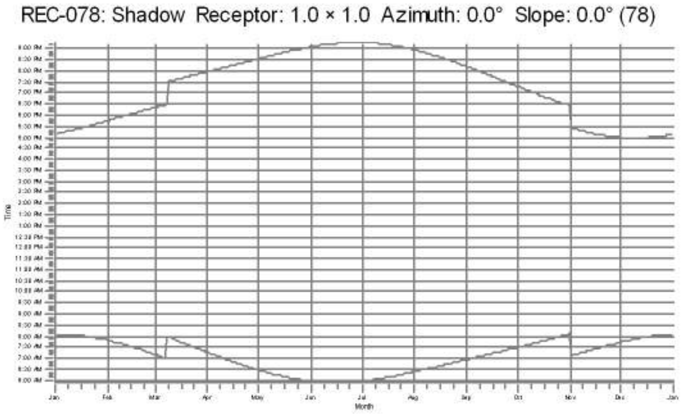












WTGs

🟧 2B.23: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (311)
🟪 2B.24: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (312)

Project:
sPower Shadow Flicker

Description:
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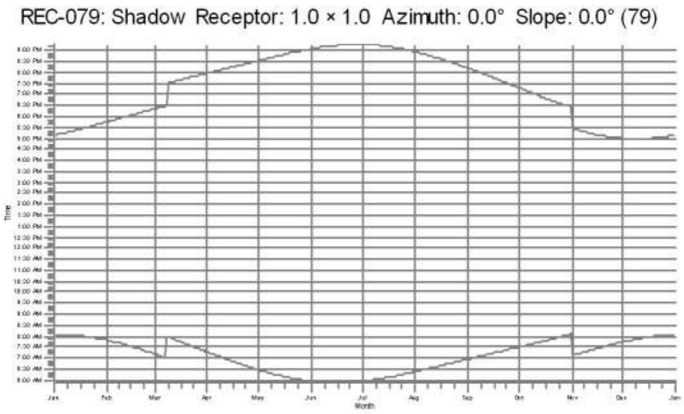
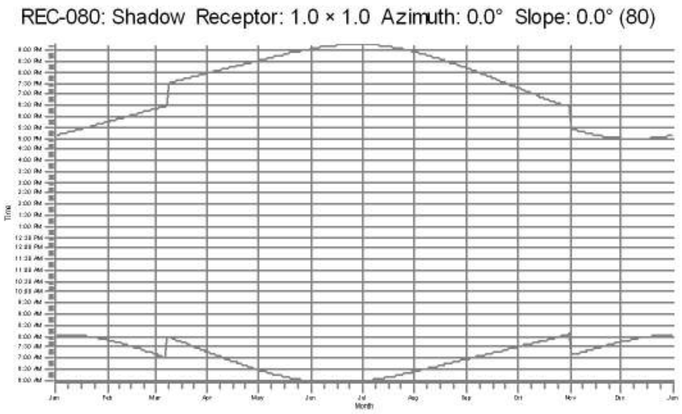
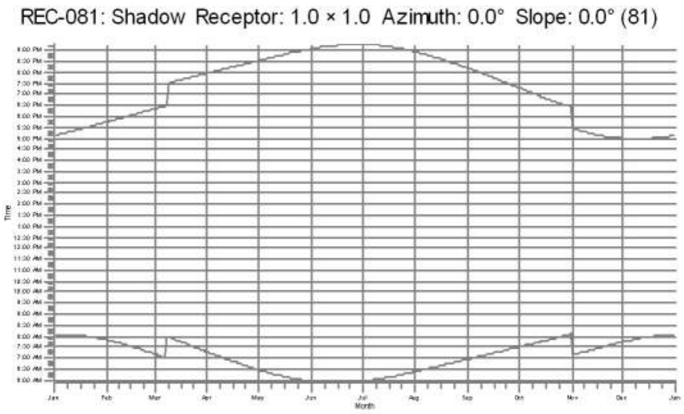
Calculated:
10/3/2018 3:53 PM/3.0.654

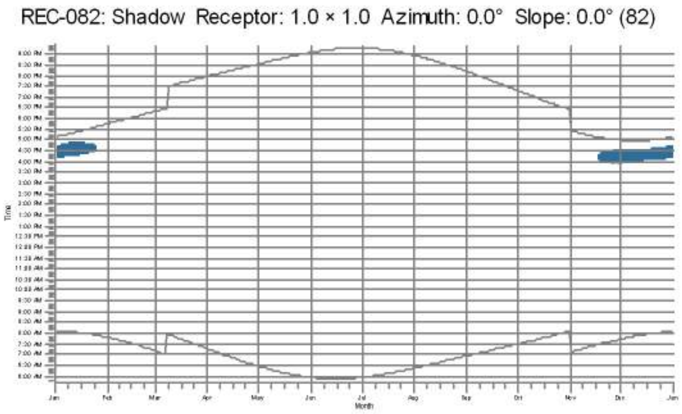
SHADOW - Calendar, graphical

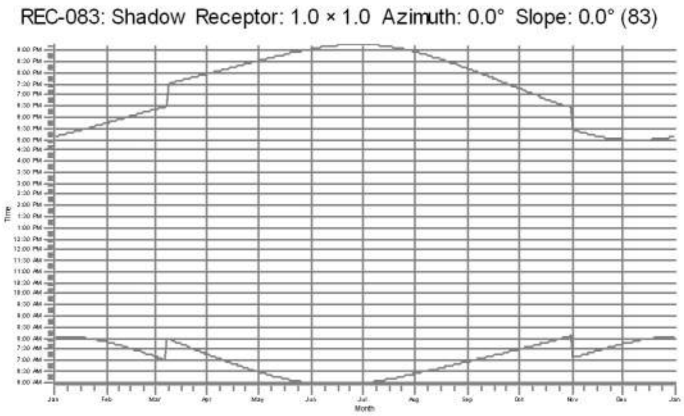
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

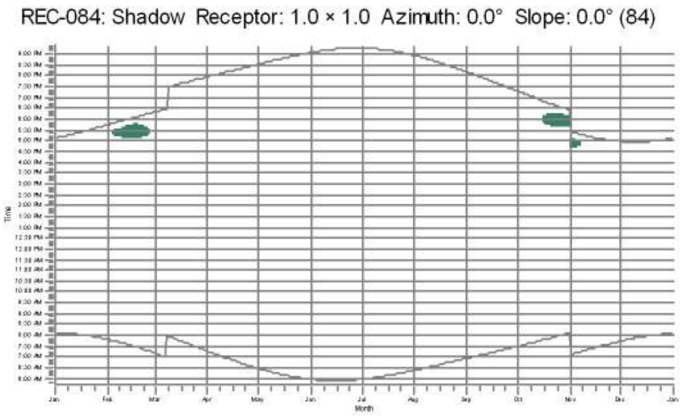

REC-079: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (79)


REC-080: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (80)


REC-081: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (81)


REC-082: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (82)


REC-083: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (83)


REC-084: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (84)

WTGs

🟦 2B.22: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (310)

🟩 3A.29: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (317)

Description:
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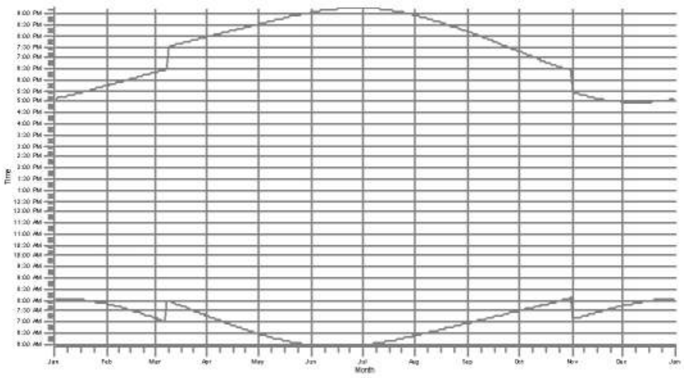
Calculated:
10/3/2018 3:53 PM/3.0.654

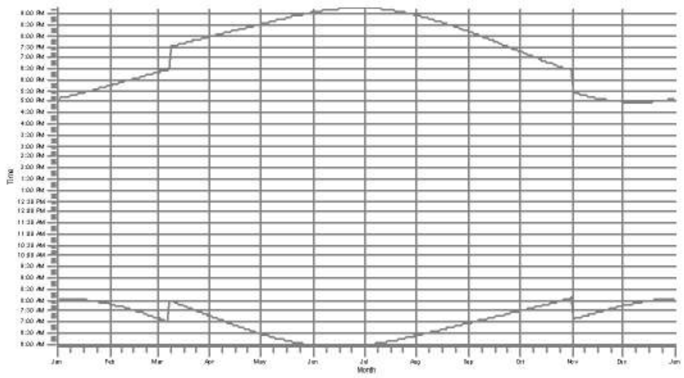
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

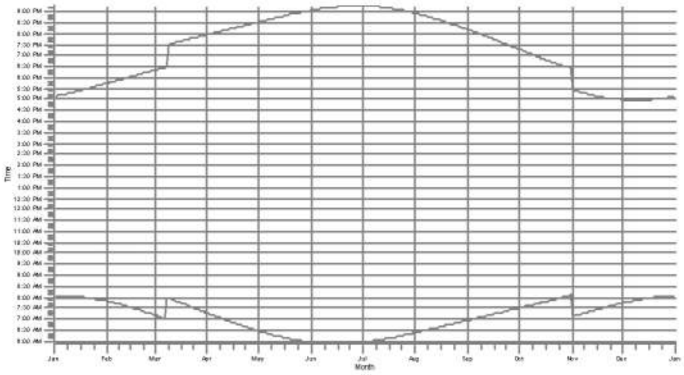
REC-085: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (85)



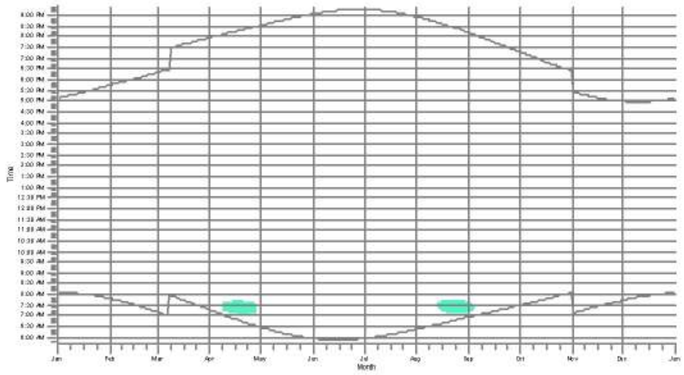
REC-086: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (86)



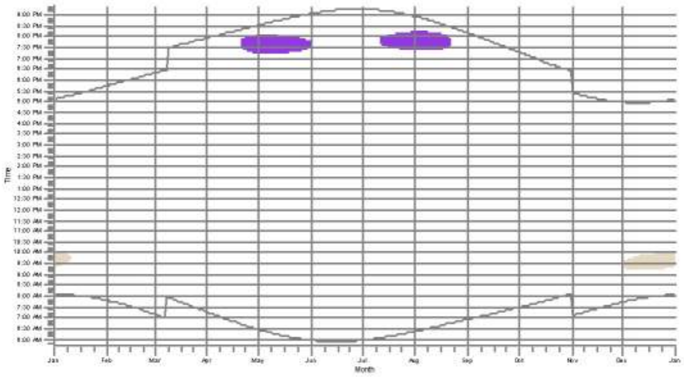
REC-087: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (87)



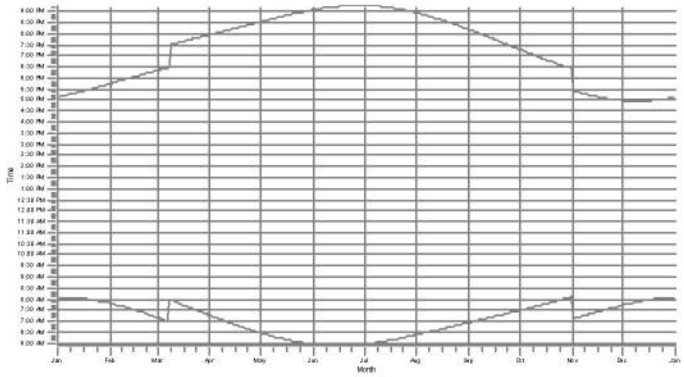
REC-088: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (88)



REC-089: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (89)



REC-090: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (90)

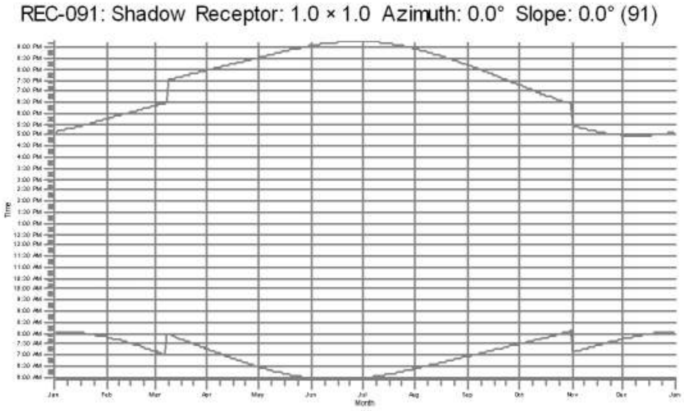


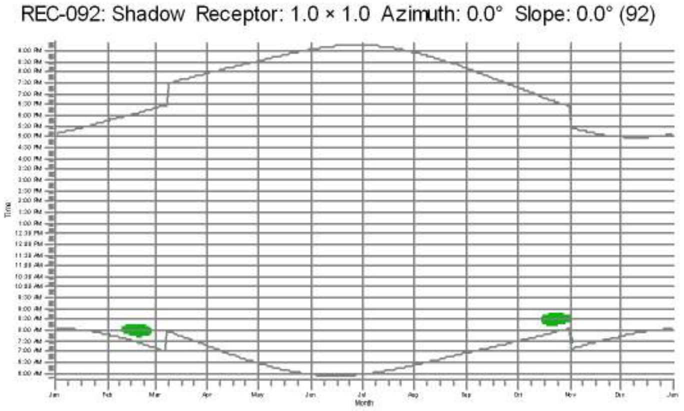
WTGs

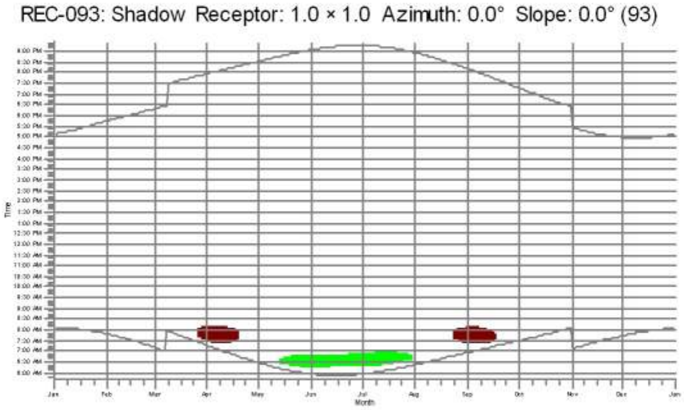
🟪	4A.46: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (334)
🟫	4A.49: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (337)
🟩	4B.56: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (344)

