Appendix: F

Shadow Flicker & Sound Pressure Report

Final Report
Crowned Ridge Wind Farm
Sound and Shadow Flicker Study
Codington County, SD

June 21,

2018

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Report Update

EAPC bears no responsibility to update this report for any changes occurring subsequent to the final issuance of this report.

Revision History

Revision No.	Revision Purpose	Date	Revised By
0	Original	2/16/2018	J. Haley
1	Revised layout	5/31/2018	J. Haley
2	Revised layout, new turbine #'s	6/18/2018	J. Haley
3	Removed turbines outside of Codington County except those within 2 km of residences	6/20/2018	J. Haley

Executive Summary

EAPC was hired to provide estimates of the potential sound and shadow flicker impacts for a proposed wind turbine layout for the Codington County portion of the Crowned Ridge I and II wind farm projects in northeastern South Dakota. The scope of this report includes all proposed turbines from Codington County included in either the Crowned Ridge I or II projects that will be permitted separately through the South Dakota Public Utilities Commission. Locations of area occupied dwellings and associated land parcels and a wind turbine layout using a mixture of wind turbines manufactured by General Electric (GE) were provided to EAPC by Crowned Ridge Wind, LLC. A windPRO model was built combining digital elevation data with the information supplied by Crowned Ridge Wind, LLC to generate sound and shadow flicker models for the site. The resulting models were then used to perform sound and shadow flicker calculations for the area. Based on the calculations, site-wide realistic sound and shadow flicker maps were produced and an evaluation of the sound impacts at 97 non-participating land parcels and shadow flicker impacts at 204 occupied residences within Codington County was performed.

For the sound study, the 97 non-participating property boundaries of the land parcels that the dwellings are located on were modeled using an area-type sound sensor so that the highest sound pressure level at the property boundary could be calculated. Moderate ground attenuation was assumed.

For the shadow study, the 204 dwellings were represented in the model by omni-directional shadow receptors that simulate a 1 m x 1 m window at 1 m above ground level. Reductions based on turbine operational time, turbine operational direction, and sunshine probabilities were used to calculate a realistic number of hours of shadow flicker to be expected at each shadow receptor. No obstacles were used so that shadow flicker reductions due to interference from trees and structures were not included, meaning that the “realistic” estimates are still somewhat conservative.

In summary, the maximum sound pressure level at a non-participating property boundary is 49.9 dBA, therefore the project in Codington County as modeled, is in compliance with Codington County’s allowable sound pressure levels as described in Section 5.03, paragraph 12 of the Codington County Zoning Ordinance #65, as well as Section 5.22.03 paragraph 12 of the newly proposed Ordinance #68.

While there are currently no rules in South Dakota to limit the number of shadow flicker hours allowed, the proposed Ordinance #68 does limit the maximum number of shadow flicker to 30 hours per year at occupied dwellings. For the turbine array provided, no occupied dwellings experienced more than 28 hours and 48 minutes of shadow flickering per year based on realistic assumptions regarding operational time and sunshine probability, therefore, the Crowned Ridge wind farm is in compliance with the shadow flicker limitations set forth in Section 5.22.03 paragraph 13 of Ordinance #68.

1. INTRODUCTION

EAPC was hired to conduct sound and shadow flicker studies for the two Crowned Ridge wind farm projects located in Codington County in northeastern South Dakota near the town of Watertown. The layout consists of 13 GE 1.7 MW wind turbines with a hub height of 80 meters, 14 GE 2.1 MW wind turbines with a hub height of 80 meters, and 239 GE 2.3 MW wind turbines with a hub height of 90 meters. The locations of the proposed wind turbines were supplied by Crowned Ridge Wind, LLC. From the database of occupied residences and coordinates supplied by Crowned Ridge Wind, LLC, 204 occupied residences and 156 land parcels in Codington County were found to be within 2 km of a wind turbine and were included in the sound and shadow models. Of the 156 land parcels, 97 are non-participating.

The area of interest is located in Codington County near the town of Watertown in northeastern South Dakota. The surrounding terrain has a change in elevation across the Codington County portion of the project site ranging from 570 to 621 meters (1,870 to 2,037 feet). The region's vegetation is comprised primarily of agricultural land. Project overview maps can be found in Appendix B.

2. BACKGROUND - SOUND

To determine if the layout provided would be compliant with the Codington County regulations, detailed sound scenarios were analyzed using windPRO. The scenarios assumed that the wind turbines were operating at a wind speed that resulted in the loudest sound being emitted. According to the GE sound documentation provided to EAPC by Crowned Ridge Wind, LLC, the loudest normal operating sound pressure level emitted from the GE 1.7-103 is 107 dBA at 10 m/s and higher at 80 m above ground level (AGL). For the GE 2.1-116, the sound emission specifications for the 2.3-116 were used, which is a conservative assumption since the sound emission levels for the 2.1-116 will likely be lower than for the larger 2.3-116. For the 2.3-116, the loudest normal operating sound pressure level emitted is 107.5 at 10 m/s and higher at 90 m AGL. The specifications for the three GE wind turbine models used in this study are included in Table 1 below. The table of wind turbine coordinates and sound profiles for the subset of turbines within 2 km of occupied Codington County residences is included in Appendix A.

Table 1: Crowned Ridge wind turbine specifications.

Crowned Ridge Wind –Turbine Specifications							
Manufacturer	Model	Hub Height (m)	Rotor Dia. (m)	Cut-In Wind Speed (m/s)	Cut-Out Wind Speed (m/s)	Max. Sound Press. Level (dBA)	Max. Sound Press. Level LNTE (dBA)
General Electric	GE 1.7	80	103	3	23	107	105
General Electric	GE 2.1	80	116	3	22	107.5	106
General Electric	GE 2.3	90	116	3	22	107.5	106

A safety margin of 2 dBA was added to both GE 1.7-103 and GE 2.3-116 sound profiles for the study. For eight locations, GE 2.3-116 Low Noise Trailing Edge (LNTE) blades were used to reduce the sound pressure levels in order to achieve compliance with the County regulations.

The state of South Dakota does not have a regulatory sound limit for wind turbines. Codington County's current Ordinance #65 Zoning Ordinance Section 5.03.12 prescribes sound limits for wind turbine projects as follows:

> "12. Noise. Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity."

Therefore, Codington County's only applicable sound limit is 50 dBA to a non-participating property line, which is what has been evaluated in this report. In addition, EAPC is aware that at the time of release of this report that the Codington County Commissioners are considering adopting Ordinance #68 Section 5.03.12 and the following changes to the sound limit as follows:

> "12. Noise.
> a. Noise level generated by wind energy system shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference level effects at the property line of existing off-site non participating residences, businesses, and buildings owned and/or maintained by a governmental entity."

EAPC believes that if this language is adopted that it does not change the intention of the sound limit from being no greater than 50 dBA at a non-participating property line.

3. *STUDY METHODOLOGY - SOUND*

This sound analysis was performed utilizing windPRO[1], which has the ability to calculate detailed sound maps across an entire area of interest or at site-specific locations using sound sensitive receptors.

The analysis used the ISO 9613-2 "Attenuation of sound during propagation outdoors, Part 2" sound calculation model with "General" ground attenuation and an attenuation factor of 0.5, which represents typical mixed vegetation and crop cover. Realistic sound pressure levels were calculated at 1.5 m AGL at the property boundaries of the potential occupied residences. The term "realistic" in this case, means that some amount of ground attenuation is accounted for.

[1] windPRO is the world's leading software tool for designing wind farms, including sound and shadow flicker analysis.

The inputs for the windPRO sound calculation include the following:

- Turbine Coordinates
- Turbine Specifications
- Sound Receptor Coordinates
- Wind Turbine Sound Emission Data
- USGS Digital Elevation Model (DEM) (height contour data)

Turbine Coordinates: The location of a wind turbine in relation to a sound receptor is one of the most important factors in determining sound impacts. Sound pressure levels drop as they travel farther from the source of emission. The attenuation comes from atmospheric absorption as well as from absorption by the ground cover between the turbine and the receptor. The sound pressure waves can also be reflected by hard or smooth surfaces such as ice or water.

Turbine Specifications: Sound emission data including 1/3rd octave data supplied by the manufacture is used assuming the loudest sound pressure levels are being emitted at the hub height of the turbine.

Sound Receptor Coordinates: As with the wind turbine coordinates, the elevation, and distance of a sound receptor in relation to the wind turbines are the main factors in determining the sound impacts. EAPC was provided with coordinates for 204 structures and associated land parcels found to be located in the vicinity of the 266 proposed wind turbine locations.

USGS Digital Elevation Model (DEM) (height contour data): For this study, 3 m USGS National Elevation Database (NED) DEM's were used to construct 10-foot interval height contour lines for the windPRO sound model. The height contour information is important to the sound calculation since it allows the model to place the wind turbines and the sound receptors at the correct elevations.

4. RESULTS OF ANALYSIS - SOUND

The sound study indicates that no non-participating property boundaries will be above 50.0 dBA. Therefore the project would be in compliance with Codington County's allowable sound pressure levels as described in Section 5.03, paragraph 12 of the Codington County Zoning Ordinance #65, as well as Section 5.22.03 paragraph 12 of the newly proposed Ordinance #68. Table 2 shows the distribution of sound pressure levels for the project. The full table of results from the realistic case sound study can be found in Appendix C and the maps showing the sound iso-lines are in Appendix D.

Table 2: Property boundary realistic sound distribution

Realistic Sound (dBA)	Non-Participating Property Boundary
0 to 25	0
25 to 30	0
30 to 35	11
35 to 40	30
40 to 45	21
45 to 50	35
50+	0

5. *BACKGROUND - SHADOW FLICKER*

Shadow flicker from wind turbines occurs when rotating wind turbine blades move between the sun and the observer. Shadow flicker is generally experienced in areas near wind turbines where the distance between the observer and wind turbine blade is short enough that sunlight has not been significantly diffused by the atmosphere. When the blades rotate, this shadow creates a pulsating effect, known as shadow flicker. If the blade's shadow is passing over the window of a building, it will have the effect of increasing and decreasing the light intensity in the room at a low frequency in the range of 0.5 to 1.2 Hz, hence the term "flicker." In this case, with a maximum rotational speed of 17.5 rpm for the GE 1.7-103, the frequency would be 0.875 Hz. This flickering effect can also be experienced outdoors, but the effect is typically less intense, and becomes less intense when farther from the wind turbine causing the flicker.

Although Codington County Ordinance #65 does not have any limits on shadow flicker, EAPC is aware that at the time of release of this report that the Codington County Commissioners are considering adopting Ordinance #68 Section 5.03.13 for shadow flicker as follows:

"13. Flicker Analysis. A Flicker Analysis shall include the duration and location of flicker potential for all schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within a project. The applicant shall provide a site map identifying the locations of shadow flicker that may be caused by the project and the expected durations of the flicker at these locations from sun-rise to sun-set over the course of a year. The analysis shall account for topography but not for obstacles such as

accessory structures and trees. Flicker at any receptor shall not exceed thirty (30) hours per year within the analysis area.

a. Exception: The Board of Adjustment may allow for a greater amount of flicker than identified above if the participating or non-participating landowners agree to said amount of flicker. If approved, such agreement is to be recorded and filed with the Codington County Zoning Officer. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land."

The proposed Ordinance #68 language for shadow flicker is consistent with shadow flicker limits found in other county ordinances in South Dakota and adjacent states. Although Ordinance #68 is not yet in effect, EAPC is voluntarily comparing results in this report to no more than 30 hours of realistic shadow flicker per year.