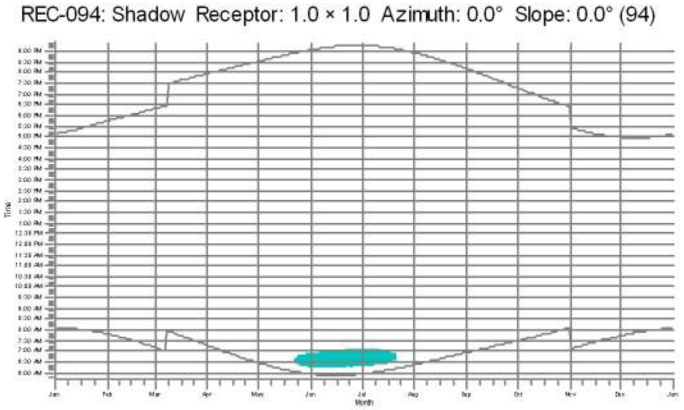
SHADOW - Calendar, graphical

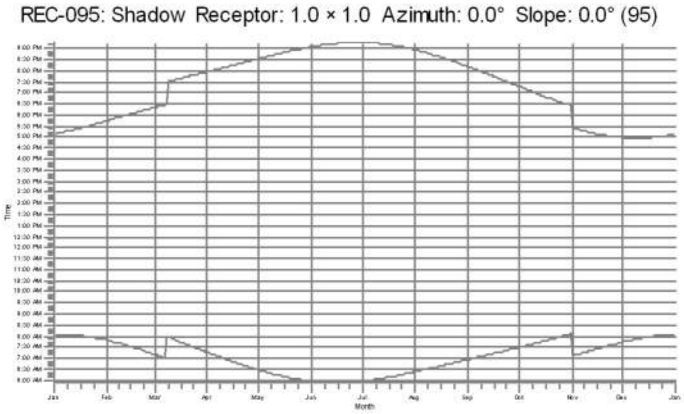
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

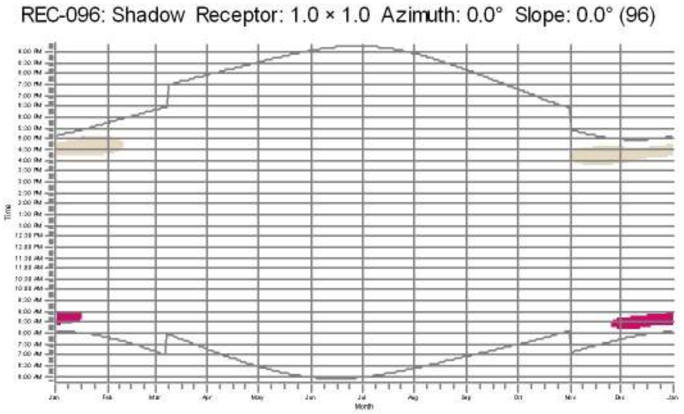












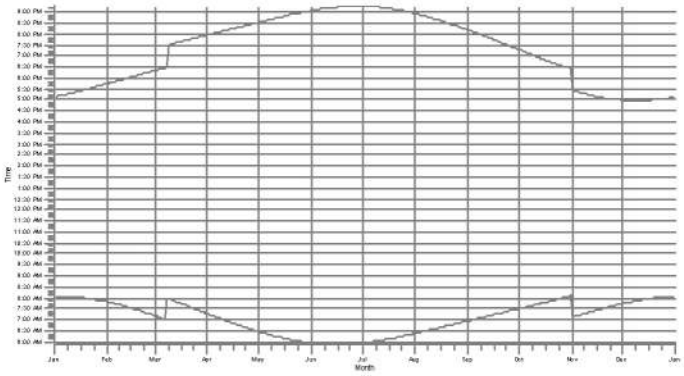
WTGs

- 🟥 1B.08: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (296)
- 🟩 1B.09: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (297)
- 🟦 2A.21: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (309)
- 🟪 4A.47: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (335)
- 🟫 4A.49: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (337)
- 🟥 4B.50: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (338)
- 🟩 4B.54: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (342)

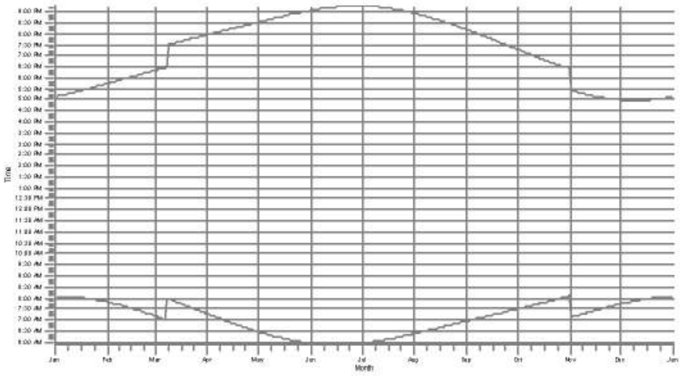
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

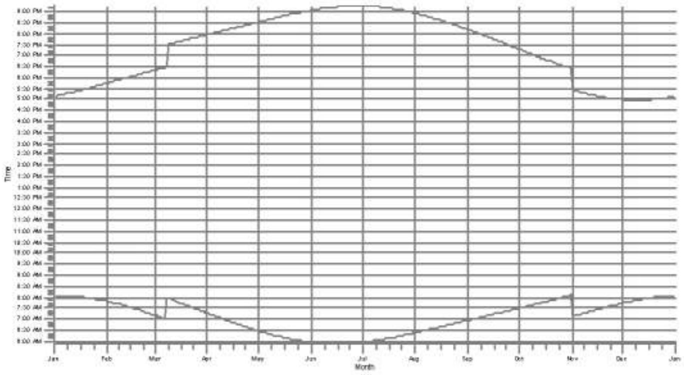
REC-097: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (97)



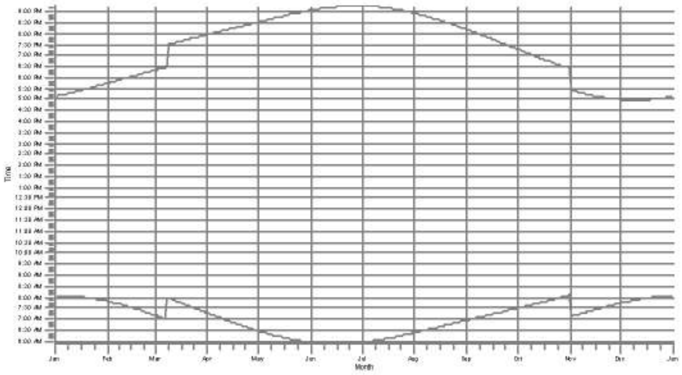
REC-098: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (98)



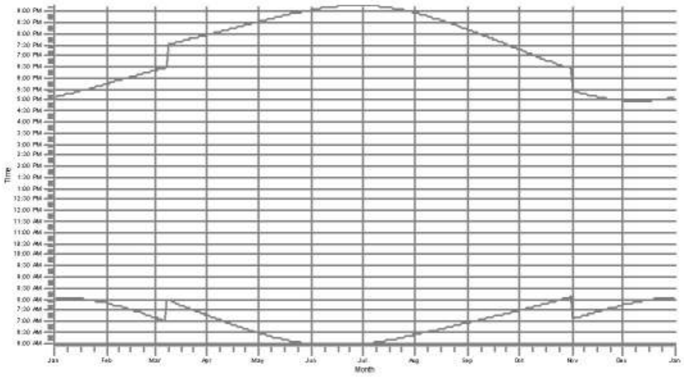
REC-099: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (99)



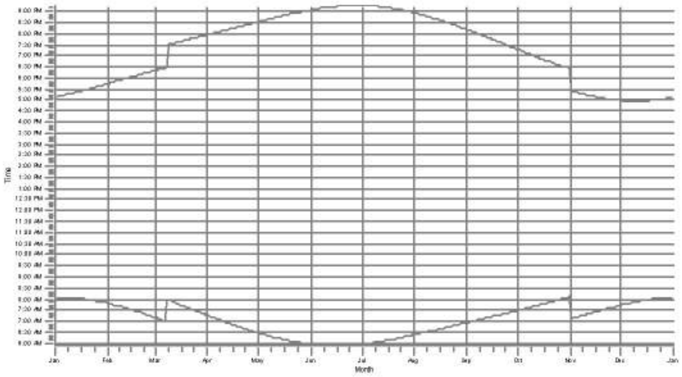
REC-100: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (100)



REC-101: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (101)



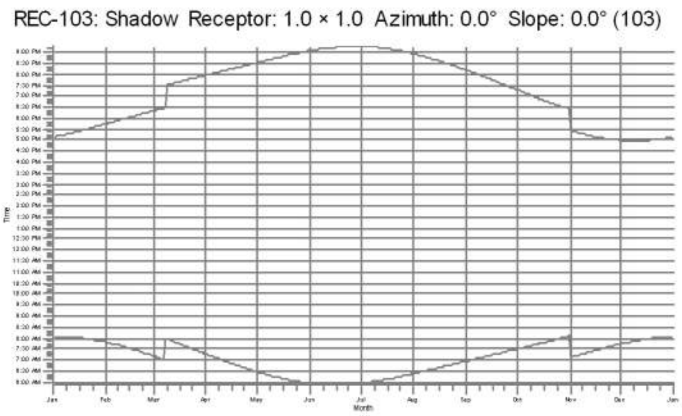
REC-102: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (102)

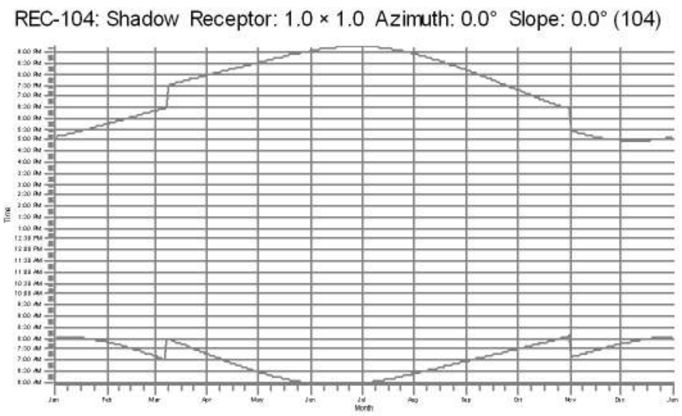


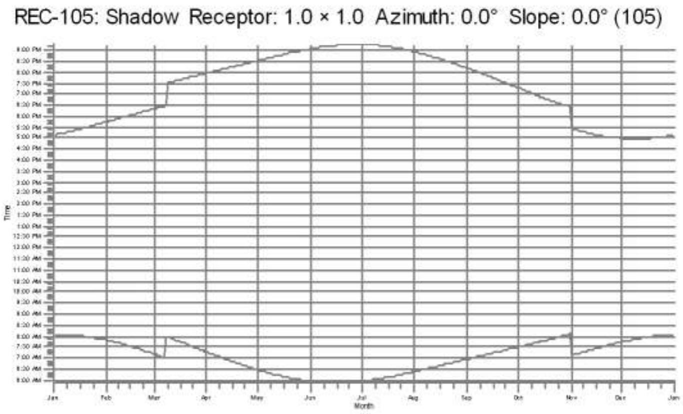
WTGs

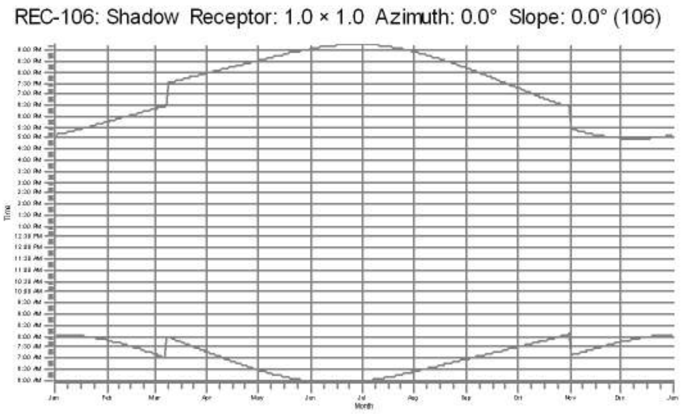
SHADOW - Calendar, graphical

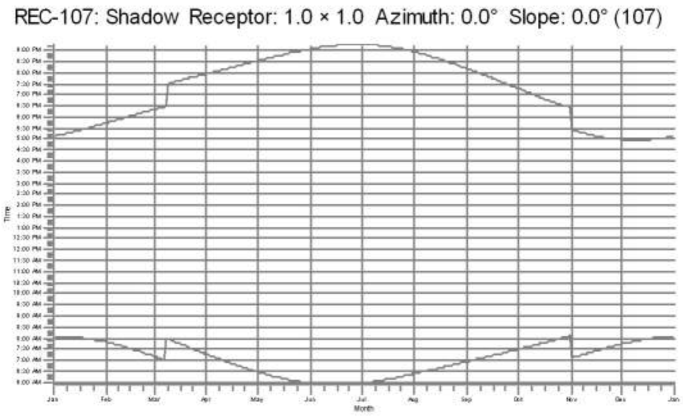
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

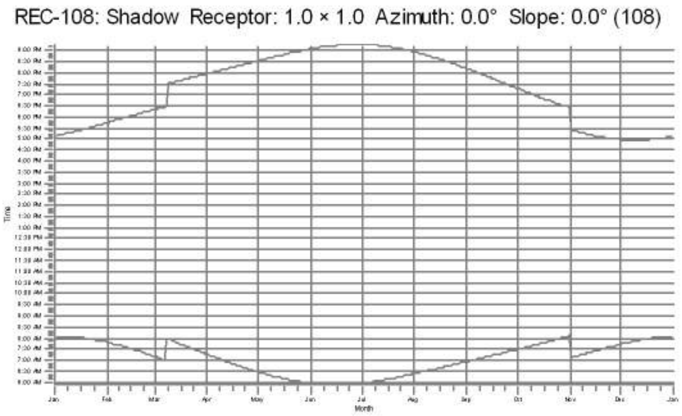








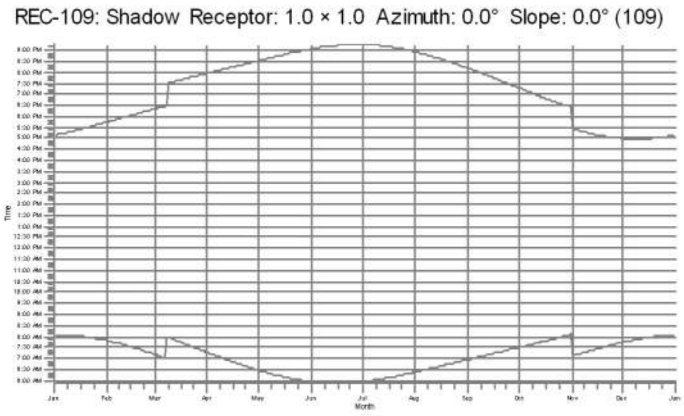


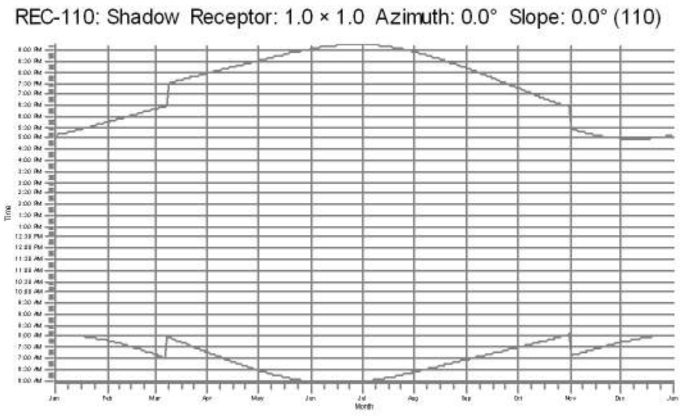


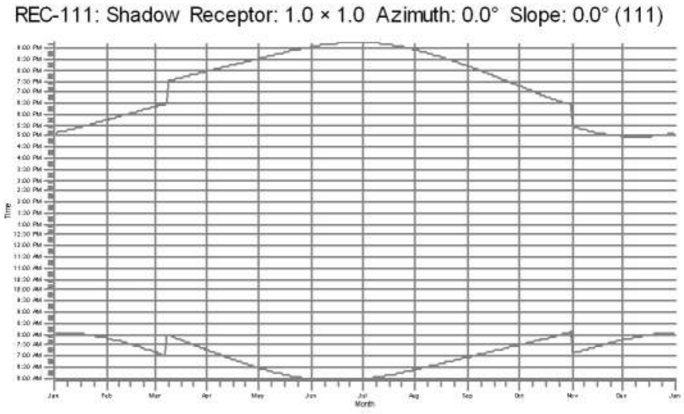
WTGs

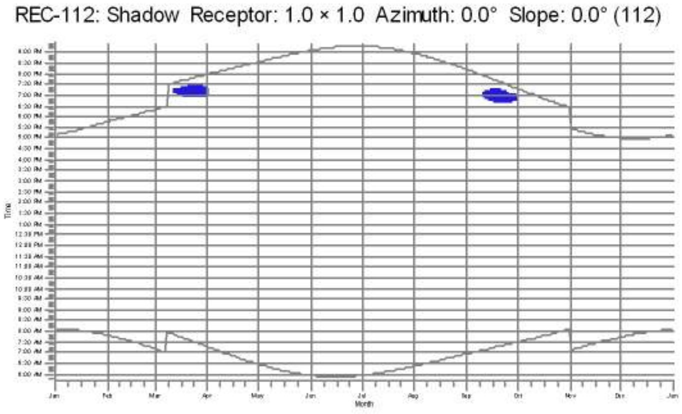
SHADOW - Calendar, graphical

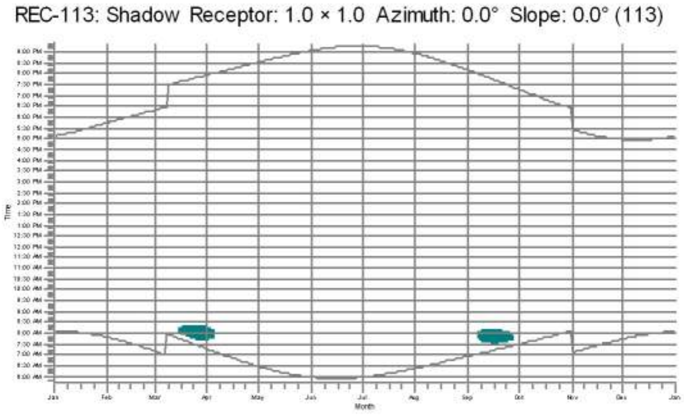
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

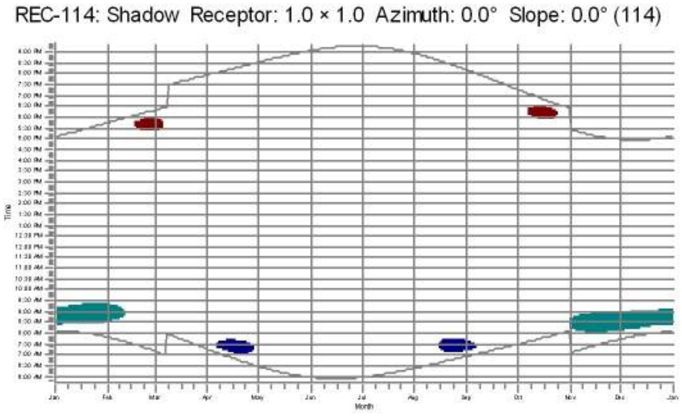

REC-109: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (109)


REC-110: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (110)


REC-111: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (111)


REC-112: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (112)


REC-113: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (113)


REC-114: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (114)

WTGs

🟩 1A.06: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (294)
🟦 1A.07: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (295)
🟥 1B.08: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (296)
🟦 3A.36: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (324)

Project:

sPower Shadow Flicker

Description:

Burns & McDonnell has relied upon information provided by third-party sources to complete this study. While there is no reason to believe that the information provided is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

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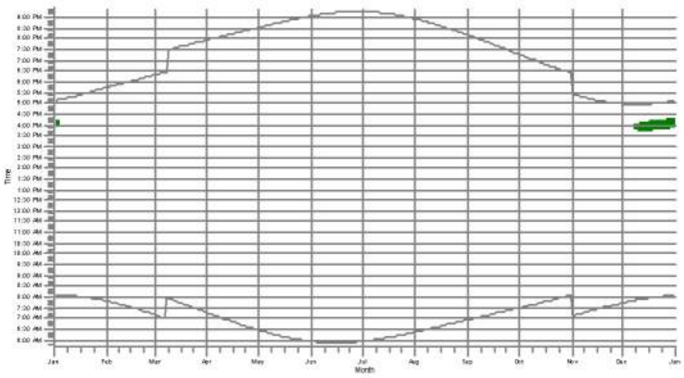
Calculated:
10/3/2018 3:53 PM/3.0.654

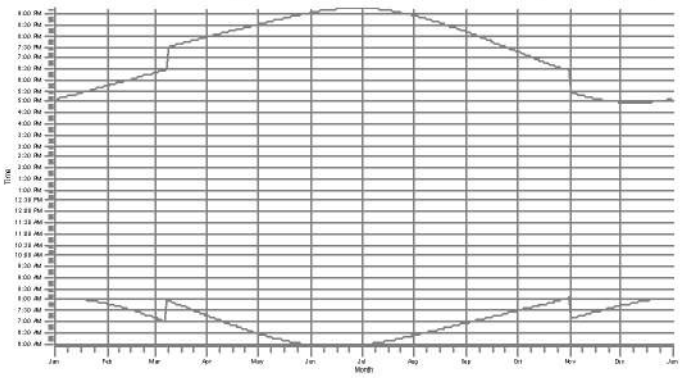
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

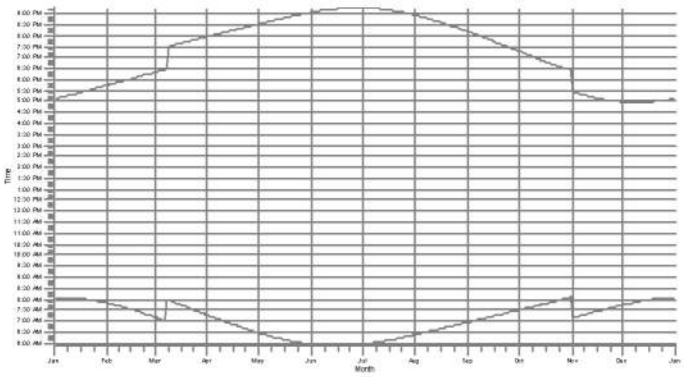
REC-115: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (115)



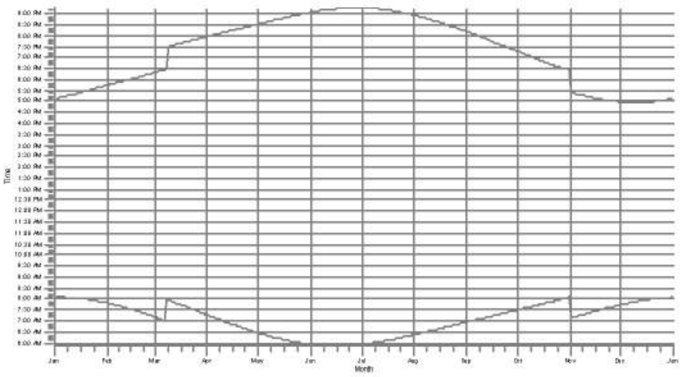
REC-116: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (116)



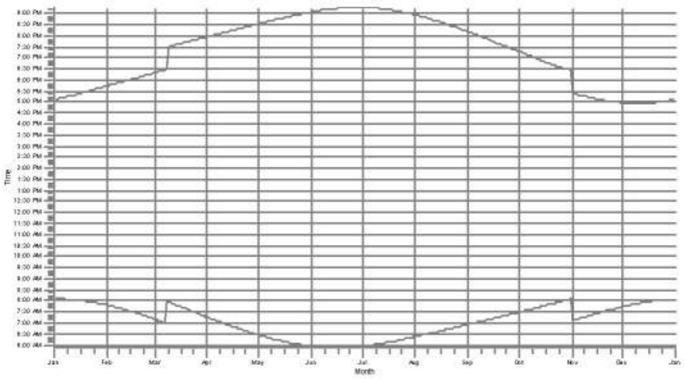
REC-117: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (117)



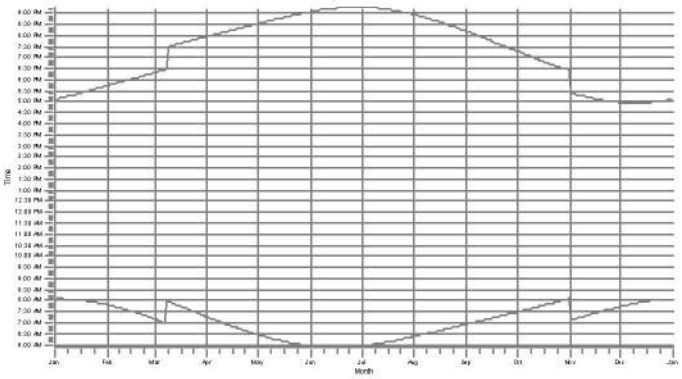
REC-118: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (118)



REC-119: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (119)



REC-120: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (120)



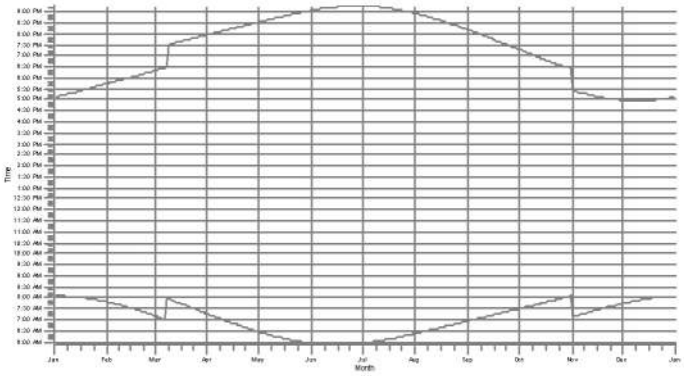
WTGs

🟩 1A.01: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (289)

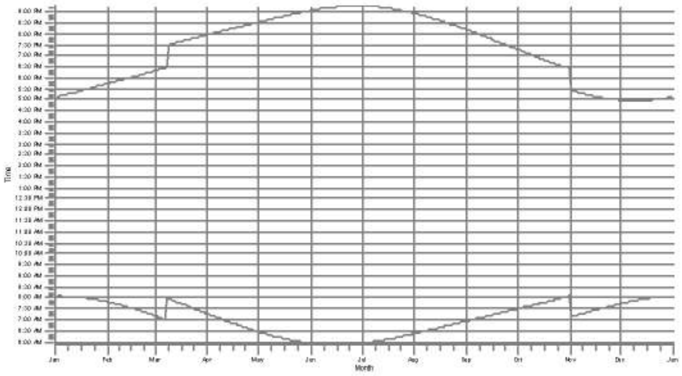
SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

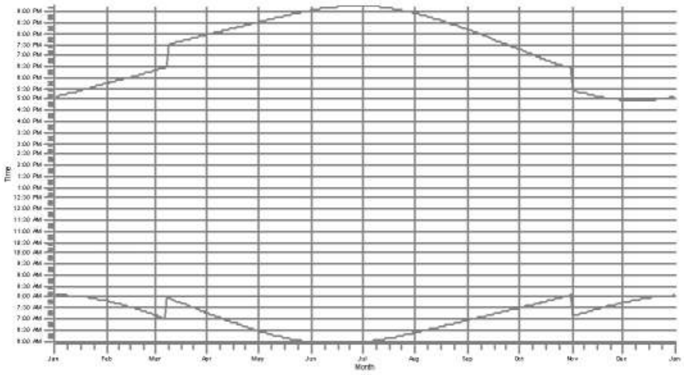
REC-121: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (121)



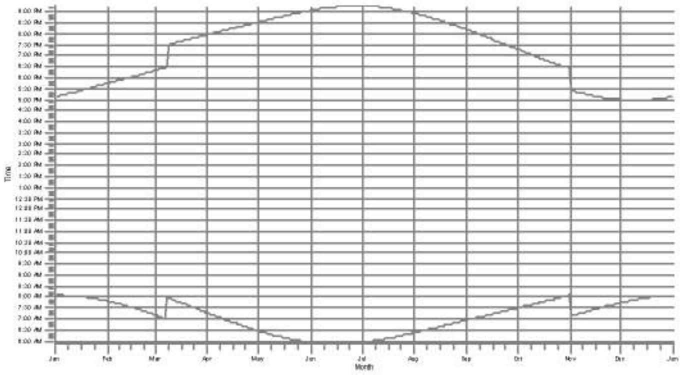
REC-122: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (122)



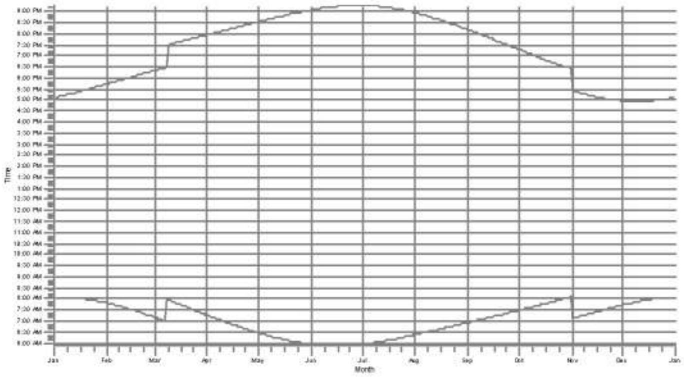
REC-123: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (123)