This flickering effect is most noticeable within approximately 1,000 meters of the turbine, and becomes more and more diffused as the distance increases. There are no uniform standards defining what distance from the turbine is regarded as an acceptable limit beyond which the shadow flicker is considered to be insignificant. The same applies to the number of hours of flickering that is deemed to be acceptable.

Shadow flicker is typically greatest in the winter months when the angle of the sun is lower and casts longer shadows. The effect is also more pronounced around sunrise and sunset when the sun is near the horizon and the shadows are longer. A number of factors influence the amount of shadow flicker on the shadow receptors.

One consideration is the environment around the shadow receptor. Obstacles such as terrain, trees or buildings between the wind turbine and the receptor can significantly reduce or eliminate shadow flicker effects. Deciduous trees may block the shadow flickering effect to some degree, depending on the tree density, species present and time of year. Deciduous trees can lead to a reduction of shadow flicker during the summer when the trees are bearing leaves. However, during the winter months, these trees are without their leaves and their impact on shadow flicker is not as significant. Coniferous trees tend to provide mitigation from shadow flicker year round. For this study, no credit was taken for any potential shading effects from any type of trees or other obstacles that would reduce the number of shadow flickering hours at the structures.

Another consideration is the time of day when shadow flicker occurs. For example, it may be more acceptable for private homes to experience the shadow flickering during daytime hours when family members may be at work or school. Likewise, a commercial property would not be significantly affected if all the shadow flicker impact occurred before or after business hours.

The climate also needs be considered when assessing shadow flicker. In areas with a significant amount of overcast weather, there would be less shadow flicker, as there are

no shadows if the sun is blocked by clouds. Also, if the wind is not blowing, the turbines would not be operational and therefore not creating shadow flickering.

6. *STUDY METHODOLOGY - SHADOW FLICKER*

This shadow flicker analysis was performed utilizing windPRO, which has the ability to calculate detailed shadow flicker maps across an entire area of interest or at site-specific locations using shadow receptors.

Shadow maps which indicate where the shadows will be cast and for how long, are generated using windPRO, calculating the shadow flicker in varying user-defined resolutions. Standard resolution was used for this study and represents shadow flicker being calculated every three minutes of every day over the period of an entire year over a grid with a 20 m by 20 m resolution.

In addition to generating a shadow flicker map, the amount of shadow flicker that may occur at a specific point can be calculated more precisely by placing a shadow receptor at the location of interest and essentially "recording" the shadow flicker that occurs as the relative sunrise to sunset motion of the sun is simulated throughout an entire year.

The point-specific shadow flicker calculation is run at a higher resolution as compared to the shadow flicker map calculation to utilize the highest precision possible within windPRO. Shadow flicker at each shadow receptor location is calculated every minute of every day for an entire year. Shadow receptors can be configured to represent an omni-directional window of a specific size at a specific point (greenhouse mode) or a window facing a single direction of a specific size at a specific point (single direction mode). The shadow receptors used in this analysis were configured as greenhouse-mode receptors representing a 1 m x 1 m window located 1 m above ground level. This represents more of a "worst-case" scenario and thus will produce more conservative results since it assumes that all windows are always in direct line of sight with the turbines and the sun.

As a part of the calculation method, windPRO must determine whether or not a turbine will be visible at the receptor locations and not blocked by local topography or obstacles. It does this by performing a preliminary Zones of Visual Influence (ZVI) calculation, utilizing 10 m grid spacing. If a particular turbine is not visible within the 10 m x 10 m area that the shadow receptor is contained within, then that turbine is not included in the shadow flicker calculation for that receptor.

The inputs for the windPRO shadow flicker calculation include the following:

- Turbine Coordinates
- Turbine Specifications
- Shadow Receptor Coordinates
- Monthly Sunshine Probabilities

- Joint Wind Speed and Direction Frequency Distribution
- USGS Digital Elevation Model (DEM) (height contour data)

A description of each input variable and how they affect the shadow flicker calculation are included below.

Turbine Coordinates: The location of a wind turbine in relation to a shadow receptor is one of the most important factors in determining shadow flicker impacts. A line-of-site is required for shadow flicker to occur. The intensity of the shadow flicker is dependent upon the distance from the wind turbine and weather conditions.

Turbine Specifications: A wind turbine's total height and rotor diameter will be included in the windPRO shadow flicker model. The taller the wind turbine, the more likely shadow flicker could have an impact on local shadow receptors as the ability to clear obstacles (such as hills or trees) is greater, although in this analysis, no credit is taken for any such blockage from trees. The larger the rotor diameter is, the wider the area where shadows will be cast. Also included with the turbine specifications are the cut-in and cut-out wind speeds within which the wind turbine is operational. If the wind speed is below the cut-in threshold or above the cut-out threshold, the turbine rotor will not be spinning and thus shadow flicker will not occur.

Shadow Receptor Coordinates: As with the wind turbine coordinates, the elevation, distance and orientation of a shadow receptor in relation to the wind turbines and the sun are the main factors in determining the impact of shadow flicker. EAPC was provided with coordinates for 204 structures found to be located in the vicinity of the 235 proposed wind turbine locations.

Monthly Sunshine Probabilities: windPRO calculates sunrise and sunset times to determine the total annual hours of daylight for the modeled area. To further refine the shadow flicker calculations, the monthly probability of sunshine is included to account for cloud cover. The greater the probability of cloud cover, the less of an impact from shadow flicker. The monthly sunshine probabilities for many of the larger cities across the United States are available from the National Climatic Data Center (NCDC). For this study, 18 years' worth of monthly sunshine probability data were retrieved for Huron, SD, which was the closest, most representative station, to create the long-term representative monthly sunshine probabilities. The long-term representative monthly average sunshine probabilities are presented below in Table 3.

Table 3: Huron, SD monthly sunshine probabilities.

Huron, SD Monthly Sunshine Probabilities (1965-1983)												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunshine %	0.62	0.62	0.62	0.59	0.66	0.69	0.76	0.74	0.69	0.59	0.51	0.51
retrieved from: http:// http://www1.ncdc.noaa.gov/pub/data/ccd-data/pctpos15.dat												

Joint Wind Speed and Direction Frequency Distribution: A set of long-term corrected wind distributions was provided by Crowned Ridge Wind, LLC to represent the annual wind speed and direction distribution for the project site. This data was used to estimate the probable number of operational hours for the wind turbines from each of the 12 wind direction sectors. During operation, the wind turbine rotors will always be assumed to face into the wind and automatically orient themselves as the wind direction changes. Shadow flicker can only occur when the blades are turning and the wind turbine rotor is between the sun and the receptor. Shadow flicker is most significant when the rotor is facing the sun.

USGS Digital Elevation Model (DEM) (height contour data): For this study, 3 m USGS National Elevation Database (NED) DEM's were used to construct 10-foot interval height contour lines for the windPRO shadow flicker model. The height contour information is important to the shadow flicker calculation since it allows the model to place the wind turbines and the shadow receptors at the correct elevations. The height contour lines also allow the model to include the topography of the site when calculating the zones of visual influence surrounding the wind turbine and shadow receptor locations.

The actual calculation of potential shadow flicker at a given shadow receptor is carried out by simulating the environment near the wind turbines and the shadow receptors. The position of the sun relative to the turbine rotor disk and the resulting shadow is calculated in time steps of one minute throughout an entire year. If the shadow of the rotor disk (which in the calculation is assumed solid) at any time casts a shadow on a receptor window, then this step will be registered as one minute of shadow flicker. The calculation also requires that the sun must be at least 3.0° above the horizon in order to register shadow flicker. When the sun angle is less than 3.0°, the shadow quickly becomes too diffuse to be distinguishable since the amount of atmosphere that the light must pass through is 15 times greater than when the sun is directly overhead.

The sun's path with respect to each wind turbine location is calculated by the software to determine the paths of cast shadows for every minute of every day over a full year. The turbine runtime and direction are calculated from the site's long-term wind speed and direction distribution. Finally, the effects of cloud cover are calculated using long-term reference data (monthly sunshine probability) to arrive at the projected annual flicker time at each receptor.

7. *RESULTS OF ANALYSIS - SHADOW FLICKER*

The term "realistic" as used in this report means that turbine operational hours and direction as well as local sunshine probabilities have been factored in, but no blocking or shading effects due to trees or structures have been accounted for. This means that the realistic estimates are still inherently conservative values. Also, the realistic shadow flicker hours predicted by windPRO assumes an availability factor of 100% which is very unlikely to be the case. Actual availability factors will likely be in the range of 95-98%, however,

with a conservative approach to estimating shadow flicker totals, the realistic estimates are not discounted accordingly.

A total of 204 occupied residences within 2 km of a wind turbine were analyzed and standard resolution realistic shadow flicker maps and individual maps were generated for the turbine array.

The 204 shadow receptors were then modeled as greenhouse-mode receptors and the estimated shadow flicker was calculated for the array. No shadow receptors are expected to experience more than 28 hours and 48 minutes of shadow flicker per year. Therefore, the Crowned Ridge wind farm would be in compliance with Section 5.22.03 paragraph 13 of the newly proposed Ordinance #68. Of the 204 receptors, the number that registered no shadow flicker hours was 69 (34%). Table 4 contains the realistic shadow flicker distribution of the 204 occupied residences. The full table of results from the realistic shadow flicker study can be found in Appendix E and the maps showing the shadow flicker iso-lines are in Appendix F.

Table 4: Occupied residences realistic shadow flicker distribution

Realistic Shadow Flicker (hrs/year)	Number of Occupied Residences
0	69
0 to 5	45
5 to 10	32
10 to 15	23
15 to 20	11
20 to 25	13
25 to 30	11
30+	0

8. CONCLUSIONS

The conservative results of this study indicate that, of the 97 non-participating property boundaries modeled, none measured more than 50 dBA, therefore the Crowned Ridge wind farm would be in compliance with both Codington County Ordinance #65 and #68.

The sound study assumes that all GE 2.1-116 turbines have the same sound profile as the GE 2.3-116, which is a conservative assumption since the sound emission levels of the GE 2.1-116 would be lower than for the larger GE 2.3-116. In eight cases, the GE 2.3-116 sound profile was changed to the LNTE version, which emits lower sound pressure levels than the standard blade. In all cases, an additional 2 dBA was added to the sound pressure emission levels to provide for more conservative results.

The shadow flicker impact on the receptors was calculated with reductions due to turbine operational direction and sunshine probabilities included. No occupied residences are expected to experience more than 28 hours and 48 minutes of shadow flicker per year, therefore the Crowned Ridge wind farm would be in compliance with the proposed Codington County Ordinance #68.

This shadow flicker analysis is based on a number of conservative assumptions including:

- No credit was taken for the blocking effects of trees or buildings.
- The receptors were omni-directional rather than modeling specific facades of buildings.
- Study assumes 100% turbine availability
- Study assumes all turbine locations are built and operating

The overall effect of using these conservative assumptions indicate that realistically, the number of hours of shadow flicker that would be observed will be less than those predicted by this study.