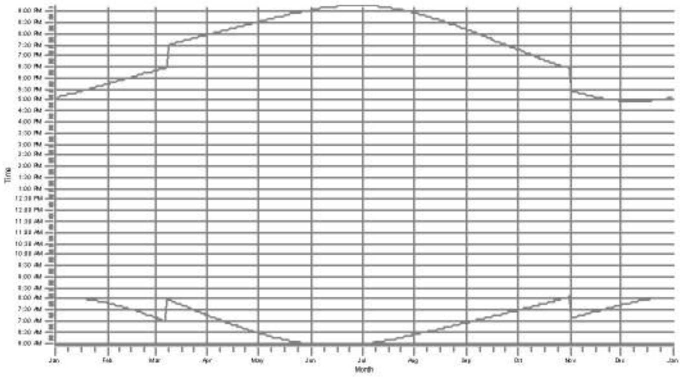
REC-124: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (124)



REC-125: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (125)



REC-126: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (126)



WTGs

Description:
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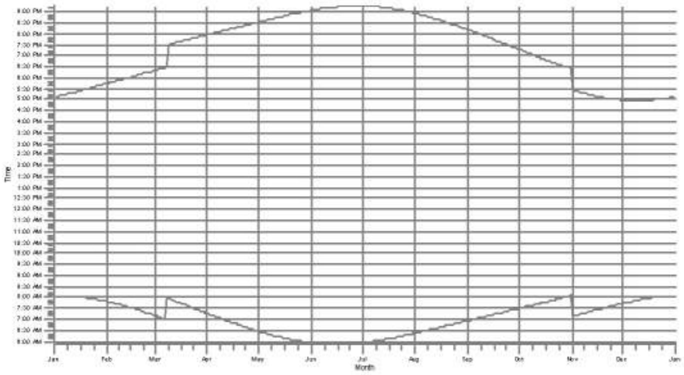
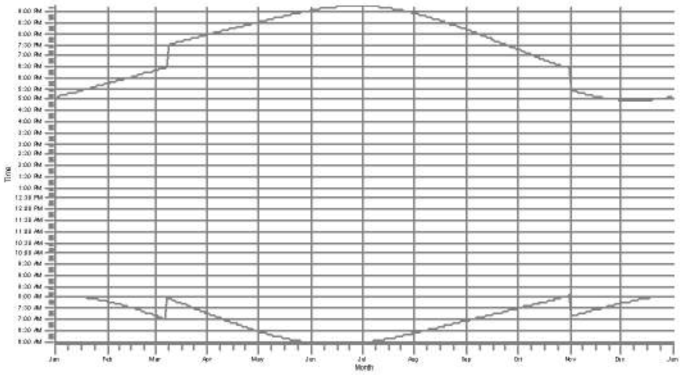
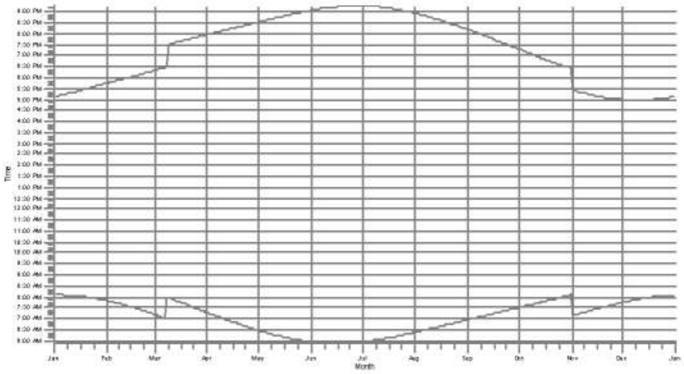
Calculated:
10/3/2018 3:53 PM/3.0.654

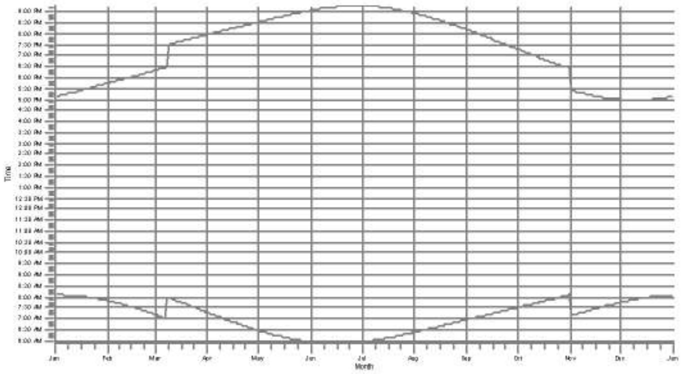
SHADOW - Calendar, graphical

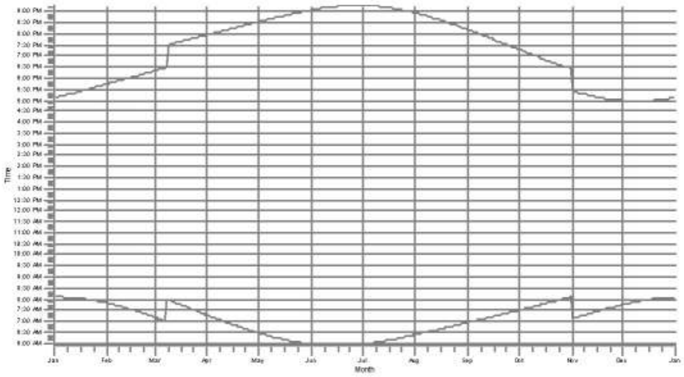
Calculation: Results.v6.62xGE3.8_wObstacles_noMap

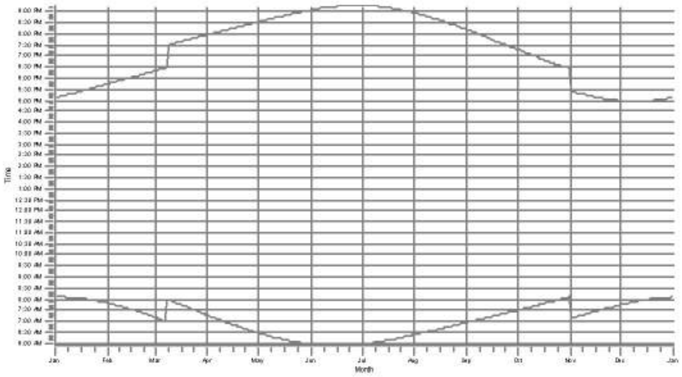

REC-127: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (127)


REC-128: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (128)


REC-129: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (129)


REC-130: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (130)

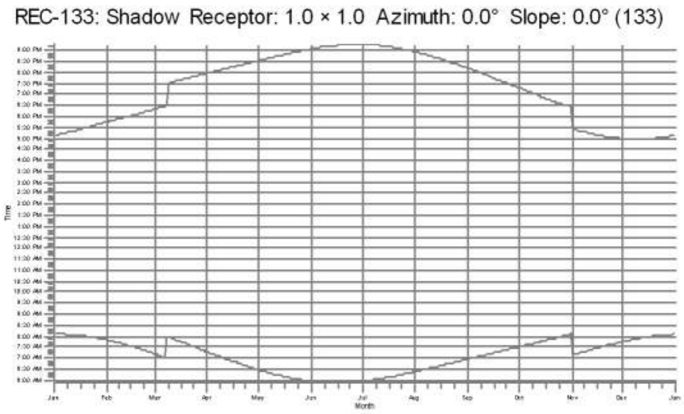

REC-131: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (131)

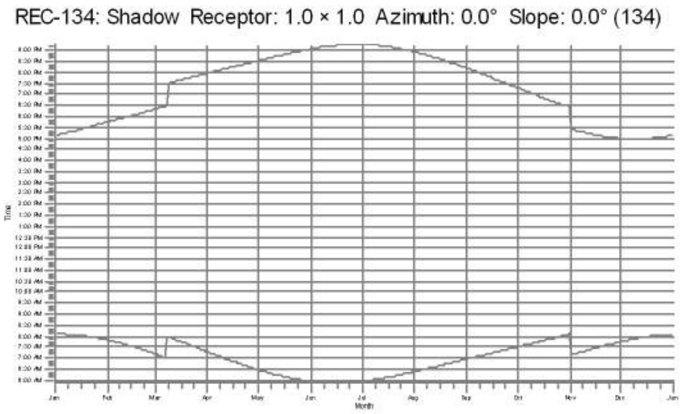

REC-132: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (132)

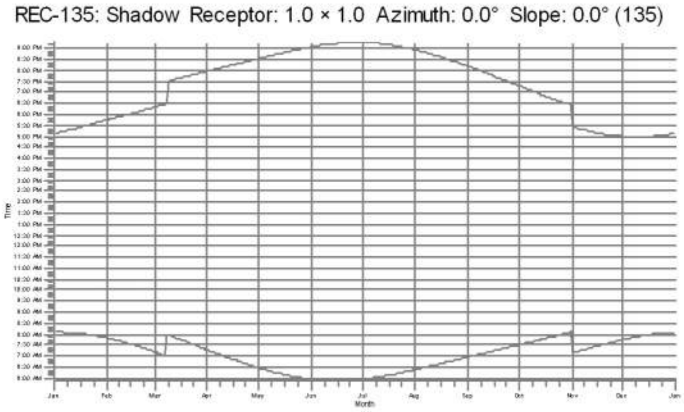
WTGs

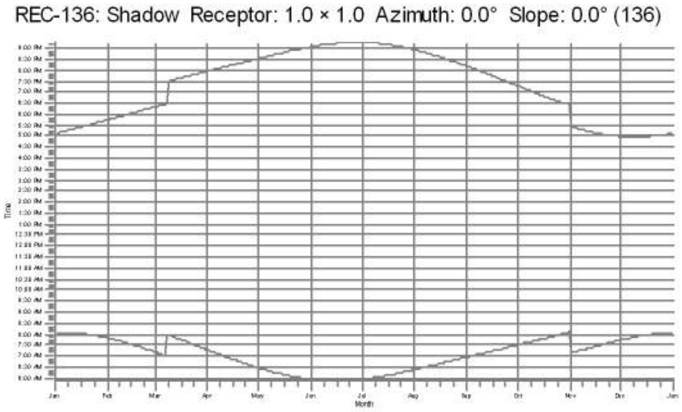
SHADOW - Calendar, graphical

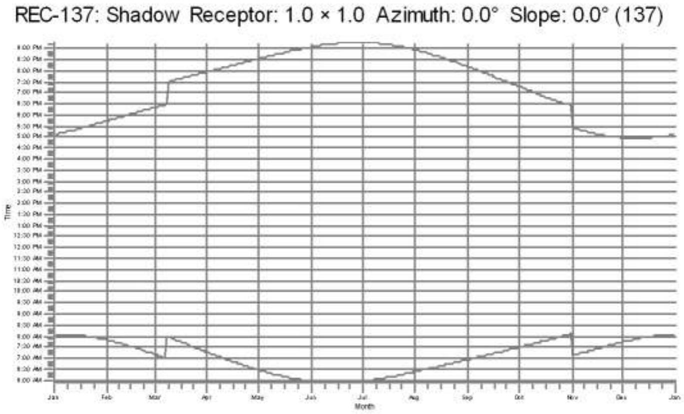
Calculation: Results.v6.62xGE3.8_wObstacles_noMap


REC-133: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (133)


REC-134: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (134)


REC-135: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (135)


REC-136: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (136)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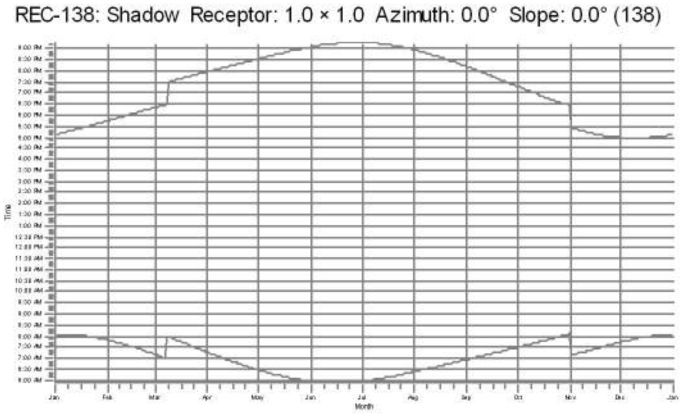
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WTGs

SHADOW - Calendar, graphical

Calculation: Results.v6.62xGE3.8_wObstacles_noMap

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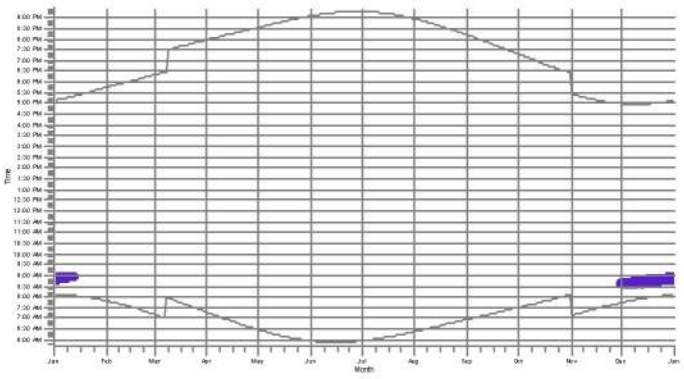

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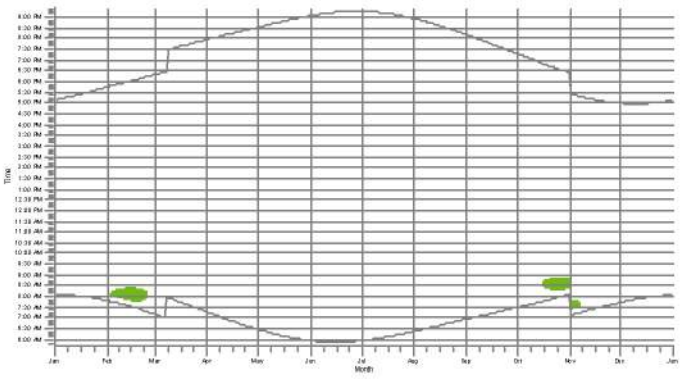

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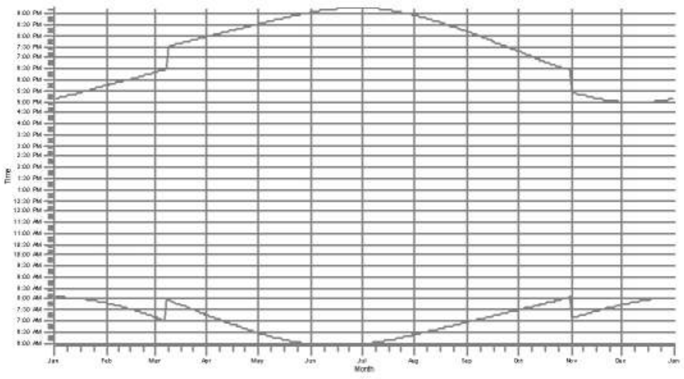