APPENDIX A: WIND TURBINE COORDINATES

Crowned Ridge Codington County
GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH
UTM NAD83 Zone 14

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CR- 10	GE2.3 116RD 90HH r2.madE	660,420	4,999,836	613.6	Normal Operation
CR- 11	GE2.3 116RD 90HH r2.madE	658,170	4,999,546	611	Normal Operation
CR- 13	GE2.3 116RD 90HH r2.madE	658,622	4,998,843	613.3	Normal Operation
CR- 14	GE2.3 116RD 90HH r2.madE	657,949	4,997,949	618.6	Normal Operation
CR- 15	GE2.3 116RD 90HH r2.madE	658,632	4,997,899	619.1	Normal Operation
CR- 16	GE2.3 116RD 90HH r2.madE	657,203	4,997,856	611.9	Normal Operation
CR- 17	GE2.3 116RD 90HH r2.madE	657,476	4,997,410	611.2	Normal Operation
CR- 18	GE2.3 116RD 90HH r2.madE	658,217	4,997,154	618	Normal Operation
CR- 19	GE2.3 116RD 90HH r2.madE	654,954	4,995,804	601.1	Normal Operation
CR- 20	GE2.3 116RD 90HH r2.madE	659,920	4,994,916	594	Normal Operation
CR- 21	GE2.3 116RD 90HH r2.madE	657,925	4,994,896	617.1	LNTE
CR- 22	GE2.3 116RD 90HH r2.madE	656,543	4,994,796	616.5	Normal Operation
CR- 23	GE2.3 116RD 90HH r2.madE	655,208	4,994,717	594.5	Normal Operation
CR- 24	GE2.3 116RD 90HH r2.madE	655,852	4,994,652	609	Normal Operation
CR- 25	GE2.3 116RD 90HH r2.madE	658,251	4,994,286	606	Normal Operation
CR- 26	GE2.3 116RD 90HH r2.madE	665,405	4,994,191	578.4	Normal Operation
CR- 27	GE2.3 116RD 90HH r2.madE	657,442	4,994,187	621	Normal Operation
CR- 28	GE2.3 116RD 90HH r2.madE	664,517	4,994,168	579	Normal Operation
CR- 29	GE2.3 116RD 90HH r2.madE	655,940	4,994,069	607	Normal Operation
CR- 3	GE2.3 116RD 90HH r2.madE	661,008	5,002,288	584.2	Normal Operation
CR- 30	GE2.3 116RD 90HH r2.madE	659,845	4,994,054	591.6	Normal Operation
CR- 31	GE2.3 116RD 90HH r2.madE	655,030	4,994,051	603	Normal Operation
CR- 32	GE2.3 116RD 90HH r2.madE	660,704	4,993,998	606	Normal Operation
CR- 33	GE2.3 116RD 90HH r2.madE	656,566	4,993,941	618	Normal Operation
CR- 34	GE2.3 116RD 90HH r2.madE	658,966	4,993,856	599.6	Normal Operation
CR- 35	GE2.3 116RD 90HH r2.madE	657,602	4,993,347	607.4	Normal Operation
CR- 36	GE2.3 116RD 90HH r2.madE	659,966	4,993,319	594	Normal Operation
CR- 37	GE2.3 116RD 90HH r2.madE	664,484	4,993,110	585	Normal Operation
CR- 38	GE2.3 116RD 90HH r2.madE	658,338	4,992,981	600.5	Normal Operation
CR- 39	GE2.3 116RD 90HH r2.madE	656,507	4,992,958	609	Normal Operation
CR- 4	GE2.3 116RD 90HH r2.madE	660,173	5,002,120	602.5	Normal Operation
CR- 40	GE2.3 116RD 90HH r2.madE	655,831	4,992,939	602.1	Normal Operation
CR- 41	GE2.3 116RD 90HH r2.madE	663,701	4,992,842	600	Normal Operation
CR- 42	GE2.3 116RD 90HH r2.madE	659,646	4,992,833	586.8	Normal Operation
CR- 43	GE2.3 116RD 90HH r2.madE	666,181	4,992,815	577.8	Normal Operation
CR- 44	GE2.3 116RD 90HH r2.madE	665,399	4,992,589	577.1	Normal Operation
CR- 45	GE2.3 116RD 90HH r2.madE	657,553	4,992,576	599.8	Normal Operation
CR- 46	GE2.3 116RD 90HH r2.madE	664,440	4,992,432	589.9	Normal Operation
CR- 47	GE2.3 116RD 90HH r2.madE	659,131	4,991,788	579	Normal Operation
CR- 48	GE2.3 116RD 90HH r2.madE	663,829	4,991,786	586.4	Normal Operation
CR- 49	GE2.3 116RD 90HH r2.madE	664,461	4,991,785	579	Normal Operation

Crowned Ridge Codington County
GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CR- 50	GE2.3 116RD 90HH r2.madE	662,999	4,991,622	612	Normal Operation
CR- 51	GE2.3 116RD 90HH r2.madE	666,337	4,991,578	573.9	Normal Operation
CR- 52	GE2.3 116RD 90HH r2.madE	665,335	4,991,491	576.1	Normal Operation
CR- 53	GE1.7 103RD 80HH r4 1.715 Max	659,750	4,990,981	598.7	Normal Operation
CR- 54	GE2.3 116RD 90HH r2.madE	665,979	4,990,946	573.7	Normal Operation
CR- 55	GE1.7 103RD 80HH r4 1.715 Max	659,045	4,990,899	597	Normal Operation
CR- 56	GE2.3 116RD 90HH r2.madE	664,548	4,990,794	591.9	Normal Operation
CR- 57	GE2.3 116RD 90HH r2.madE	663,874	4,990,787	600.3	Normal Operation
CR- 58	GE2.3 116RD 90HH r2.madE	665,663	4,990,303	585	Normal Operation
CR- 59	GE2.3 116RD 90HH r2.madE	666,523	4,990,291	573	Normal Operation
CR- 6	GE2.3 116RD 90HH r2.madE	660,193	5,001,329	610	Normal Operation
CR- 60	GE2.3 116RD 90HH r2.madE	659,155	4,990,208	593.9	Normal Operation
CR- 61	GE2.3 116RD 90HH r2.madE	662,982	4,990,178	612	Normal Operation
CR- 62	GE2.3 116RD 90HH r2.madE	660,954	4,990,155	600.9	Normal Operation
CR- 63	GE2.3 116RD 90HH r2.madE	664,627	4,989,977	588.7	Normal Operation
CR- 64	GE2.3 116RD 90HH r2.madE	663,935	4,989,962	606	Normal Operation
CR- 65	GE2.3 116RD 90HH r2.madE	661,723	4,989,887	609	Normal Operation
CR- 66	GE2.3 116RD 90HH r2.madE	663,165	4,989,613	614.8	Normal Operation
CR- 67	GE2.3 116RD 90HH r2.madE	666,226	4,989,531	574.7	Normal Operation
CR- 68	GE2.3 116RD 90HH r2.madE	665,420	4,989,461	585	Normal Operation
CR- 69	GE1.7 103RD 80HH r4 1.715 Max	660,621	4,989,453	606	Normal Operation
CR- 7	GE2.3 116RD 90HH r2.madE	659,753	5,001,074	618	Normal Operation
CR- 70	GE2.3 116RD 90HH r2.madE	662,158	4,989,355	609	Normal Operation
CR- 71	GE2.3 116RD 90HH r2.madE	659,405	4,989,320	607.3	Normal Operation
CR- 72	GE1.7 103RD 80HH r4 1.715 Max	660,087	4,989,309	606	Normal Operation
CR- 73	GE1.7 103RD 80HH r4 1.715 Max	661,344	4,989,297	610	Normal Operation
CR- 74	GE2.3 116RD 90HH r2.madE	663,041	4,988,744	615	Normal Operation
CR- 75	GE2.3 116RD 90HH r2.madE	664,196	4,988,736	607.6	LNTE
CR- 76	GE2.3 116RD 90HH r2.madE	662,381	4,988,644	615	Normal Operation
CR- 77	GE2.3 116RD 90HH r2.madE	659,158	4,988,642	612	Normal Operation
CR- 78	GE1.7 103RD 80HH r4 1.715 Max	660,859	4,988,550	604	Normal Operation
CR- 79	GE2.3 116RD 90HH r2.madE	656,126	4,988,486	594.9	Normal Operation
CR- 8	GE2.3 116RD 90HH r2.madE	661,380	5,000,282	588.3	Normal Operation
CR- 80	GE1.7 103RD 80HH r4 1.715 Max	661,552	4,988,481	608.8	Normal Operation
CR- 81	GE1.7 103RD 80HH r4 1.715 Max	659,825	4,988,365	606.5	Normal Operation
CR- 82	GE2.3 116RD 90HH r2.madE	663,271	4,988,133	613	Normal Operation
CR- 83	GE2.3 116RD 90HH r2.madE	662,238	4,988,037	606	Normal Operation
CR- 84	GE2.3 116RD 90HH r2.madE	660,677	4,987,880	600.7	Normal Operation
CR- 85	GE1.7 103RD 80HH r4 1.715 Max	659,295	4,987,798	612	Normal Operation
CR- 86	GE2.3 116RD 90HH r2.madE	658,534	4,987,759	613.4	Normal Operation
CR- 87	GE1.7 103RD 80HH r4 1.715 Max	661,830	4,987,596	609	Normal Operation

Crowned Ridge Codington County
GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CR- 88	GE1.7 103RD 80HH r4 1.715 Max	660,157	4,987,492	603	Normal Operation
CR- 89	GE2.3 116RD 90HH r2.madE	657,758	4,986,926	614.9	Normal Operation
CR- 90	GE2.3 116RD 90HH r2.madE	658,545	4,986,881	612	Normal Operation
CR- 91	GE2.3 116RD 90HH r2.madE	657,023	4,986,868	612	Normal Operation
CR- 92	GE1.7 103RD 80HH r4 1.715 Max	660,049	4,986,704	606.9	Normal Operation
CR- 93	GE2.3 116RD 90HH r2.madE	659,133	4,986,700	607.8	Normal Operation
CR- 94	GE1.7 103RD 80HH r4 1.715 Max	660,716	4,986,660	600.7	Normal Operation
CR- 95	GE2.3 116RD 90HH r2.madE	657,488	4,986,184	612	Normal Operation
CR- 96	GE2.3 116RD 90HH r2.madE	656,744	4,986,037	609	Normal Operation
CR- 98	GE2.3 116RD 90HH r2.madE	657,015	4,985,192	609	Normal Operation
CR-Alt19	GE2.3 116RD 90HH r2.madE	663,816	4,986,314	613.1	Normal Operation
CR-Alt20	GE2.3 116RD 90HH r2.madE	664,124	4,986,705	611.8	Normal Operation
CR-Alt21	GE2.3 116RD 90HH r2.madE	663,042	4,986,482	612	Normal Operation
CR-Alt22	GE2.3 116RD 90HH r2.madE	662,551	4,986,877	614.3	Normal Operation
CRII- 104	GE2.3 116RD 90HH r2.madE	662,560	4,981,078	588	LNTE
CRII- 105	GE2.3 116RD 90HH r2.madE	663,201	4,981,245	594	Normal Operation
CRII- 106	GE2.3 116RD 90HH r2.madE	661,170	4,981,296	585.7	Normal Operation
CRII- 111	GE2.3 116RD 90HH r2.madE	661,513	4,981,963	591	Normal Operation
CRII- 112	GE2.3 116RD 90HH r2.madE	664,889	4,982,000	612.7	Normal Operation
CRII- 113	GE2.3 116RD 90HH r2.madE	665,926	4,982,352	610.7	Normal Operation
CRII- 114	GE2.3 116RD 90HH r2.madE	665,029	4,982,755	613.6	Normal Operation
CRII- 115	GE2.1 116RD 80HH rev2.mad	667,423	4,982,834	585.9	Normal Operation
CRII- 116	GE2.3 116RD 90HH r2.madE	664,098	4,982,988	603	Normal Operation
CRII- 117	GE2.3 116RD 90HH r2.madE	666,339	4,983,199	600	Normal Operation
CRII- 118	GE2.3 116RD 90HH r2.madE	665,536	4,983,411	607.9	Normal Operation
CRII- 119	GE2.3 116RD 90HH r2.madE	664,901	4,983,463	603.4	Normal Operation
CRII- 120	GE2.3 116RD 90HH r2.madE	662,307	4,983,683	592.6	Normal Operation
CRII- 121	GE2.3 116RD 90HH r2.madE	666,651	4,983,822	588.8	Normal Operation
CRII- 122	GE2.3 116RD 90HH r2.madE	662,977	4,983,870	603.9	Normal Operation
CRII- 123	GE2.3 116RD 90HH r2.madE	663,421	4,984,335	606	Normal Operation
CRII- 124	GE2.3 116RD 90HH r2.madE	664,181	4,984,488	606	Normal Operation
CRII- 125	GE2.3 116RD 90HH r2.madE	664,784	4,984,583	604.3	Normal Operation
CRII- 126	GE2.3 116RD 90HH r2.madE	664,219	4,985,199	607.3	Normal Operation
CRII- 127	GE2.3 116RD 90HH r2.madE	665,748	4,985,299	600.2	Normal Operation
CRII- 128	GE2.3 116RD 90HH r2.madE	667,329	4,985,347	582	Normal Operation
CRII- 129	GE2.3 116RD 90HH r2.madE	664,879	4,985,433	609	Normal Operation
CRII- 13	GE2.3 116RD 90HH r2.madE	661,844	4,965,186	585	Normal Operation
CRII- 130	GE2.3 116RD 90HH r2.madE	665,620	4,986,146	599.5	Normal Operation
CRII- 131	GE2.3 116RD 90HH r2.madE	665,556	4,986,863	596.1	Normal Operation
CRII- 132	GE2.3 116RD 90HH r2.madE	664,656	4,987,150	608	Normal Operation
CRII- 19	GE2.3 116RD 90HH r2.madE	661,200	4,965,795	588	Normal Operation