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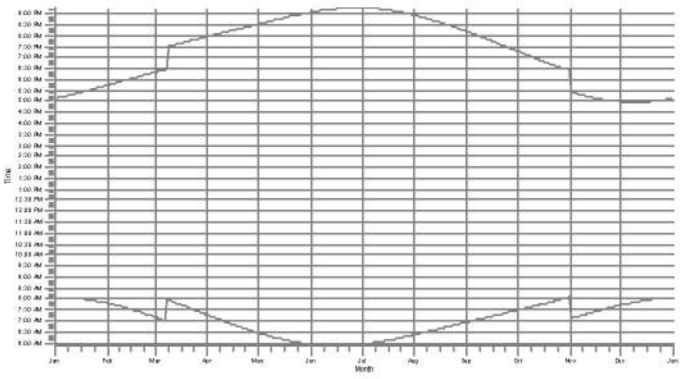

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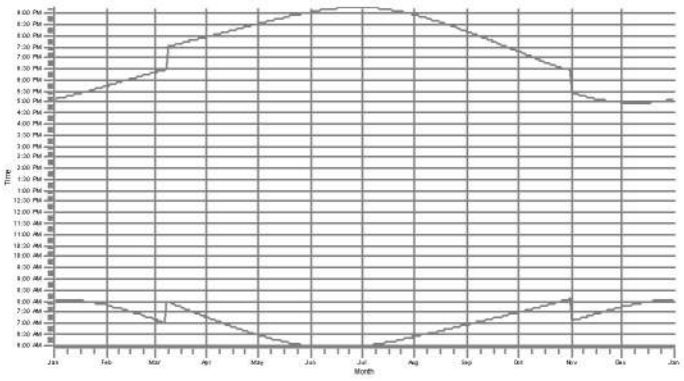

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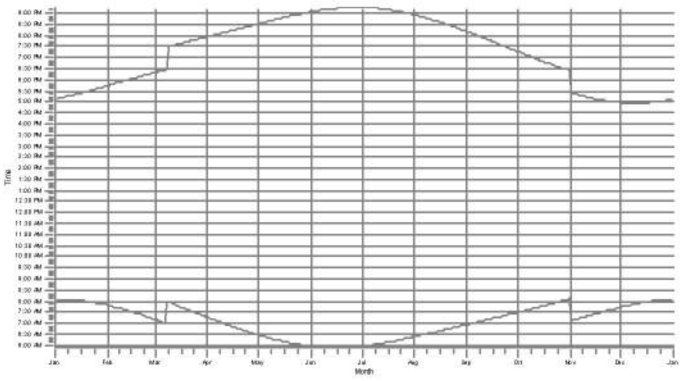

WTGs

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🟩 48.52: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (340)

Project:

sPower Shadow Flicker

Description:

Burns & McDonnell has relied upon information provided by third-party sources to complete this study. While there is no reason to believe that the information provided is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

Licensed user:

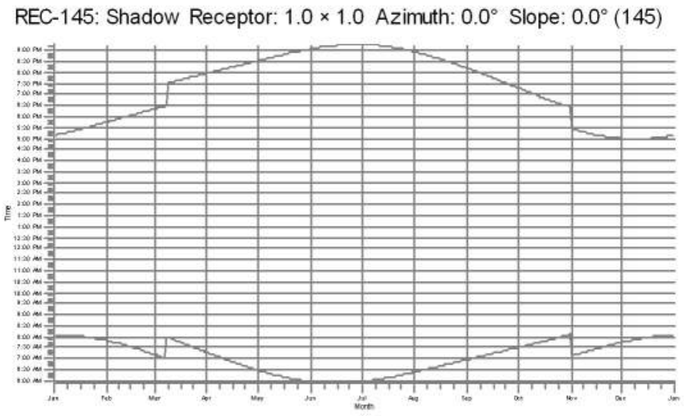
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Ella D. Rose / edrose@burnsmcd.com

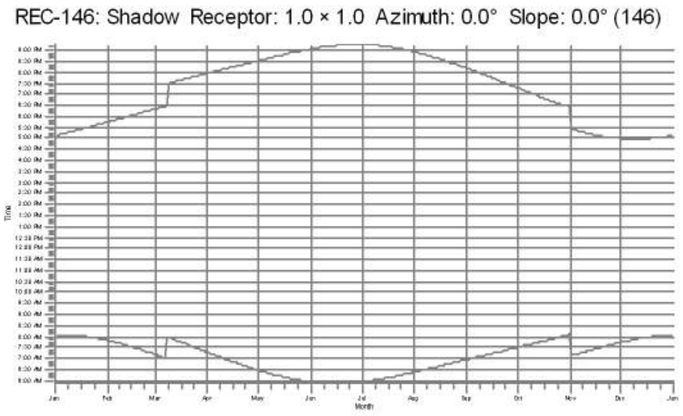
Calculated:

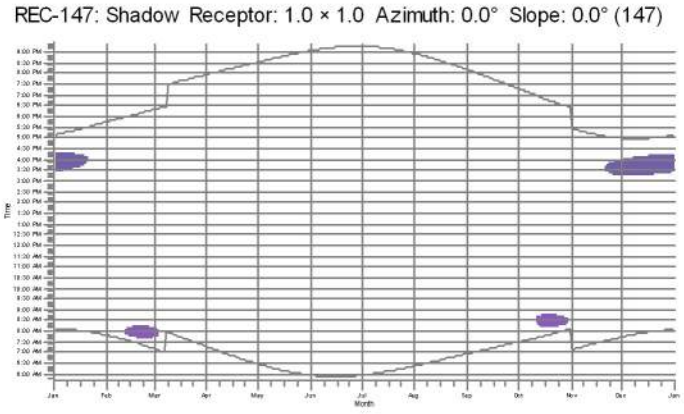
10/3/2018 3:53 PM/3.0.654

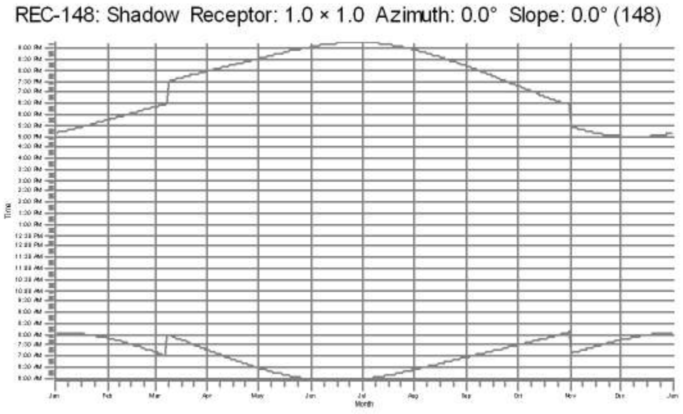
SHADOW - Calendar, graphical

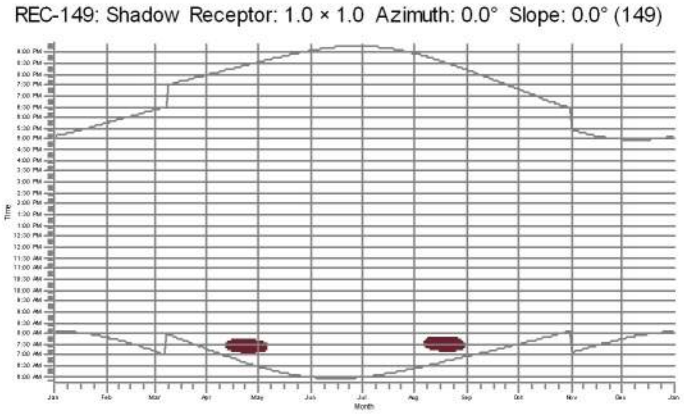
Calculation: Results.v6.62xGE3.8_wObstacles_noMap











WTGs

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🟪 4A.45: GE WIND ENERGY GE 3.8-137 3830 137.0 !O! hub: 111.5 m (TOT: 180.0 m) (333)

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Burns & McDonnell World Headquarters
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Kansas City, MO 64114
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APPENDIX N - CULTURAL RESOURCES DOCUMENTATION

Available upon request.

APPENDIX O - PROJECT DISTURBANCE AREAS

Summary of Prevailing Wind Park Ground Disturbance Impacts

Project Component	Estimated Quantity	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
		Dimensions	Total Acreage	Dimensions	Total Acreage
Turbines	61 turbines	160-foot radius	113 acres	25-foot radius	3 acres
Access roads	17 miles	50-foot wide	103 acres	16-foot wide	33 acres
Upgraded roads	40 miles	N/A	3 acres	N/A	N/A
Crane paths	54 miles	60-foot wide	393 acres	N/A	N/A
Collector lines	65 miles	30-foot wide	236 acres	10-foot by 5-foot junction box	0.001 acre
Collection substation	1 substation	5 acres	5 acres	4 acres	4 acres
Meteorological towers	4 towers	200-foot by 200-foot area	4 acres	42-foot by 42-foot area	0.2 acre
O&M facility	1 facility	6 acres	6 acres	6 acres	6 acres
Laydown/staging/ batch plant areas	1 laydown area; batch plants located within the laydown area	12 acres	12 acres	N/A	N/A
Transmission line structures	381 structures	100-foot by 100-foot	87 acres	1.5-foot radius	0.06 acre
Step-up substation	1 substation	20 acres	20 acres	300-foot by 200-foot	1.4 acres
		Total[a]:	**982 acres**	**Total:**	**48 acres**

(a) Because there is some overlap in the disturbance areas for the individual Project components, the total impact acreages do not equal the sum of the impact acreages for the individual components presented in this table.

APPENDIX P - CONSISTENCY EVALUATION FORMS

*Programmatic Biological Assessment Project Consistency Evaluation Form**
Upper Great Plains Region Wind Energy Development Program

(for USFWS Internal Use Only) *TAILS S7 Bundle #:*
Individual TAILS Log #:

Project Proponent

Project Name: Prevailing Wind Park Project
State: South Dakota
County: Bon Homme, Hutchinson, Charles Mix, Yankton
Township, Range & Sections:

Developer: Prevailing Wind Park, LLC
City: San Fransisco,
State: CA
POC: Bridget Canty
Phone: 831.430.6326

Federal Agency/Point of Contact

Fish & Wildlife Service Ecological Services Field Office
City: Pierre
State: South Dakota
POC: Natalie Gates
Phone: (605) 224-8693

Western Area Power Administration
City: Billings
State: MT
POC: Christina Gomer
Phone: 406.255.2811

For actions involving USFWS Land interests:
USFWS Wetland Management District:
City: State:
POC:
Phone:

	Y	N
USFWS Property Interest	☐	☐
Grassland Easement Exchange	☐	☐

Project Description Overview with Best Estimates

Construction Initiation Date: 1/25/19
Construction Completion Date: 12/1/19
Number Turbines: up to 61
Turbine Tower Height (ft/m): 366 ft (111.5 m)
Turbine RSA: 3.6 ac (14,741 sq m)

Max. Turbine Ht: 590.6 (180 m)
Turbine Pad Size: 201 sq ft (18.7 sq m)
Miles (km) of New Road: 15.2 mi (24.4 km)
Miles (km) Improved Road: 36.9 mi (59.4 km)
Miles (km) Existing County Rd: 65 mi (104.6 km)

Project Area Size: 50,858 ac
Wind Reserve Area Size: N/A
Power Generating Initiation Date: 12/31/19
Project Termination Date: 1/1/50

Turbine Size (MW), Make & Model: 3.8 MW, GE 3.8-127

Collector Lines from Turbine to Substation: Miles Buried: 65 mi (104.6 km) Miles Overhead: 0 27.6 mi (44.4 km)(transmission line)

To help demonstrate compliance with the BMPs, Species Specific Avoidance and Minimization Measures, a complete application must include maps of the project area and associated species/habitat/buffer zones. Maps attached Yes ☒ No ☐

Land Cover Types Affected

			Acres					
	Yes	No	Private	State	Federal	Subtotal	% Total	Description/Comments
Native Grass	☒	☐	1,609			1,609	3	Native grasslands as defined by the South Dakota State Univ Native Lands GIS Layer
Tame Grass	☒	☐	2,036			2,036	4	non-native grasslands
Agricultural	☒	☐	42,934			42,934	84	croplands, hay fields, pastures
Wetland	☒	☐	1,403			1,403	3	wetlands and open water
Riparian	☐	☒	0			0	0	
Trees	☒	☐	376			376	1	evergreen forest
Other	☒	☐	2,500			2,500	5	developed, barren, scrub/shrub
Total			50,858 ac				100%	

ESA Listed (L), Proposed (P) and Candidate (C) Species Affected (Check Boxes)

Plants
- ☐ EP Fringed Orchid (L)
- ☐ Mead's Milkweed (L)
- ☐ Prairie Bush Clover (L)
- ☐ Ute Ladies'-Tresses (L)
- ☒ WP Fringed Orchid (L)
- ☐ Whitebark Pine (C)

Invertebrates
- ☐ American Burying Beetle (L)
- ☐ Dakota Skipper (L)
- ☒ Higgins Eye (L)
- ☐ Poweshiek Skipperling (L)
- ☐ Salt Creek Tiger Beetle (L)
- ☒ Scaleshell Mussel (L)

Fish
- ☐ Bull Trout (L)
- ☒ Pallid Sturgeon (L)
- ☒ Topeka Shiner (L)

Reptiles
- ☐ Eastern Massasauga (C)

Birds
- ☐ G. Sage Grouse (C)
- ☒ Int. Least Tern (L)
- ☒ Piping Plover (L)
- ☒ Rufa Red Knot (L)
- ☐ Sprague's Pipit (C)
- ☒ Whooping Crane (L)

Mammals
- ☐ Black-footed Ferret (L)
- ☐ Canada Lynx (L)
- ☐ Gray Wolf (L)
- ☐ Grizzly Bear (L)
- ☐ Indiana Bat (L)
- ☒ N. Long-Eared Bat (L)

☒ **Project proponent has reviewed the Programmatic Wind Energy EIS and BA, Appendix B of the BA relating to Species Consistency Evaluation Forms, and the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines.**

Commitment to incorporate applicable BMPs and Species-Specific Avoidance & Minimization Measures into the project plan:

Bridget Canty	Bridget Canty	10/25/18
Project Proponent (Point of Contact)	Signature	Date

Agency Verification of Compliance with the Programmatic Wind Energy Biological Assessment:

Western Area Power Administration (Point of Contact)	Signature	Date
U.S. Fish & Wildlife Service (Point of Contact)	Signature	Date
U.S. Fish & Wildlife Service (ES Field Office Lead Biologist)	Signature	Date

***Version 3: March 2015**

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Higgins eye (*Lampsilis higginsii*)

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, one of the more important BMPs for the conservation of this species follows.

- ☒ Initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed to minimize the possibility of erosion and runoff into Higgins eye occupied habitat.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.

☒ Do not site turbines, access roads, transmission line towers, or other project facilities in aquatic habitat where Higgins eye mussels may be present.

Species-Specific Minimization Measures

The identified avoidance measures together with general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species.