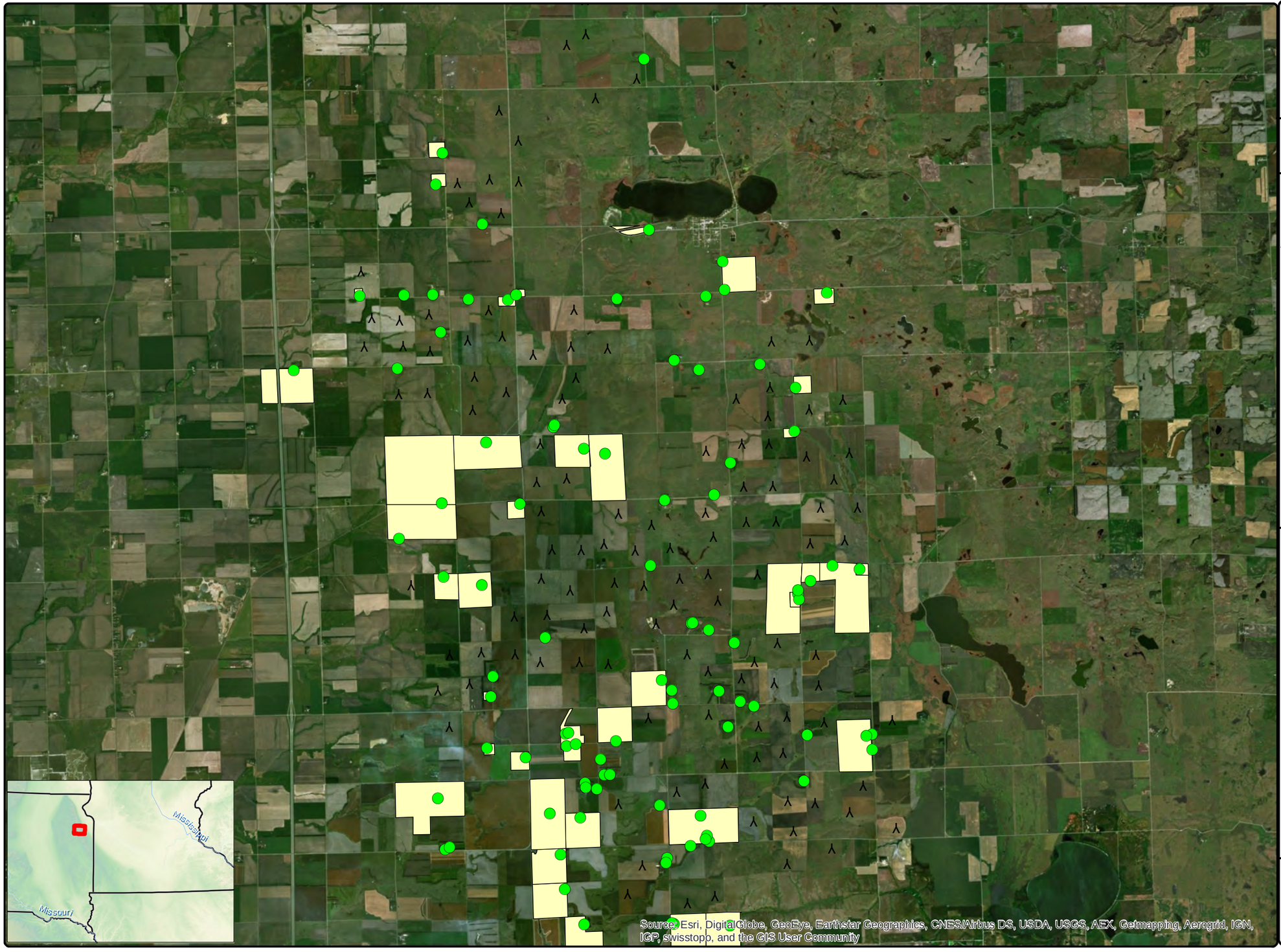
Crowned Ridge Codington County
GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRII- 22	GE2.3 116RD 90HH r2.madE	662,014	4,966,215	588	Normal Operation
CRII- 23	GE2.3 116RD 90HH r2.madE	662,811	4,966,264	589.9	Normal Operation
CRII- 25	GE2.3 116RD 90HH r2.madE	661,425	4,966,745	588	Normal Operation
CRII- 26	GE2.3 116RD 90HH r2.madE	660,209	4,966,765	576.5	Normal Operation
CRII- 27	GE2.3 116RD 90HH r2.madE	667,732	4,966,874	579	Normal Operation
CRII- 28	GE2.3 116RD 90HH r2.madE	664,584	4,966,932	578	LNTE
CRII- 34	GE2.3 116RD 90HH r2.madE	667,733	4,967,677	579.2	Normal Operation
CRII- 39	GE2.3 116RD 90HH r2.madE	664,482	4,968,373	585	Normal Operation
CRII- 40	GE2.3 116RD 90HH r2.madE	663,447	4,968,418	592.8	Normal Operation
CRII- 41	GE2.3 116RD 90HH r2.madE	665,827	4,968,475	585.6	Normal Operation
CRII- 42	GE2.3 116RD 90HH r2.madE	668,455	4,968,482	595.5	Normal Operation
CRII- 43	GE2.3 116RD 90HH r2.madE	667,376	4,968,511	586.5	Normal Operation
CRII- 49	GE2.3 116RD 90HH r2.madE	662,578	4,969,084	592.6	LNTE
CRII- 51	GE2.3 116RD 90HH r2.madE	666,174	4,969,250	597	Normal Operation
CRII- 52	GE2.3 116RD 90HH r2.madE	667,344	4,969,319	598.6	Normal Operation
CRII- 55	GE2.3 116RD 90HH r2.madE	666,908	4,970,184	609	Normal Operation
CRII- 56	GE2.3 116RD 90HH r2.madE	666,135	4,970,237	593.4	Normal Operation
CRII- 59	GE2.3 116RD 90HH r2.madE	668,248	4,973,458	612.4	Normal Operation
CRII- 61	GE2.3 116RD 90HH r2.madE	667,589	4,973,910	615	Normal Operation
CRII- 63	GE2.3 116RD 90HH r2.madE	668,350	4,974,115	615.8	Normal Operation
CRII- 64	GE2.3 116RD 90HH r2.madE	666,982	4,974,334	615	LNTE
CRII- 65	GE2.3 116RD 90HH r2.madE	661,369	4,974,608	600	Normal Operation
CRII- 66	GE2.3 116RD 90HH r2.madE	667,711	4,974,761	613.3	Normal Operation
CRII- 67	GE2.3 116RD 90HH r2.madE	662,077	4,974,986	604.2	LNTE
CRII- 69	GE2.3 116RD 90HH r2.madE	666,524	4,975,244	614.7	Normal Operation
CRII- 71	GE2.3 116RD 90HH r2.madE	659,668	4,975,487	579.5	Normal Operation
CRII- 72	GE2.3 116RD 90HH r2.madE	660,366	4,975,523	590.6	Normal Operation
CRII- 75	GE2.3 116RD 90HH r2.madE	665,849	4,975,895	608.1	Normal Operation
CRII- 76	GE2.3 116RD 90HH r2.madE	663,309	4,976,260	597	Normal Operation
CRII- 77	GE2.3 116RD 90HH r2.madE	660,874	4,976,403	594	Normal Operation
CRII- 79	GE2.3 116RD 90HH r2.madE	659,556	4,976,577	576.5	Normal Operation
CRII- 81	GE2.3 116RD 90HH r2.madE	666,482	4,976,896	615	LNTE
CRII- 82	GE2.3 116RD 90HH r2.madE	664,868	4,977,195	606	Normal Operation
CRII- 83	GE2.3 116RD 90HH r2.madE	659,267	4,977,221	570	Normal Operation
CRII- 84	GE2.3 116RD 90HH r2.madE	661,202	4,977,297	585.1	Normal Operation
CRII- 86	GE2.1 116RD 80HH rev2.mad	668,086	4,977,549	606	Normal Operation
CRII- 88	GE2.3 116RD 90HH r2.madE	666,516	4,978,167	609	Normal Operation
CRII- 89	GE2.3 116RD 90HH r2.madE	667,592	4,978,215	611.1	Normal Operation
CRII- 91	GE2.1 116RD 80HH rev2.mad	668,348	4,978,315	600	Normal Operation
CRII- 92	GE2.3 116RD 90HH r2.madE	664,354	4,978,724	594.7	Normal Operation
CRII- 93	GE2.3 116RD 90HH r2.madE	665,975	4,978,841	610.5	Normal Operation

Crowned Ridge Codington County
GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRII- 95	GE2.3 116RD 90HH r2.madE	666,647	4,979,039	615	Normal Operation
CRII- 96	GE2.3 116RD 90HH r2.madE	665,082	4,979,106	604.5	Normal Operation
CRII- 99	GE2.3 116RD 90HH r2.madE	665,723	4,979,545	607.2	Normal Operation
CRII-Alt3	GE2.3 116RD 90HH r2.madE	663,055	4,985,480	610.2	Normal Operation
CRII-Alt4	GE2.3 116RD 90HH r2.madE	661,648	4,985,388	596	Normal Operation
CRII-Alt5	GE2.3 116RD 90HH r2.madE	660,955	4,983,386	588.5	Normal Operation
CRII-Alt6	GE2.3 116RD 90HH r2.madE	664,584	4,986,211	606.6	Normal Operation

APPENDIX B: CROWNED RIDGE WIND ENERGY PROJECT SITE OVERVIEW MAPS



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

0 0.5 1 2 Mile

EAPC WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm
Overview Map
North Half

Client

SWCA Environmental Consultants

Project Description

Crowned Ridge wind turbine layout with Codington County occupied residences and non-participating land parcels and wind turbines within 2 km.