Impact Information

Project within county with recorded Higgins eye? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: October 29, 2018

Parties involved: Reviewed IPaC list and habitat suitability

Suitable habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable habitat: 13 Miles

Has habitat been surveyed to protocol? ☐ Yes ☒ No Dates of survey:

Result of survey: ☐ Occupied (species detected) ☐ Not occupied (species not detected)

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

Development would not occur in areas adjacent to the species' potential habitat. The Project is 13 miles from potential habitat and would not affect the Missouri River, so the Species-Specific Avoidance and Minimization Measures are not applicable and preconstruction surveys were not warranted. Therefore, the Project will have no effect on Higgins eye.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Interior least tern (*Sternula antillarum*)

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

- ☒ Meteorological towers shall not be located in sensitive habitats or in areas where resources known to be sensitive to human activities (e.g., wetlands, cultural resources, and listed species) are present. Installation of towers shall be scheduled to avoid disruption of wildlife reproductive activities or other important behaviors, and the disturbed area will be minimized.
- ☒ The use of guy wires on meteorological towers shall be avoided or minimized. Any needed guy wires shall have guys appropriately marked with bird flight diverters.
- ☒ Place approved marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within the Missouri (including Niobrara River) and Yellowstone River system floodplains or any closer than 1.5 mi (2.4 km) from known/suitable sandbar habitat and reservoir shorelines with nesting, resting, and foraging areas.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within the Platte River (including Loup and Elkhorn Rivers) system floodplain or any closer than 1.5 mi (2.4 km) from known/suitable riverine habitat.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within 1.5 mi (2.4 km) of known sandpit nesting, resting, and foraging areas along the Platte River (including Loup and Elkhorn Rivers) system.

Species-Specific Minimization Measures

Additional minimization measures specifically intended to reduce the potential for adverse effects on the interior least tern have not been identified at this time. The identified avoidance measures together with general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species.

Impact Information

Project within county with recorded interior least tern? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: October 29, 2018

Parties involved: Reviewed IPaC and habitat suitability

Suitable habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable Missouri River system habitat: 13 Miles

Distance from suitable Platte River system riverine habitat 150 Miles

Distance from suitable Platte River system sandpit habitat: 150 Miles

Has habitat been surveyed to protocol? ☐ Yes ☒ No Dates of survey:

Result of survey: ☐ Occupied (species detected) ☐ Not occupied (species not detected)

New overhead distribution/transmission lines proposed? ☒ Yes ☐ No

Distance from occupied habitat: 13 Miles

Marking with bird flight diverters proposed? ☐ Yes ☒ No

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Interior least tern (*Sternula antillarum*)

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

There is no known habitat in the Project Area, so no loss of habitat would occur and Species-Specific Avoidance and Minimization Measures are not applicable. Desktop evaluation showed potential habitat and occupied areas 13 miles away, so preconstruction surveys were not warranted. Direct mortality could occur from collision if the least tern were to migrate through the area during periods of low visibility. Therefore, the Project may affect, but is not likely to adversely affect Interior least tern.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Northern long-eared bat *(Myotis septentrionalis)*

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

- ☒ Activities with continuous periods (i.e., longer than 24 hours) of noise disturbances greater than 75 db measured on the A scale (e.g., loud machinery) should be avoided within a 1-mi (1.6-km) radius of known or assumed northern long-eared bat hibernacula..

- ☒ Restrict use of herbicides for vegetation management near known or assumed northern long-eared bat hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).

- ☒ Avoid clearing of suitable habitat (spring staging, fall swarming, summer roosting) within a 5-mile (8.0 km) radius of known or assumed northern long-eared bat hibernacula. Retain snags, dead/dying trees, and trees with exfoliating (loose) bark ≥3-in. (7.6-cm) diameter at breast height (dbh) in areas ≤1 mi (1.6 km) from water.

- ☒ Develop and implement a Bird and Bat Conservation Strategy (BBCS) as described in the *Land-Based Wind Energy Guidelines* that includes survey protocols acceptable to the USFWS in the project area during the spring and fall bird and bat migration seasons. Mortality monitoring will help to identify individual turbines that contribute to avian and bat mortality. This information could be used to provide design layout information for future wind development projects and to reduce the potential for future avian and bat mortality.

Species-Specific Avoidance Measures

☒ Throughout the range of the northern long-eared bat within the UGP Region, conduct preconstruction evaluations and/or surveys to identify suitable foraging, roosting, and commuting habitat within project boundaries and to identify the distance from project boundaries to hibernacula known/presumed used by northern long-eared bats. Disturbance of hibernacula is prohibited throughout the year.

☒ Avoid all suitable habitat (do not site turbines) in areas within 5 mi (8 km) of hibernacula used by northern long-eared bats or within 0.5 mi (0.8 km) of known or presumed occupied foraging, roosting, and commuting habitat. Habitat evaluations should be coordinated with the local USFWS Ecological Services Office prior to or during turbine site planning.

Species-Specific Minimization Measures

☒ A robust survey developed and implemented as part of the BBCS program, consistent with the Wind Energy Guidelines and approved by the USFWS during the preconstruction evaluation and survey stage, will be implemented for a minimum of 1 yr preconstruction.

☒ The need for implementation of cut-in speeds higher than manufacturers' recommendations during the fall bat migration period will be based on the following site-specific, project-by-project risk assessments by the State Ecological Services Field Office of the USFWS:

- During the preconstruction evaluation and survey stage, and based on a collision risk assessment of location of the project, proximity to potential summer habitat, distance to known occurrences, distance to known hibernacula, and suspected migration patterns, the applicant will coordinate with Western, Refuges, and the local Ecological Services Field Offices of the USFWS to determine if the risk of injury or mortality is sufficiently high to warrant higher cut-in speeds.
- In the event that preconstruction surveys indicate species occurrence or occupancy of habitat adjacent to the project area, higher turbine cut-in speeds will be required to offset the increased risk for injury or mortality. The monitoring must be rigorous enough to meet standards acceptable to the local USFWS State office.
- When warranted by either of the two aforementioned conditions for specific projects, turbine cut-in speeds will be increased to 16.4 ft/sec (5.0 m/sec) or greater from 0.5 hour before sunset to 0.5 hour after sunrise during the fall migration period (generally August 15–October 15, but consult with the USFWS for the established migration dates in each State) for northern long-eared bats in the western and central areas of the UGP Region. In the eastern fringe of the UGP Region, a minimum cut-in speed of 22.6 ft/sec (6.9 m/sec) from 0.5 hour before sunset to 0.5 hour after sunrise during the fall migration period (generally August 15–October 15, but consult with the USFWS for established migration dates in each State) for northern long-eared bats is required. Areas within the UGP Region that occur east of the western borders of Minnesota and Iowa will be used as the line of demarcation where the minimum cut-in speed of 22.6 ft/sec (6.9 m/sec) will be used. Use of feathering below the respective cut-in speed of 16.4 ft/sec (5.0 m/sec) or 22.6 ft/sec (6.9 m/sec) will also be implemented at night during the fall migration season to eliminate turbine rotation and avoid mortality of migrating northern long-eared bats. Increased cut-in speed and feathering can be suspended from 0.5 hour after sunrise to 0.5 hour before sunset.

☒ Immediately report observations of northern long-eared bat mortality to the appropriate USFWS office.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Northern long-eared bat *(Myotis septentrionalis)*

Impact Information

Project within county with recorded northern long-eared bat? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: December 13, 2017

Parties involved: Natalie Gates/USFWS, Lesley Murphy/SDGFP, Bridget Canty/sPower, Korina Cassidy/sPower, Clayton Derby/WEST, Kristin Nasman/WEST

Suitable foraging or roosting habitat in or near project footprint? ☒ Yes ☐ No

Distance from suitable habitat: 0.3 Miles

Distance from hibernacula: 250 Miles

Has habitat been surveyed to protocol? ☒ Yes ☐ No Dates of survey:

Result of survey: ☒ Occupied (species detected) ☐ Not occupied (species not detected)

Turbine cut-in speed: m/sec

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect": Presence/absence surveys were conducted for the NLEB over the course of two years, 2015 and 2016. During the 2015 surveys and within the original Project Area, NLEB were detected at two of the 20 survey stations. One station south of Avon and 4 miles from the current boundary had five documented calls and one station on the western edge had a single call. The Project boundary was moved north and away from the the Missouri River. The 2016 survey area covered most of the current Project Area excluding the extreme northwest and northeast corners. No calls were detected from the eight survey stations in 2016, including the location of the one confirmed call south of the Project boundary from 2015, indicating probable absence in the Project Area. The lack of detections in 2016 seems to coincide with the westward spread of white-nose syndrome. The species may pass through the Project Area during migration. Based on the lack of detections and lack of occupied habitat in the current Project Area, the Project may affect, but is not likely to adversely affect the northern long-eared bat.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Piping plover *(Charadrius melodus)*

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

  - ☒ Meteorological towers shall not be located in sensitive habitats or in areas where resources known to be sensitive to human activities (e.g., wetlands, cultural resources, and listed species) are present. Installation of towers shall be scheduled to avoid disruption of wildlife reproductive activities or other important behaviors, and the disturbed area will be minimized.
  - ☒ The use of guy wires on meteorological towers shall be avoided or minimized. Any needed guy wires shall have guys appropriately marked with approved bird flight diverters.
  - ☒ Place marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within the Missouri (including Niobrara River) and Yellowstone River system floodplains or any closer than 1.5 mi (2.4 km) from known/suitable sandbar habitat and reservoir shorelines with nesting, resting, and foraging areas.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within the Platte River (including Loup and Elkhorn Rivers) system floodplain or any closer than 1.5 mi (2.4 km) from known/suitable riverine habitat.

☒ Do not site turbines, access roads, transmission lines, or other project facilities within 1.5 mi (2.4 km) of known sandpit nesting, resting, and foraging areas along the Platte River (including Loup and Elkhorn Rivers) system.

☒ Do not site turbines, transmission lines, access roads, or other project facilities within 3.0 mi (4.8 km) of alkali lakes where piping plover nesting has been documented or those designated as critical habitat.

☒ Do not site turbines, transmission lines, access roads, or other project facilities in between any alkali lakes identified with a 3.0 mi (4.8 km) buffer where the outer limit of the buffer zones are less than 3.0 mi (4.8 km) apart.

☒ Do not site turbines, transmission lines, access roads, or other project facilities within 1.5 mi (2.4 km) of riverine designated critical habitat or 3.0 mi (4.8 km) of alkali wetlands designated as critical habitat.

Species-Specific Minimization Measures

Additional minimization measures specifically intended to reduce the potential for adverse effects on the piping plover have not been identified at this time. The identified avoidance measures together with general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Piping plover *(Charadrius melodus)*

Impact Information

Project within county with recorded piping plovers? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: October 29, 2018

Parties involved: Reviewed IPaC list and habitat suitability

Suitable habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable riverine, reservoir, or alkali lake habitat: >3 Miles

Distance from designated critical habitat: 13 Miles

Has habitat been surveyed to protocol? ☐ Yes ☒ No Dates of survey:

Result of survey: ☐ Occupied (species detected) ☐ Not occupied (species not detected)

New overhead distribution/transmission lines proposed? ☒ Yes ☐ No

Distance from occupied piping plover habitat: 13 Miles

Marking with bird flight diverters proposed? ☐ Yes ☒ No

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

There is no known habitat in the Project Area, so no loss of habitat would occur and Species-Specific Avoidance and Minimization Measures are not application. Desktop evaluation showed the closest potential habitat 13 miles from the Project and the nearest alkali lakes with documented piping plover use are >3 miles from the Project; therefore, preconstruction surveys were not warranted. The Project is 13 miles from designated Critical Habitat. Direct mortality could occur from collision if piping plovers are present in the Project Area during periods of low visibility. Therefore, the Project may affect, but is not likely to adversely affect piping plovers.

*Programmatic Biological Assessment Project Consistency Evaluation Form**
Upper Great Plains Region Wind Energy Development Program

(for USFWS Internal Use Only) *TAILS S7 Bundle #:* ____

Individual TAILS Log #: ____

Project Proponent

Project Name: Prevailing Wind Park
State: South Dakota
County: Bon Homme, Hutchinson, Charles Mix, Yankton
Township, Range & Sections: ____

Developer: Prevailing Wind Park, LLC
City: San Francisco
State: California
POC: Bridget Canty
Phone: 831-430-6326

Federal Agency/Point of Contact

Fish & Wildlife Service Ecological Services Field Office
City: Pierre
State: South Dakota
POC: Natalie Gates
Phone: 602-224-8693

Western Area Power Administration
City: Billings
State: Montana
POC: Christina Gomer
Phone: 406-255-2811

For actions involving USFWS Land interests:

USFWS Wetland Management District: ____
City: ____ State: ____
POC: ____
Phone: ____

	Y	N
USFWS Property Interest	☐	☐
Grassland Easement Exchange	☐	☐

Project Description Overview with Best Estimates

Construction Initiation Date: 1/25/19
Construction Completion Date: 12/1/19
Number Turbines: up to 61
Turbine Tower Height (ft/m): 366 ft/111.5 m
Turbine RSA: 3.6 ac

Max. Turbine Ht: 590.6 ft/180 m
Turbine Pad Size: 201 sq ft/18.7 sq m
Miles (km) of New Road: 15.2 mi / 24.4 km
Miles (km) Improved Road: 36.9 mi / 59.4 km
Miles (km) Existing County Rd: 65 mi / 104.6 km

Project Area Size: 50,858 ac
Wind Reserve Area Size: N/A
Power Generating Initiation Date: 12/31/19
Project Termination Date: 12/31/49

Turbine Size (MW), Make & Model: 3.8 MW, GE 3.8-127

Collector Lines from Turbine to Substation: Miles Buried: 65 mi / 104.6 km Miles Overhead: 27.6 mi / 44.4 km (transmission line)

To help demonstrate compliance with the BMPs, Species Specific Avoidance and Minimization Measures, a complete application must include maps of the project area and associated species/habitat/buffer zones. Maps attached Yes ☒ No ☐

Land Cover Types Affected

			Acres					
	Yes	No	Private	State	Federal	Subtotal	% Total	Description/Comments
Native Grass	☒	☐	1,609			1,609	3	Native grasslands as defined by the SD State U Native Lands GIS Layer
Tame Grass	☒	☐	2,036			2,036	4	Non-native grasslands
Agricultural	☒	☐	42,934			42,934	84	Croplands, hayfields, pastures
Wetland	☒	☐	1,403			1,403	3	Wetlands and open water
Riparian	☐	☒	0			0	0	
Trees	☒	☐	376			376	1	Deciduous & evergreen forest; approx 300 ac suitable bat habitat
Other	☒	☐	2,500			2,500	5	Developed, barren, scrub/shrub
Total							100%	

ESA Listed (L), Proposed (P) and Candidate (C) Species Affected (Check Boxes)

Plants
- ☐ EP Fringed Orchid (L)
- ☐ Mead's Milkweed (L)
- ☐ Prairie Bush Clover (L)
- ☐ Ute Ladies'-Tresses (L)
- ☒ WP Fringed Orchid (L)
- ☐ Whitebark Pine (C)

Invertebrates
- ☐ American Burying Beetle (L)
- ☐ Dakota Skipper (L)
- ☒ Higgins Eye (L)
- ☐ Poweshiek Skipperling (L)
- ☐ Salt Creek Tiger Beetle (L)
- ☒ Scaleshell Mussel (L)

Fish
- ☐ Bull Trout (L)
- ☒ Pallid Sturgeon (L)
- ☐ Topeka Shiner (L)

Reptiles
- ☐ Eastern Massasauga (C)

Birds
- ☐ G. Sage Grouse (C)
- ☒ Int. Least Tern (L)
- ☒ Piping Plover (L)
- ☒ Rufa Red Knot (L)
- ☐ Sprague's Pipit (C)
- ☒ Whooping Crane (L)

Mammals
- ☐ Black-footed Ferret (L)
- ☐ Canada Lynx (L)
- ☐ Gray Wolf (L)
- ☐ Grizzly Bear (L)
- ☐ Indiana Bat (L)
- ☒ N. Long-Eared Bat (L)

☒ **Project proponent has reviewed the Programmatic Wind Energy EIS and BA, Appendix B of the BA relating to Species Consistency Evaluation Forms, and the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines.**

Commitment to incorporate applicable BMPs and Species-Specific Avoidance & Minimization Measures into the project plan:

Bridget Canty		11/29/18
Project Proponent (Point of Contact)	Signature	Date

Agency Verification of Compliance with the Programmatic Wind Energy Biological Assessment:

Western Area Power Administration (Point of Contact)	Signature	Date
U.S. Fish & Wildlife Service (Point of Contact)	Signature	Date
U.S. Fish & Wildlife Service (ES Field Office Lead Biologist)	Signature	Date

***Version 3: March 2015**

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Rufa red knot *(Calidris canutus rufa)*

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

- ☒ The use of guy wires on meteorological towers shall be avoided or minimized. Any needed guy wires shall have guys appropriately marked with approved bird flight diverters.
- ☒ Place marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.

Species-Specific Minimization Measures

Additional minimization measures specifically intended to reduce the potential for adverse effects on the rufa red knot have not been identified at this time. The identified general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species. Additional minimization measures specifically intended to reduce the potential for adverse effects on the rufa red knot have not been identified at this time. The identified general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species.

Coordinate with the local USFWS field office regarding new species information or conservation measures during planning stages.

Impact Information

Project within county with recorded rufa red knot as a transient? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates:

Parties involved:

Suitable stopover habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable habitat: 13 Miles

New overhead distribution/transmission lines proposed? ☒ Yes ☐ No

Distance from suitable stopover habitat? 13 Miles

Marking with approved bird flight diverters proposed? ☐ Yes ☐ No

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

There is no known habitat in the Project Area, so no loss of habitat would occur and Species-Specific Avoidance and Minimization Measures are not applicable. Desktop evaluation showed potential habitat and occupied areas 13 miles away, so preconstruction surveys were not warranted. Direct mortality could occur from collision if the Rufa red knot were to migrate through the area during periods of low visibility. Therefore, the Project may affect, but is not likely to adversely affect the Rufa red knot.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Scaleshell mussel (*Leptodea leptodon*)

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

☒ None.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.

☒ Do not site turbines, access roads, transmission line towers, or other project facilities in aquatic habitat where scaleshell mussels may be present.

Species-Specific Minimization Measures

The identified avoidance measures together with general BMPs to reduce ecological impacts from wind energy under the proposed program adequately address the conservation measures for this species.

Impact Information

Project within county with recorded scaleshell mussel? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: October 29, 2018

Parties involved: Reviewed IPaC list and habitat suitability

Suitable habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable habitat: 13 Miles

Has habitat been surveyed to protocol? ☐ Yes ☒ No Dates of survey:

Result of survey: ☐ Occupied (species detected) ☐ Not occupied (species not detected)

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

Development would not occur in areas adjacent to potential species habitat. The Project is 13 miles from potential habitat and will not impact the Missouri River, so Species-Specific Avoidane and Minimization Measures are not applicable and preconstruction surveys were not warranted. Therefore, the Project will have no effect on Scaleshell mussel.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Western prairie fringed orchid (*Platanthera praeclara*)

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

- ☒ Minimize the size of areas in which soil would be disturbed or vegetation would be removed.
- ☒ Initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies such as State or county extension offices or weed boards.

Species-Specific Avoidance Measures

☒ Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries. Surveys should include proper identification and survey techniques based on recommendations from the USFWS on the most current survey protocols.

☒ Do not site turbines, access roads, transmission line towers, or other project facilities in occupied habitats.

☒ Clearly delineate buffer zones around locations of plants within the project area and restrict activities within 100 ft (30.5 m) of those locations.

Species-Specific Minimization Measures

For projects that encompass occupied habitat or that occur near occupied habitat:

☒ Employ additional project-specific BMPs to control invasive plants in areas of suitable habitat disturbed by project activities.

☒ Employ additional project-specific BMPs during and after construction to control erosion and runoff along access roads adjacent to suitable habitat.

☒ Avoid actions that could alter surface water flow, infiltration, and groundwater levels in suitable habitat.

☒ Do not use herbicides within 100 ft (30.5 m) of areas where the species occurs.

Impact Information

Project within county with recorded western prairie fringed orchid? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates:

Parties involved:

Suitable habitat in or near project footprint? ☐ Yes ☒ No

Distance from suitable habitat: Miles

Has habitat been surveyed to protocol? ☐ Yes ☒ No Dates of survey:

Result of survey: ☐ Occupied (species detected) ☐ Not occupied (species not detected)

If occupied, 100 ft (30.5 m) buffer zones delineated? ☐ Yes ☐ No

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect": The FWS identifies Hutchinson and Yankton Counties as counties of potential occurrence; however, based on the USFWS Species Profile page (https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=1669) the species is believed extirpated from South Dakota and the known occurrence are all south of the Missouri River or much further to the east. The Project extends slightly into Hutchinson and Yankton counties; approximately 9,900 acres of the Project overlaps with the species' range; however, suitable habitat is limited to approximately 890 acres. The Project will avoid and minimize impacts to all wetland and grassland areas.Therefore, the Project may affect, but is not likely to adversely affect the western prairie-fringed orchid.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Whooping crane *(Grus americana)*

Project Name: Prevailing Wind Park Project

Company: Prevailing Wind Park, LLC

Best Management Practices

☒ All general BMPs, as stated in the final *Programmatic Environmental Impact Statement for the Upper Great Plains Region Wind Energy Program* and table 4.5-1 of the final *Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program,* will be implemented where appropriate, during each phase of the project (i.e., site characterization, construction, operations, and decommissioning). Although not all-inclusive, several of the more important BMPs for the conservation of this species follow.

- ☒ The use of guy wires on meteorological towers shall be avoided or minimized. Any needed guy wires shall have guys appropriately marked with approved bird flight diverters.

Species-Specific Avoidance Measures

For projects that occur within the portion of the whooping crane migration corridor that encompasses 95 percent of historic sightings:

☒ Conduct preconstruction evaluations and/or surveys to identify wetlands that provide potentially suitable stopover habitat and areas of occurrence within project boundaries.

☐ Do not site turbines, transmission lines, access roads, or other project facilities within 1 mi (1.6 km) of wetlands that provide suitable stopover habitat or within 5 mi (8 km) of the Platte or Niobrara Rivers in Nebraska.

☒ Do not site turbines, transmission lines, access roads, or other project facilities within 5 mi (8 km) of designated critical habitat.

Species-Specific Minimization Measures

For projects that that occur within the portion of the whooping crane migration corridor that encompasses 95 percent of historic sightings:

☐ Place approved bird flight diverters on the top static wire on any new or upgraded overhead collector, distribution, and transmission lines within 1 mi (1.6 km) of suitable stopover habitat.

☐ Establish a procedure for preventing whooping crane collisions with turbines during operations by establishing and implementing formal plans for monitoring the project site and surrounding area for whooping cranes during spring and fall migration periods throughout the operational life of the project (or as determined by the local USFWS field office) and shutting down turbines and/or construction activities within 2 mi (3.2 km) of whooping crane sightings. Monitoring can be done by existing onsite personnel trained in whooping crane identification. Specific requirements of the monitoring and shutdown plan will be determined during preconstruction evaluations. Sightings of whooping cranes in the vicinity of projects will be reported to the appropriate USFWS field office immediately.

☐ Instruct workers in the identification and reporting of sandhill and whooping cranes and to avoid disturbance of cranes present near project areas.

☐ The acreage of wetlands that are potentially suitable migratory stopover habitat located within a 0.5 mi (0.8 km) radius of turbines may be mitigated based upon site-specific evaluations.

Programmatic Biological Assessment Species Consistency Evaluation Form
Upper Great Plains Region Wind Energy Development Program
Impact Information and Consistency Determination

Whooping crane *(Grus americana)*

Impact Information

Project within county with recorded whooping crane? ☒ Yes ☐ No

Preconstruction evaluations conducted with USFWS? ☒ Yes ☐ No Dates: 12/13/17

Parties involved: Natalie Gates/USFWS, Lesley Murphy/SDGFP, Bridget Canty/sPower, Korina Cassidy/sPower, Clayton Derby/WEST, Kristin Nasman/WEST

Suitable habitat in or near project footprint? ☒ Yes ☐ No

Distance from suitable stopover habitat: 0.5 Miles

Distance from designated critical habitat? 150 Miles

Distance from the Platte or Niobrara River? 25 Miles

New overhead distribution/transmission lines proposed? ☒ Yes ☐ No

Distance from suitable stopover habitat? 0 Miles

Marking with approved bird flight diverters proposed? ☐ Yes ☒ No

Monitoring plan for spring/fall migration (copy attached)? ☒ Yes ☐ No

Employees trained in identification of whooping cranes? ☒ Yes ☐ No

Shut-down protocol for sitings within 2 mi (3.2 km) (attached)? ☒ Yes ☐ No

Map of project footprint and species habitat attached? ☒ Yes ☐ No

Effects—Explanation of consistency determination with programmatic effects determination of "may affect, not likely to adversely affect" or "no effect":

Project is outside of the 95% national migration corridor used and described in the PEIS. Project not near designated critical habitat but potential habitat does exist within Project footprint and vicinity. Project will train employees to identify whooping cranes and implement shutdown of turbines if whooping cranes within 2 miles of turbines. Mortality may occur from collision with turbine blades (though no whooping cranes have been reported as fatalities at operating projects) or overhead powerline; suitable habitat may be avoided or degraded. Project may affect, but is not likely to adversely affect whooping cranes.

APPENDIX Q - SCOPING MEETING INFORMATION

Department of Energy
Western Area Power Administration
Upper Great Plains Customer Service Region
P.O. Box 35800
Billings, MT 59107-5800

B0401.BL

NOV 20 2017

Dear Customers and Interested Parties:

This letter is to notify you of the proposed Prevailing Wind Park wind energy facility (Project) and to request your input on the proposed Project. Prevailing Winds, LLC proposes to produce up to 200 megawatts (MWs) of generating capacity from up to 100 wind turbines and associated facilities. In addition to the wind turbines, Project components would include an underground power collection system, a new Project substation, an overhead power line, access roads, and a maintenance and operation center. The Project area under consideration is approximately 47,000 acres of private land in Bon Homme, Charles Mix, and Hutchinson Counties between the towns of Avon, Tripp, and Wagner, South Dakota (see enclosed map).

The Project would interconnect with Western Area Power Administration's (WAPA) Utica Junction Substation, located approximately 22 miles east of the Project. As a result, WAPA will provide federal oversight of the preparation of an Environmental Assessment (EA) under the National Environmental Policy Act. The EA will evaluate the environmental effects of the proposed Project on resources such as wetlands, vegetation and wildlife, cultural and recreation resources, as well as other social, economic, and environmental effects.

WAPA is announcing a public scoping period for the Project. The scoping period provides an opportunity for the general public, government agencies, tribal governments, and others to identify issues and alternatives that will help WAPA define the scope of the EA. One public scoping meeting (open house format) will be held to provide an opportunity for interested parties to discuss the Project with resource specialists and to submit comments. The meeting will be held on Wednesday, December 13, 2017, from 5:00 p.m. to 8:00 p.m., at the Tripp Legion Hall, 102 N. Main Street, Tripp, SD, 57376.

Comments may be submitted in the following ways:

- By mail to:
  Western Area Power Administration
  Attn: Ms. Christina Gomer
  2900 4th Avenue North
  Billings, MT 59101
- By fax to (406) 255-2900
- By email to gomer@wapa.gov
- In writing at the public scoping open house meeting:
  December 13, 2017
  5:00 p.m. – 8:00 p.m.
  Tripp Legion Hall
  102 N Main Street
  Tripp, SD 57376

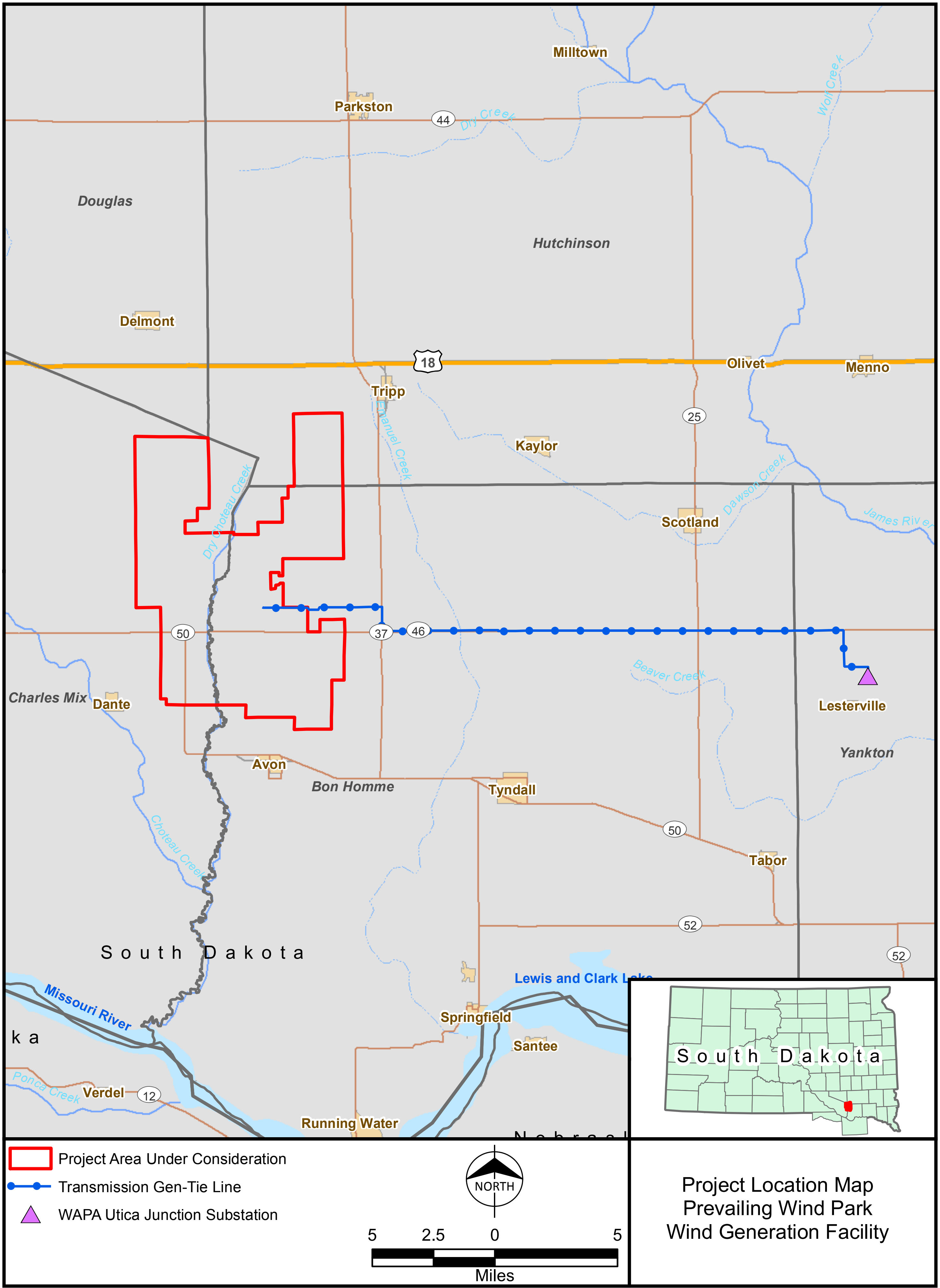
For your input to be considered during preparation of the draft EA, WAPA requests comments by January 13, 2018. If you have any questions, or need more information about the Project, please contact WAPA using the methods listed above. Thank you for your time and interest in the project.