Location: Watertown, SD

Project #: 20174430

Issue Dates

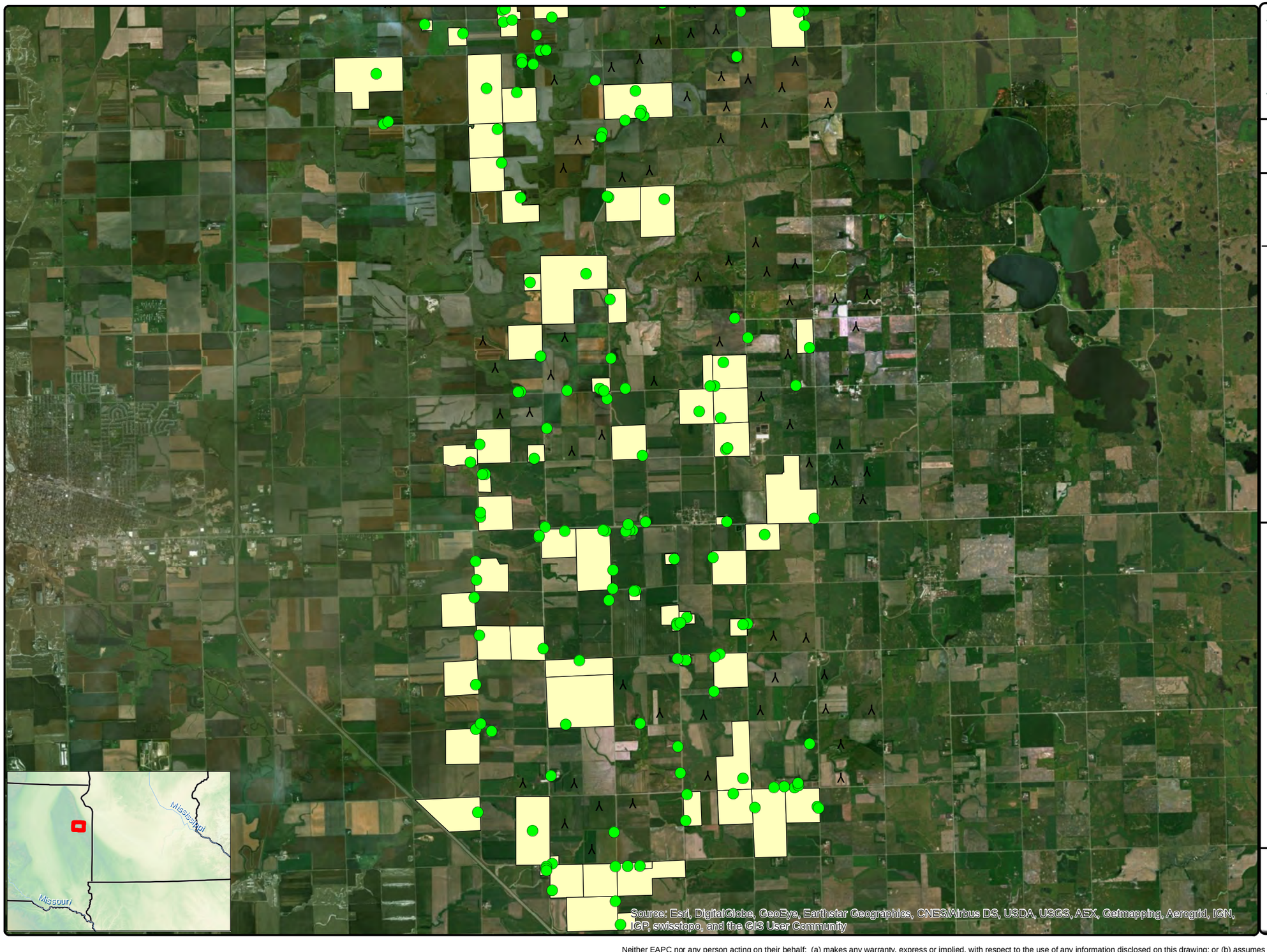
#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

Legend

- Crowned Ridge Wind Turbines
- Codington Occupied Residences
- Non-Participating Parcels

N W E S



0 0.5 1 2 Mile

EAPC WIND ENERGY

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Crowned Ridge Wind Farm
Overview Map
South Half

Client

SWCA Environmental Consultants

Project Description

Crowned Ridge wind turbine layout with Codington County occupied residences and non-participating land parcels and wind turbines within 2 km.

Location: Watertown, SD

Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

Legend

- Crowned Ridge Wind Turbines
- Codington Occupied Residences
- Non-Participating Parcels

N W E S

APPENDIX C: TABLE OF SOUND RESULTS

Crowned Ridge Codington County
Realistic case sound results at non-participating property boundaries
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14

Noise Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Receptor Type	Distance to Nearest Turbine (ft)
CR1-C1-NP	657,361	4,983,922	590	37.6	Boundary	4,209
CR1-C2-NP	658,435	4,984,609	602	38.7	Boundary	5,036
CR1-C3-NP	657,819	4,984,538	603	40.9	Boundary	2,936
CR1-C4-NP	659,890	4,985,620	605	41.7	Boundary	3,596
CR1-C7-NP	661,273	4,985,037	591	46.8	Boundary	1,253
CR1-C14-NP	657,803	4,986,003	609	47.8	Boundary	1,191
CR1-C16-NP	662,067	4,985,694	597	49	Boundary	948
CR1-C26-NP	657,765	4,987,981	607	45.1	Boundary	1,867
CR1-C27-NP	656,658	4,988,459	587	43.8	Boundary	1,749
CR1-C28-NP	665,432	4,989,009	584	46.6	Boundary	1,483
CR1-C29-NP	666,496	4,989,001	574	44.2	Boundary	1,952
CR1-C31-NP	665,639	4,989,013	585	46.2	Boundary	1,637
CR1-C32-NP	657,180	4,989,773	573	39.2	Boundary	4,967
CR1-C33-NP	657,102	4,991,984	580	43.1	Boundary	2,441
CR1-C34-NP	658,763	4,990,222	589	47.4	Boundary	1,286
CR1-C38-NP	660,955	4,990,468	591	48.9	Boundary	1,027
CR1-C39-NP	659,741	4,991,242	583	49.8	Boundary	856
CR1-C40-NP	658,706	4,991,231	580	46.3	Boundary	1,555
CR1-C41-NP	664,801	4,991,929	578	49.3	Boundary	1,211
CR1-C43-1-NP	660,973	4,996,728	571	36.8	Boundary	6,877
CR1-C43-NP	660,752	4,996,852	575	37	Boundary	6,913
CR1-C44-NP	665,447	4,992,972	578	48	Boundary	1,250
CR1-C45-NP	653,820	4,993,527	576	37.9	Boundary	4,327
CR1-C52-NP	654,986	4,995,398	603	46.8	Boundary	1,335
CR1-C53-NP	664,165	4,995,345	582	38.4	Boundary	4,032
CR1-C54-NP	663,495	4,995,329	583	37.4	Boundary	5,072
CR1-C60-NP	656,909	4,998,465	609	43	Boundary	2,218
CR1-C61-NP	656,927	4,997,826	612	49.4	Boundary	912
CR1-C62-NP	658,155	4,994,994	615	49.1	Boundary	820
CR1-C63-NP	658,543	4,995,211	607	43.4	Boundary	2,277
CR1-C65-NP	665,516	4,995,045	578	40.5	Boundary	2,825
CR1-C70-NP	664,953	4,987,981	596	43.8	Boundary	2,894
CR1-C71-NP	664,425	4,988,741	600	49.8	Boundary	886
CR1-C73-NP	663,740	4,982,989	592	47.8	Boundary	1,175
CR1-C80-NP	659,693	4,983,990	603	38.5	Boundary	4,590
CR1-C81-NP	660,516	4,983,200	596	44.5	Boundary	1,565
CR1-C84-NP	659,727	4,982,360	601	37.6	Boundary	5,249
CR1-C85-NP	659,751	4,981,560	588	37.3	Boundary	4,734
CR1-C88-NP	660,588	4,980,432	558	38.7	Boundary	3,419

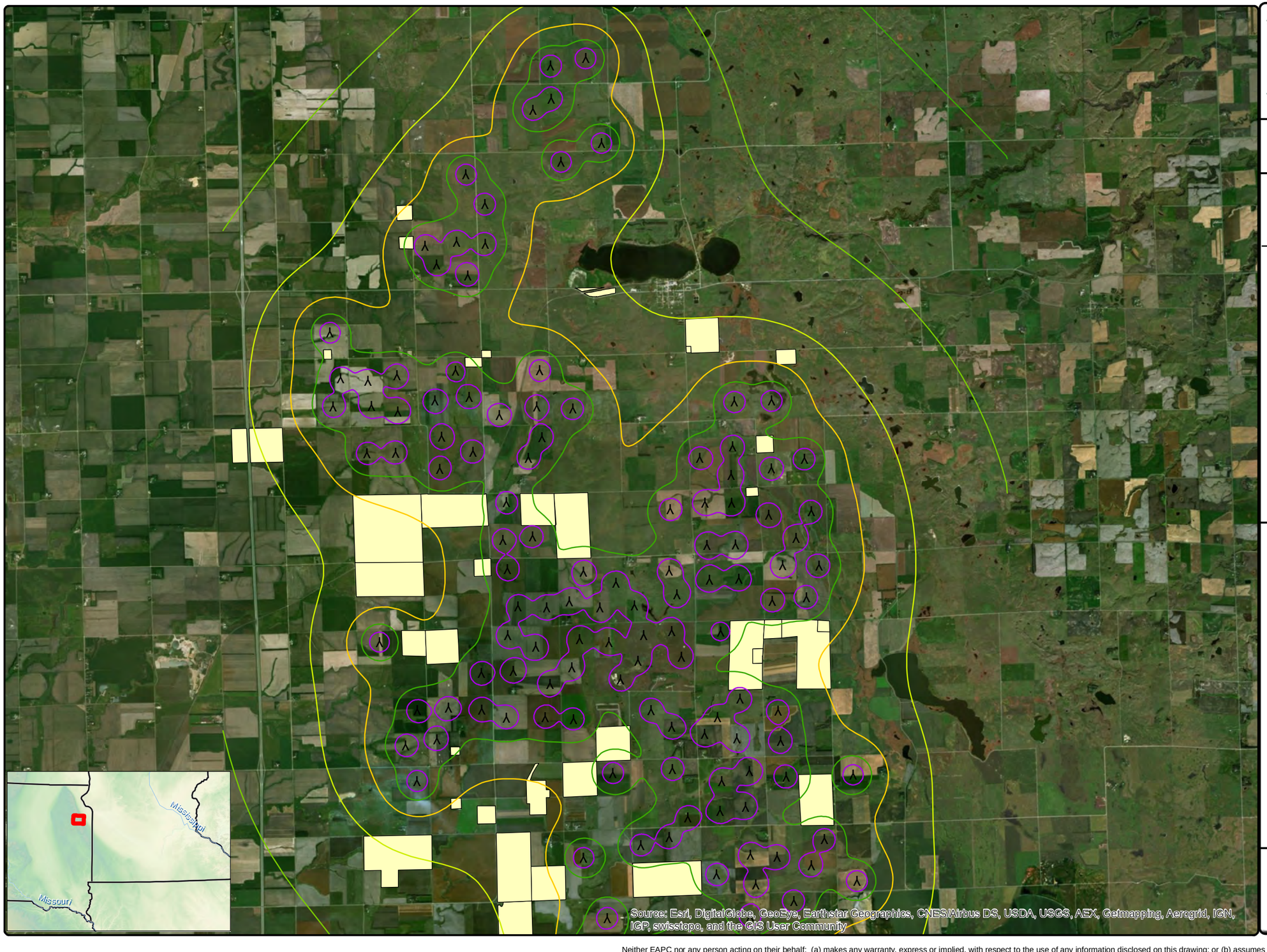
Crowned Ridge Codington County
Realistic case sound results at non-participating property boundaries
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Noise Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Receptor Type	Distance to Nearest Turbine (ft)
CR2-C1-NP	662,584	4,980,838	591	48.9	Boundary	791
CR2-C7-NP	665,612	4,966,608	582	38.7	Boundary	4,393
CR2-C10-NP	664,808	4,966,574	561	43.7	Boundary	1,384
CR2-C16-NP	664,794	4,966,949	570	49.6	Boundary	689
CR2-C22-NP	660,638	4,972,764	597	34.6	Boundary	6,040
CR2-C23-NP	663,922	4,969,541	594	39.3	Boundary	3,980
CR2-C24-NP	662,346	4,969,319	600	45.6	Boundary	1,083
CR2-C25-NP	659,097	4,969,077	561	51.6	Structure	5,377
CR2-C29-NP	662,351	4,969,069	595	48.8	Boundary	748
CR2-C30-NP	659,178	4,967,412	569	36.3	Boundary	3,720
CR2-C35-NP	659,126	4,974,667	556	38.9	Boundary	3,225
CR2-C36-NP	660,716	4,974,757	581	43.3	Boundary	2,198
CR2-C37-NP	662,306	4,974,989	606	48.9	Boundary	751
CR2-C39-NP	664,406	4,966,558	559	43.9	Boundary	1,358
CR2-C40-NP	659,711	4,975,130	584	47.2	Boundary	1,178
CR2-C42-NP	665,537	4,975,594	598	47.8	Boundary	1,056
CR2-C43-NP	664,105	4,975,238	597	42.5	Boundary	2,037
CR2-C44-NP	659,193	4,966,412	555	36.9	Boundary	3,527
CR2-C46-NP	660,215	4,966,435	582	47.3	Boundary	1,083
CR2-C49-NP	661,059	4,965,032	582	42.3	Boundary	2,546
CR2-C51-NP	662,863	4,964,873	582	39	Boundary	3,497
CR2-C52-NP	662,432	4,964,852	572	41.8	Boundary	2,218
CR2-C53-NP	661,853	4,964,839	578	47	Boundary	1,138
CR2-C55-NP	660,848	4,964,816	582	39.6	Boundary	3,412
CR2-C59-NP	664,868	4,976,865	606	47.6	Boundary	1,083
CR2-C61-NP	659,856	4,977,354	580	47.6	Boundary	1,175
CR2-C62-NP	666,690	4,976,912	612	49.9	Boundary	686
CR2-C64-NP	661,628	4,964,834	578	45.6	Boundary	1,355
CR2-C66-NP	661,867	4,964,063	572	37.2	Boundary	3,684
CR2-C67-NP	660,639	4,978,403	557	38.2	Boundary	4,071
CR2-C68-NP	662,455	4,963,673	579	34.4	Boundary	5,351
CR2-C69-NP	661,200	4,977,610	572	47.8	Boundary	1,027
CR2-C71-NP	665,510	4,970,264	582	43.1	Boundary	2,047
CR2-C72-NP	663,902	4,970,529	596	36.6	Boundary	6,020
CR2-C73-NP	659,832	4,969,664	570	32.2	Boundary	8,888
CR2-C74-NP	660,705	4,970,463	585	33.5	Boundary	6,329
CR2-C75-NP	665,533	4,969,027	577	44.8	Boundary	2,051
CR2-C79-NP	666,034	4,985,303	596	49.3	Boundary	938