Sincerely,

Christina Gomer

Christina Gomer
NEPA Coordinator

Enclosure



Project Location Map
Prevailing Wind Park
Wind Generation Facility

Path: Z:\Clients\ENS\PrevailingWi\91343_Permitting\Studies\Geospatial\DataFiles\ArcDocs\ProjectLocation_20171115.mxd jbell 11/15/2017

Source: ESRI; South Dakota GIS; Prevailing Winds, LLC; Burns & McDonnell Engineering Company, Inc.

Issued: 11/15/2017

Affidavit of Publication

State of South Dakota }
County of Bon Homme } SS

Rebecca Uz Being first duly sworn says that The **Scotland Journal** is a legal weekly newspaper for the publication of legal and other official notices as required by the South Dakota Revised Code of Nineteen Hundred Nineteen, and any amendments thereof, printed and published in the City of Scotland, County of Bon Homme, and State of South Dakota, and has been such a legal newspaper during the time hereinafter mentioned, with a bona fide circulation of at least 250 copies weekly, and published within said county for more than 52 successive weeks prior to the first time herein mentioned and is printed in the English language in whole or in part in an office maintained at the place of publication and that deponent is the publisher in charge of the advertising department of said newspaper; that the advertisement headed

SDNA 2x5 WAPA

a printed copy of which hereto attached, was printed and published in said newspaper for .... successive weeks, upon the following dates:

Nov. 29 2017 .... 20.....
Dec. 6 2017 .... 20.....
Dec. 13 2017 .... 20.....
.... 20..... .... 20.....

That the full amount of the fee charged for the publication of said notice, $142.20 inures to the benefit of the publisher of said newspaper, that no agreement or understanding for the division thereof has been made with any other person, and that no part has been agreed to be paid to any person whomsoever.

Rebecca Uz, publisher

Subscribed and sworn to before me this
13 day of December, 2017

Peggy

Notary Public, South Dakota

My commission expires 10-24-2021

PEGGY S[illegible]ELSKE
Notary Public
SEAL
South Dakota

PUBLIC INPUT ENCOURAGED!

Public comments are sought to define the scope and alternatives for an Environmental Assessment of a proposed wind energy facility located in Bon Homme, Charles Mix, and Hutchinson Counties between the towns of Avon, Tripp, and Wagner, South Dakota. The proposed project, to be called Prevailing Wind Park, would include up to 100 wind turbine generators, an underground power collection system, project substation, access roads, and a maintenance and operation center. The project would also include an overhead gen-tie line from the project substation to Western Area Power Administration's (WAPA) Utica Junction Substation within Bon Homme and Yankton Counties. Construction of the Prevailing Wind Park is proposed to begin as early as mid-2018.

Western Area Power Administration will hold one public scoping meeting (open house format) to provide an opportunity for interested parties to discuss the project with the project developer (Prevailing Winds, LLC) and resource specialists and to submit comments. The meeting will be held on Wednesday, December 13, 2017, from 5:00 p.m. to 8:00 p.m., at the Tripp Legion Hall.

To learn more about this project and to share your ideas, join us at:

December 13, 2017 • 5:00 p.m. – 8:00 p.m.
Tripp Legion Hall • 102 N Main Street
Tripp, SD 57376

Comments may be submitted in the following ways:

- By mail to:
  Western Area Power Administration, Attn: Ms. Christina Gomer
  2900 4th Avenue North, Billings, MT 59101
- By fax to (406) 255-2900
- By email to gomer@wapa.gov
- In writing at the public scoping open house meeting.

Comments should be postmarked no later than January 13, 2018.

Affidavit of Publication

State of South Dakota }
County of Bon Homme } ss

Rebecca Tjz..........Being first duly sworn says that the **Tyndall Tribune & Register** is a legal weekly newspaper for publication of legal and other official notices as required by Chapter 298 of the Session Laws of South Dakota, 1939; that it has bona fide paid circulation of more than two hundred copies weekly; that it is published in English language in the City of Tyndall, Bon Homme County, South Dakota, and has been admitted to the United States mail under second class mailing privilege for more than one year prior to the first publication of the notice herein mentioned, and that it is printed in an office maintained at the place of publication at Tyndall, South Dakota, and that deponent is the publisher in charge of the advertising department of said newspaper; that the advertisement headed

SDNA 2x5 WAPA

a printed copy of which is hereto attached, was printed and published in said newspaper for three successive weeks, upon the following dates:

Nov. 29 20 17 ....20......
Dec 6 20 17 ....20......
Dec 13 20 17 ....20......
........................20...... ....20......

That the full amount of the fee charged for the publication of said notice, $.... 144.60, inures to the benefit of the publisher of said newspaper, that no agreement or understanding for the division thereof has been made with any other person, and that no part has been agreed to be paid to any person whomsoever.

Rebecca Tjz, publisher

Subscribed and sworn to before me this

13 day of December 20 17

Peggy Schelske
Notary Public, South Dakota
My Commission expires Oct. 24, 2021

PEGGY SCHELSKE
Notary Public
SEAL
South Dakota

PUBLIC INPUT ENCOURAGED!

Public comments are sought to define the scope and alternatives for an Environmental Assessment of a proposed wind energy facility located in Bon Homme, Charles Mix, and Hutchinson Counties between the towns of Avon, Tripp, and Wagner, South Dakota. The proposed project, to be called Prevailing Wind Park, would include up to 100 wind turbine generators, an underground power collection system, project substation, access roads, and a maintenance and operation center. The project would also include an overhead gen-tie line from the project substation to Western Area Power Administration's (WAPA) Utica Junction Substation within Bon Homme and Yankton Counties. Construction of the Prevailing Wind Park is proposed to begin as early as mid-2018.

Western Area Power Administration will hold one public scoping meeting (open house format) to provide an opportunity for interested parties to discuss the project with the project developer (Prevailing Winds, LLC) and resource specialists and to submit comments. The meeting will be held on Wednesday, December 13, 2017, from 5:00 p.m. to 8:00 p.m., at the Tripp Legion Hall.

To learn more about this project and to share your ideas, join us at:

December 13, 2017 • 5:00 p.m. – 8:00 p.m.
Tripp Legion Hall • 102 N Main Street
Tripp, SD 57376

Comments may be submitted in the following ways:

- By mail to:
  Western Area Power Administration, Attn: Ms. Christina Gomer
  2900 4th Avenue North, Billings, MT 59101
- By fax to (406) 255-2900
- By email to gomer@wapa.gov
- In writing at the public scoping open house meeting.

Comments should be postmarked no later than January 13, 2018.

AFFIDAVIT OF PUBLICATION

STATE OF SOUTH DAKOTA
COUNTY OF HUTCHINSON

SCOTT E. EHLER, BEING DULY SHORN, SAYS: THAT THE TRIPP STAR LEDGER IS, AND DURING ALL THE TIME HEREINAFTER MENTIONED WAS, A WEEKLY LEGAL NEWSPAPER AS DEFINED IN SDCL 17-2-2, AS AMENDED, PUBLISHED AT PARKSTON, HUTCHINSON COUNTY, SOUTH DAKOTA BY THE PARKSTON ADVANCE, INC.; THAT AFFIANT IS AND DURING ALL OF SAID TIMES WAS, AN EMPLOYEE OF THE PUBLISHER OF SUCH NEWSPAPER AND HAS PERSONAL KNOWLEDGE OF THE FACTS STATED IN THIS AFFIDAVIT; THAT THE NOTICE, ORDER OR ADVERTISEMENT, A PRINTED COPY OF WHICH IS ATTACHED, WAS PUBLISHED IN SAID NEWSPAPER FOR 3 SUCCESSIVE ISSUES, BEARING THE FOLLOWING DATES:

NOVEMBER 29, 2017
DECEMBER 6, 2017
DECEMBER 13, 2017

THAT THE FULL AMOUNT OF THE FEE CHARGED FOR PUBLISHING THE SAME TO WIT, THE SUM OF $150.00, INURES SOLELY TO THE BENEFIT OF THE PUBLISHER OF SAID NEWSPAPER; THAT NO AGREEMENT OR UNDERSTANDING FOR THE DIVISION OF THE FEE HAS BEEN MADE WITH ANY PERSON, AND THAT NO PART OF THE FEE HAS BEEN AGREED TO BE PAID TO ANY OTHER PERSON.

SUBSCRIBED AND SWORN TO BEFORE ME THIS 13TH DAY OF DECEMBER A.D., 2017

Kim Ehler

NOTARY PUBLIC, COUNTY OF HUTCHINSON, SOUTH DAKOTA

SEAL
KIM EHLER
Notary Public
South Dakota

MY COMMISSION EXPIRES
JANUARY 12, 2022

PUBLIC INPUT ENCOURAGED!

Public comments are sought to define the scope and alternatives for an Environmental Assessment of a proposed wind energy facility located in Bon Homme, Charles Mix, and Hutchinson Counties between the towns of Avon, Tripp, and Wagner, South Dakota. The proposed project, to be called Prevailing Wind Park, would include up to 100 wind turbine generators, an underground power collection system, project substation, access roads, and a maintenance and operation center. The project would also include an overhead gen-tie line from the project substation to Western Area Power Administration's (WAPA) Utica Junction Substation within Bon Homme and Yankton Counties. Construction of the Prevailing Wind Park is proposed to begin as early as mid-2018.

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Comments should be postmarked no later than January 13, 2018.

tion carried.

The date of the next council

Affidavit of Publication

STATE OF SOUTH DAKOTA
COUNTY OF BON HOMME
CITY OF AVON
SCHOOL DISTRICT 4-1

Jackson S. Brodeen

Of said county and city, being duly sworn, on oath says that he is the PUBLISHER of the Avon Clarion, a weekly newspaper, printed in Armour, SD, published in Avon, said county of Bon Homme and his full and personal knowledge of all the facts herein stated; that said newspaper is by declamation the official city newspaper, the official newspaper of School District 4-1, is published 52 weeks a year, has been legally published for an excess of one year under second class permit, with an excess of 200 copies per week, and is distributed wholly or in part in the City of Avon. The above swears that the

Western Area Power Administration Notice

A printed copy of which, taken from the paper in which the same was printed and published, is attached to this sheet, and made part of this affidavit, was published in said newspaper at least once a week for 3 successive weeks on the day of each week on which said newspaper was published, towit:

Wednesday.....................Nov. 29, 2017
Wednesday.....................Dec. 6, 2017
Wednesday........................Dec. 13, 2017

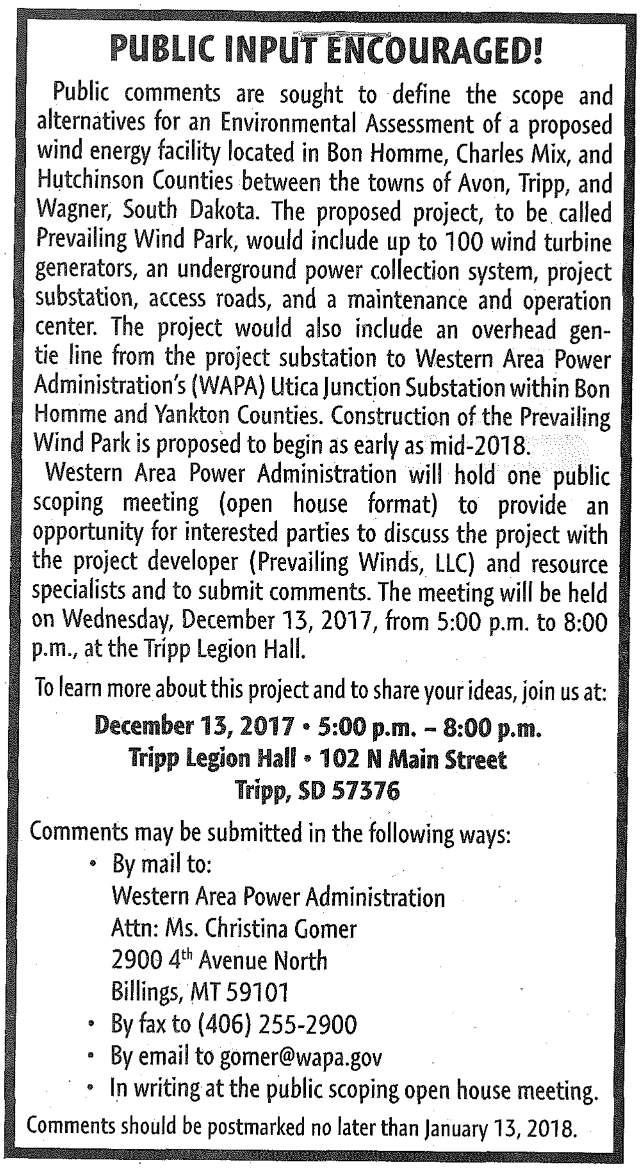
That the full amount of fee charged for publication of this notice, $198.00 insures to the benefit of the publisher of said newspaper, that no agreement or understanding for the division thereof has made with any person, and, that no part has been agreed to be paid to any person whatsoever.

Subscribed and sworn to before me

This 3rd day of Jan. 3, 2018

....
Notary Public, South Dakota

My commission expires 7-31-21



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APPENDIX R - AGENCY CORRESPONDENCE AND PUBLIC COMMENTS

Available upon request.