Crowned Ridge Codington County
Realistic case sound results at non-participating property boundaries
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Noise Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Receptor Type	Distance to Nearest Turbine (ft)
CR2-C80-NP	665,496	4,971,451	598	37.9	Boundary	4,498
CR2-C81-NP	663,868	4,971,929	603	34.7	Boundary	9,281
CR2-C82-NP	659,862	4,971,615	573	32	Boundary	10,062
CR2-C87-NP	662,722	4,971,068	603	34.6	Boundary	6,634
CR2-C88-NP	659,072	4,971,256	570	30.8	Boundary	13,330
CR2-C89-NP	662,159	4,971,021	603	34.1	Boundary	6,378
CR2-C90-NP	664,071	4,970,806	594	36.8	Boundary	6,168
CR2-C92-NP	663,893	4,970,967	599	36.2	Boundary	6,427
CR2-C93-NP	659,960	4,973,070	579	35.6	Boundary	5,827
CR2-C95-NP	659,461	4,973,630	561	36.9	Boundary	4,505
CR2-C102-NP	661,830	4,976,324	592	41.3	Boundary	3,146
CR2-C104-NP	661,656	4,971,297	603	34.7	Boundary	6,204
CR2-C107-NP	662,229	4,977,633	564	39.3	Boundary	3,547
CR2-C112-NP	666,288	4,972,265	602	38.1	Boundary	5,253
CR2-C115-NP	662,993	4,980,847	562	46.7	Boundary	1,280
CR2-C116-NP	664,683	4,976,890	600	46.9	Boundary	1,171
CR2-C118-NP	665,548	4,975,288	600	42.9	Boundary	2,224
CR2-C127-NP	664,778	4,973,045	603	36.1	Boundary	7,516
CR2-C134-NP	666,749	4,974,324	611	49.3	Boundary	768
CR2-C135-NP	667,221	4,966,634	591	43.5	Boundary	1,854

APPENDIX D: STANDARD RESOLUTION SOUND MAPS



0 0.5 1 2 Mile

EAPC WIND ENERGY

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Crowned Ridge Wind Farm
Sound Iso-Lines
North Half

Client

SWCA Environmental Consultants

Project Description

Primary wind turbine layout with non-participating land parcels in Codington County and wind turbines within 2 km.

Predicted sound pressure levels at non-participating property boundaries.

Location: Watertown, SD

Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

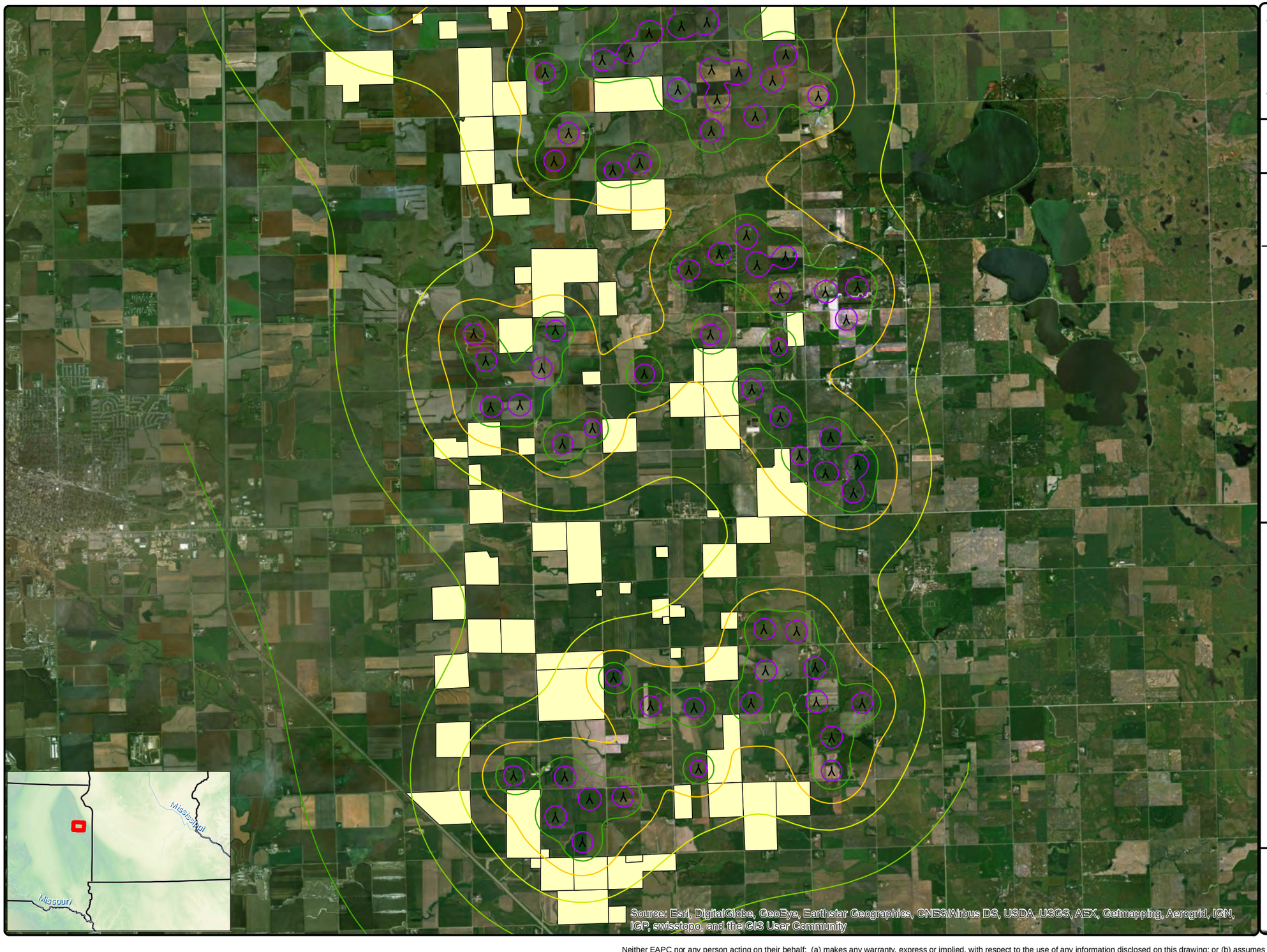
Legend

- Crowned Ridge Wind Turbines

Sound Pressure (dBA)

- 25
- 30
- 35
- 40
- 45
- 50
- Non-Participating Parcels

N W E S



0 0.5 1 2 Mile

EAPC WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm
Sound Iso-Lines
South Half

Client

SWCA Environmental Consultants

Project Description

Primary wind turbine layout with non-participating land parcels in Codington County and wind turbines within 2 km.

Predicted sound pressure levels at non-participating property boundaries.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

Legend

- Crowned Ridge Wind Turbines

Sound Pressure (dBA)

- 25
- 30
- 35
- 40
- 45
- 50
- Non-Participating Parcels

N W E S

APPENDIX E: TABLE OF SHADOW FLICKER RESULTS

Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C1-NP	656,743	4,983,525	595.9	0:00	5,541
CR1-C2-NP	658,791	4,984,483	601.6	0:00	6,273
CR1-C3-NP	657,888	4,984,697	604.2	4:11	3,291
CR1-C4-NP	659,744	4,984,749	606.0	0:00	5,981
CR1-C5-NP	659,958	4,984,794	605.0	0:00	5,659
CR1-C6-P	662,989	4,995,228	599.8	0:00	6,102
CR1-C7-NP	660,893	4,984,861	593.4	0:00	3,022
CR1-C8-P	660,532	4,984,445	599.5	0:00	3,743
CR1-C9-P	665,352	4,985,004	609.0	18:30	1,621
CR1-C10-P	663,510	4,985,195	609.0	12:58	1,762
CR1-C11-P	664,111	4,985,679	609.1	12:04	1,614
CR1-C12-1-P	662,199	4,986,047	606.0	22:16	2,818
CR1-C12-P	662,222	4,985,736	603.0	18:32	2,201
CR1-C13-P	663,792	4,985,785	612.0	22:41	1,739
CR1-C14-NP	657,982	4,985,894	609.0	10:01	1,877
CR1-C15-P	663,291	4,986,026	615.0	21:46	1,703
CR1-C16-NP	661,960	4,986,288	606.0	11:10	2,736
CR1-C17-P	658,031	4,986,373	609.0	27:47	1,886
CR1-C18-P	663,651	4,987,157	610.4	26:11	2,146
CR1-C19-P	659,243	4,987,276	611.1	21:21	1,722
CR1-C20-P	663,054	4,987,455	606.1	15:19	2,336
CR1-C21-P	660,756	4,984,086	594.8	0:59	2,388
CR1-C22-P	660,755	4,984,082	594.8	1:00	2,375
CR1-C23-P	660,619	4,984,078	595.9	0:00	2,523
CR1-C24-P	660,176	4,983,887	601.1	7:47	3,038
CR1-C25-P	660,190	4,983,788	602.3	6:44	2,838
CR1-C26-NP	657,767	4,988,493	597.1	6:23	3,481
CR1-C27-NP	656,876	4,988,683	582.8	6:59	2,546
CR1-C28-NP	665,429	4,988,598	590.8	3:08	2,831
CR1-C29-NP	666,572	4,988,867	575.8	6:56	2,457
CR1-C30-P	661,699	4,988,957	615.0	21:14	1,614
CR1-C31-NP	665,939	4,988,950	585.4	0:00	2,126
CR1-C32-NP	655,843	4,989,581	568.5	0:00	3,711
CR1-C33-NP	656,839	4,990,404	569.8	0:00	6,713
CR1-C34-NP	658,661	4,990,389	588.0	24:38	1,726
CR1-C35-P	662,025	4,990,475	609.0	11:48	2,169
CR1-C36-P	663,181	4,990,600	615.0	23:33	1,532
CR1-C37-P	663,563	4,991,342	605.1	27:49	1,696
CR1-C38-NP	660,639	4,991,557	597.0	4:14	3,474

Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C39-NP	660,144	4,991,670	588.0	6:06	2,602
CR1-C40-NP	657,865	4,991,818	583.7	5:22	2,690
CR1-C41-NP	665,053	4,992,084	576.1	21:07	2,008
CR1-C42-P	659,458	4,992,229	580.0	11:57	1,801
CR1-C43-NP	661,660	4,996,772	571.6	0:00	8,346
CR1-C44-NP	665,076	4,993,095	578.6	25:42	1,946
CR1-C45-NP	653,390	4,993,503	573.0	1:42	5,673
CR1-C46-P	655,802	4,993,540	609.0	25:44	1,795
CR1-C47-P	662,825	4,993,508	613.9	7:29	3,612
CR1-C48-P	664,247	4,993,646	588.0	3:47	1,923
CR1-C49-P	662,250	4,993,731	609.0	2:21	5,148
CR1-C50-P	656,806	4,994,388	621.0	28:36	1,591
CR1-C51-P	657,455	4,995,160	621.0	24:44	1,768
CR1-C52-NP	654,924	4,995,231	603.0	6:47	1,883
CR1-C53-NP	663,376	4,996,043	578.7	0:00	7,201
CR1-C54-NP	663,421	4,995,376	583.2	0:00	5,354
CR1-C55-P	660,914	4,995,169	606.1	2:56	3,366
CR1-C56-P	655,953	4,995,244	606.5	28:48	1,972
CR1-C57-P	656,628	4,995,266	615.6	10:23	1,568
CR1-C58-P	657,781	4,996,906	615.0	15:53	1,647
CR1-C59-P	661,548	5,000,754	584.0	9:49	1,644
CR1-C60-NP	656,855	4,998,565	613.4	3:28	2,592
CR1-C61-NP	656,690	4,997,831	612.0	27:59	1,683
CR1-C62-NP	658,375	4,995,138	614.9	18:08	1,676
CR1-C63-NP	658,566	4,995,254	612.6	10:44	2,408
CR1-C64-P	659,436	4,992,174	581.0	19:52	1,617
CR1-C65-NP	665,805	4,995,305	579.0	1:30	3,884
CR1-C66-NP	659,718	4,985,032	606.0	0:00	5,590
CR1-C67-NP	659,789	4,985,057	606.0	0:00	5,469
CR1-C68-P	662,652	4,987,606	609.0	6:32	1,962
CR1-C69-P	662,685	4,987,619	609.0	6:12	2,008
CR1-C70-NP	665,135	4,988,293	595.4	12:50	3,405
CR1-C71-NP	665,137	4,988,378	595.6	11:05	3,300
CR1-C72-NP	665,158	4,988,170	595.1	1:28	3,661
CR1-C73-NP	663,066	4,982,530	591.0	7:49	3,704
CR1-C74-NP	662,869	4,983,122	595.9	2:34	2,480
CR1-C75-NP	663,010	4,982,658	588.0	5:23	3,730
CR1-C76-NP	662,981	4,982,580	588.4	5:44	3,901

Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C77-P	661,915	4,983,367	591.0	12:14	1,650
CR1-C78-P	660,190	4,983,788	602.3	6:44	2,838
CR1-C79-P	660,452	4,983,750	595.9	22:42	2,037
CR1-C80-NP	659,351	4,983,174	604.0	0:40	5,308
CR1-C81-NP	660,062	4,983,083	597.0	6:16	3,094
CR1-C82-NP	657,025	4,982,388	594.0	0:00	9,199
CR1-C83-P	656,917	4,982,338	594.0	0:00	9,370
CR1-C84-NP	659,607	4,982,216	594.0	0:00	5,856
CR1-C85-NP	659,706	4,981,419	588.0	1:22	4,819
CR1-C86-P	662,086	4,982,135	585.1	20:07	1,962
CR1-C87-NP	662,628	4,982,425	585.4	4:46	3,960
CR1-C88-NP	660,156	4,980,595	570.9	0:00	4,045
CR1-C89-P	662,062	4,982,029	584.5	25:59	1,814
CR2-C1-NP	662,198	4,980,622	591.0	3:52	1,909
CR2-C2-NP	662,238	4,980,604	590.9	1:03	1,880
CR2-C7-NP	665,694	4,966,179	570.0	0:00	4,403
CR2-C10-NP	665,189	4,966,505	570.1	0:00	2,428
CR2-C16-NP	665,418	4,966,866	567.0	7:37	2,746
CR2-C22-NP	661,202	4,972,711	597.0	0:00	6,247
CR2-C23-NP	664,069	4,969,661	594.0	0:56	4,436
CR2-C24-NP	661,541	4,969,653	600.0	3:22	3,881
CR2-C25-NP	659,097	4,969,077	561.0	0:00	8,419
CR2-C26-P	664,733	4,968,915	591.0	6:13	1,959
CR2-C27-P	662,985	4,968,167	582.3	17:41	1,722
CR2-C28-P	659,208	4,968,159	572.8	0:00	5,630
CR2-C29-NP	661,223	4,968,144	595.1	0:00	4,639
CR2-C30-NP	659,100	4,968,023	568.1	0:00	5,502
CR2-C31-P	663,117	4,972,923	606.0	0:00	7,579
CR2-C32-P	659,469	4,967,984	575.0	0:00	4,678
CR2-C33-P	663,878	4,967,612	576.0	2:46	2,999
CR2-C34-P	663,934	4,966,991	570.6	14:09	2,142
CR2-C35-NP	658,964	4,974,334	566.8	0:00	4,432
CR2-C36-NP	660,475	4,974,426	578.5	8:22	2,995
CR2-C37-NP	663,037	4,974,496	606.0	9:36	3,537
CR2-C38-P	660,874	4,966,929	585.5	26:01	1,906
CR2-C39-NP	664,089	4,966,486	565.9	2:28	2,185
CR2-C40-NP	659,189	4,974,765	578.0	1:34	2,841
CR2-C41-P	660,770	4,975,147	594.3	17:55	1,811

Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR2-C42-NP	664,887	4,975,388	597.0	12:17	3,570
CR2-C43-NP	664,382	4,975,544	597.0	1:42	4,229
CR2-C44-NP	659,145	4,966,062	561.1	0:43	4,183
CR2-C45-NP	664,058	4,965,862	570.0	4:14	3,911
CR2-C46-NP	660,435	4,965,627	582.0	12:03	2,569
CR2-C47-P	662,200	4,975,837	595.2	7:41	2,821
CR2-C48-P	662,370	4,965,588	590.3	19:19	2,172
CR2-C49-NP	660,907	4,964,846	582.0	6:38	3,261
CR2-C50-P	661,252	4,976,035	597.0	4:27	1,729
CR2-C51-NP	662,977	4,964,794	583.9	4:46	3,934
CR2-C52-NP	662,688	4,964,792	586.2	14:34	3,058
CR2-C53-NP	662,401	4,964,782	582.0	0:00	2,257
CR2-C54-P	662,636	4,976,079	597.0	12:38	2,287
CR2-C55-NP	660,765	4,964,777	582.0	4:37	3,632
CR2-C56-NP	660,759	4,964,737	582.0	4:55	3,763
CR2-C57-P	666,667	4,976,162	613.8	5:04	2,484
CR2-C58-NP	660,764	4,964,686	582.0	5:52	3,904
CR2-C59-NP	664,952	4,976,698	601.4	4:32	1,654
CR2-C60-P	662,287	4,976,800	594.0	13:56	3,793
CR2-C61-NP	660,630	4,976,840	582.2	10:59	1,644
CR2-C62-NP	666,992	4,977,048	615.0	18:33	1,745
CR2-C63-P	665,528	4,977,285	612.0	14:26	2,185
CR2-C64-NP	660,901	4,964,220	582.0	0:00	4,429
CR2-C65-P	665,217	4,977,746	609.0	5:20	2,139
CR2-C66-NP	662,396	4,963,954	582.0	0:00	4,429
CR2-C67-NP	660,379	4,978,592	556.2	0:00	5,036
CR2-C68-NP	662,517	4,963,408	579.0	0:00	6,237
CR2-C69-NP	661,701	4,978,792	564.0	0:00	5,171
CR2-C70-P	665,521	4,970,518	588.9	13:53	2,218
CR2-C71-NP	665,411	4,970,503	586.0	10:06	2,529
CR2-C72-NP	663,856	4,970,488	597.0	0:00	6,227
CR2-C73-NP	659,183	4,970,246	567.3	0:00	11,772
CR2-C74-NP	660,687	4,969,931	586.5	0:00	6,798
CR2-C75-NP	664,866	4,969,808	583.3	5:06	4,393
CR2-C76-NP	664,747	4,969,738	584.5	3:55	4,560
CR2-C77-P	663,865	4,969,694	597.0	1:26	4,406
CR2-C78-P	665,273	4,983,933	609.0	25:21	1,916
CR2-C79-NP	666,869	4,984,663	587.9	2:36	2,703

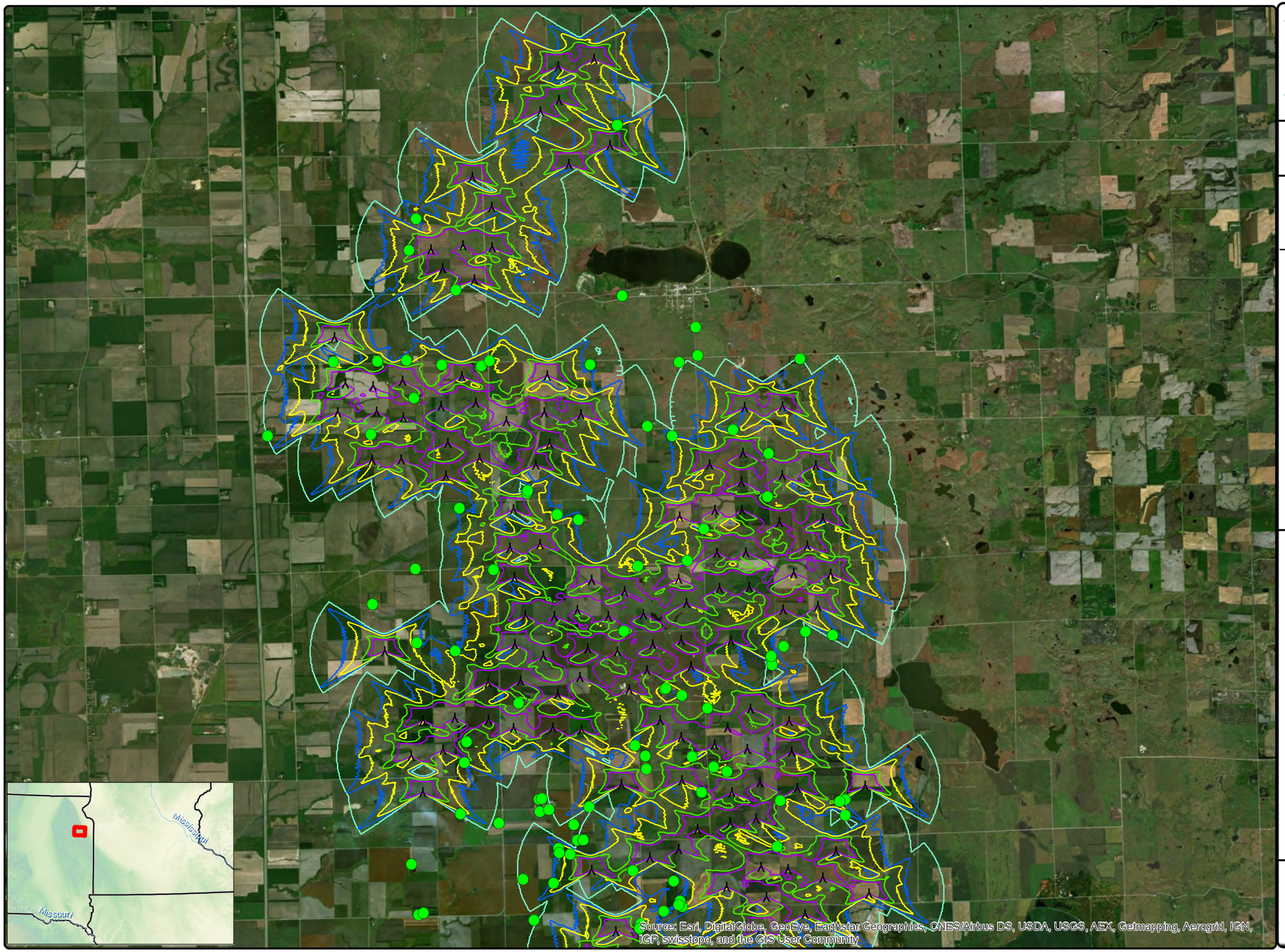
Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR2-C80-NP	664,705	4,972,092	597.3	0:00	7,684
CR2-C81-NP	663,790	4,972,054	603.0	0:00	9,734
CR2-C82-NP	659,093	4,971,994	567.0	0:00	11,371
CR2-C83-P	662,341	4,971,795	600.2	0:00	8,927
CR2-C84-NP	659,112	4,971,557	573.3	0:00	12,451
CR2-C85-P	662,337	4,971,353	603.0	0:00	7,487
CR2-C86-NP	662,880	4,971,302	603.0	0:00	7,346
CR2-C87-NP	662,841	4,971,294	603.0	0:00	7,303
CR2-C88-NP	659,058	4,971,145	575.6	0:00	13,382
CR2-C89-NP	662,244	4,971,076	603.0	0:00	6,627
CR2-C90-NP	664,088	4,970,672	595.0	0:00	6,863
CR2-C91-NP	663,938	4,970,546	597.0	0:00	6,552
CR2-C92-NP	663,855	4,970,535	597.3	0:00	6,342
CR2-C93-NP	659,203	4,973,158	584.8	0:00	7,792
CR2-C94-NP	659,202	4,973,052	583.7	0:00	8,133
CR2-C95-NP	659,248	4,974,054	567.0	0:00	4,898
CR2-C96-NP	659,316	4,974,063	570.1	0:00	4,813
CR2-C97-P	660,093	4,976,001	583.8	21:44	1,804
CR2-C98-NP	660,155	4,976,007	582.6	22:40	1,732
CR2-C99-P	660,584	4,972,570	591.0	0:00	7,165
CR2-C100-P	660,592	4,972,602	591.0	0:00	7,060
CR2-C101-P	660,732	4,972,807	591.0	0:00	6,266
CR2-C102-NP	662,025	4,976,085	594.0	6:00	3,609
CR2-C103-NP	662,046	4,976,067	594.1	6:00	3,547
CR2-C104-NP	662,109	4,972,735	604.3	0:00	6,608
CR2-C105-NP	662,122	4,976,029	595.7	5:48	3,425
CR2-C106-NP	662,165	4,972,711	605.1	0:00	6,752
CR2-C107-NP	662,265	4,978,194	577.5	4:28	4,564
CR2-C108-P	662,638	4,972,709	606.0	0:00	7,493
CR2-C109-P	662,699	4,972,874	606.0	0:00	7,172
CR2-C110-P	662,729	4,972,734	606.0	0:00	7,595
CR2-C111-P	662,808	4,972,734	606.0	0:00	7,753
CR2-C112-NP	665,928	4,972,630	603.0	0:00	6,575
CR2-C115-NP	663,555	4,980,564	575.3	8:18	2,520
CR2-C116-NP	664,640	4,976,142	591.1	4:51	3,533
CR2-C117-NP	664,742	4,976,142	594.1	4:54	3,478
CR2-C118-NP	665,014	4,974,639	600.0	1:58	4,951
CR2-C119-NP	665,052	4,974,682	600.0	2:06	4,760

Crowned Ridge Codington County
Realistic case shadow results
Results using GE 1.7-103-80 m HH, GE 2.1-116-80 m HH, GE 2.3-116-90 m HH WTG's
UTM NAD83 Zone 14
continued

Shadow Receptor #	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR2-C123-P	666,146	4,966,653	579.5	2:15	5,203
CR2-C126-P	666,389	4,966,670	584.8	1:40	4,455
CR2-C127-NP	665,037	4,972,935	603.0	0:00	7,861
CR2-C128-P	666,636	4,966,649	589.0	3:01	3,671
CR2-C129-P	666,716	4,966,751	591.0	3:32	3,356
CR2-C130-P	666,727	4,966,695	591.0	3:43	3,350
CR2-C131-NP	666,732	4,984,987	591.0	17:27	2,287
CR2-C132-NP	666,857	4,985,021	588.2	6:27	1,883
CR2-C133-P	666,992	4,967,681	571.4	14:08	2,431
CR2-C134-NP	667,097	4,973,011	613.4	3:41	3,363
CR2-C135-NP	667,172	4,966,196	594.9	0:00	2,887
CR2-C136-NP	667,209	4,966,166	595.4	0:00	2,887
CR2-C150-P	657,178	4,985,788	612.0	10:30	1,640

APPENDIX F: STANDARD RESOLUTION SHADOW FLICKER MAPS



0 0.5 1 2 Mile

EAPC WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm
Shadow Flicker Iso-Lines
North Half

Client

SWCA Environmental Consultants

Project Description

Primary wind turbine layout with active farmsteads in Codington County and wind turbines within 2 km.

Predicted shadow flicker at active farmsteads.

Location: Watertown, SD

Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

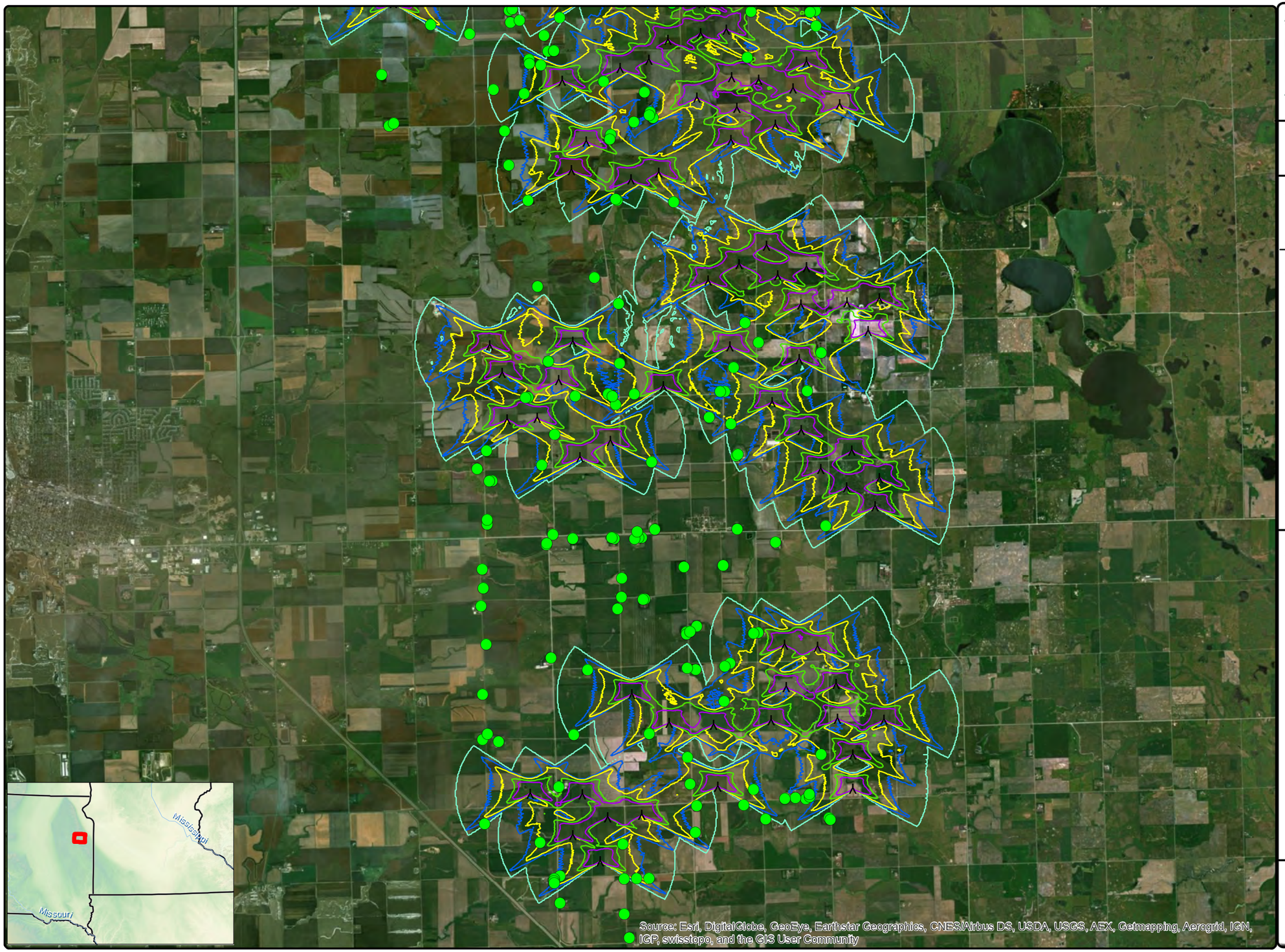
Legend

- Crowned Ridge Wind Turbines
- Codington Occupied Residences

Shadow Flicker (hr/yr)

- 0
- 5
- 10
- 30
- 50

N W E S



0 0.5 1 2 Mile

EAPC WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm
Shadow Flicker Iso-Lines
South Half

Client

SWCA Environmental Consultants

Project Description

Primary wind turbine layout with active farmsteads in Codington County and wind turbines within 2 km.

Predicted shadow flicker at active farmsteads.

Location: Watertown, SD

Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2018.06.18

Drawn By: JH *Checked By: JH*

Legend

- Crowned Ridge Wind Turbines
- Codington Occupied Residences

Shadow Flicker (hr/yr)

- 0
- 5
- 10
- 30
- 50

N W E S