

Appendix H. Shadow Flicker Impact Analysis for the North Bend Wind Project, Hyde and Hughes Counties, South Dakota

Shadow Flicker Impact Analysis for the North Bend Wind Project Hyde and Hughes Counties, South Dakota

June 2021

PRESENTED TO

North Bend Wind Project, LLC

PRESENTED BY

Tetra Tech, Inc.



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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
GE	General Electric
Hz	Hertz
Project area	the encompassing 46,931-acre area where the Project is located
North Bend Wind	North Bend Wind Project, LLC
Tetra Tech	Tetra Tech, Inc.
the Project	the North Bend Wind Project
UTM	Universal Transverse Mercator

1.0 OVERVIEW

North Bend Wind Project, LLC (North Bend Wind) is proposing to construct and operate the North Bend Wind Project (the Project) located in Hyde and Hughes counties, South Dakota. The Project will be located on privately held land within an area that encompasses approximately 46,931 acres (Project area). The Project is expected to have an up to nominal 200 megawatt (MW) power output capacity after constructing up to 71 wind turbines. North Bend Wind has contracted Tetra Tech, Inc. (Tetra Tech) to conduct a shadow flicker impact assessment to evaluate the expected shadow flicker impacts resulting from the Project wind turbines.

2.0 PROJECT COMPONENTS

The Project is considering a layout consisting of 78 potential turbine locations to construct a total 71 General Electric (GE) wind turbines. The turbine model being considered for the Project has the following specifications:

- **GE 2.82-127 wind turbines:** Three-blade 127-meter rotor diameter, with a hub height of 89 meters and generating capacity of 2.82 MW. The GE 2.82-127 has a normal high rotor speed of 15.7 rotations per minute, which translates to a blade pass frequency of 0.79 hertz (Hz; 0.79 alternations per second). While only 71 GE wind turbines would be constructed, 78 potential wind turbine locations were evaluated.

3.0 SHADOW FLICKER BACKGROUND

A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset. However, when the sun angle is very low (less than three degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker does not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not operating. In addition, shadow flicker occurs only when at least 20 percent of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker frequency is related to the wind turbine's rotor blade speed and the number of blades on the rotor. From a health perspective, the low flicker frequencies associated with wind turbines are harmless, and public concerns that flickering light from wind turbines can have negative health effects, such as triggering seizures in people with epilepsy, are unfounded. Epilepsy Action (the working name for the British Epilepsy Foundation) states that there is no evidence that wind turbines can cause seizures (Epilepsy Action 2018). However, they recommend that wind turbine flicker frequency be limited to 3 Hz. For comparison, strobe lights used in discos have frequencies that range from about 3 Hz to 10 Hz (1 Hz = one flash per second). Since the proposed Project's wind turbine blade pass frequency is approximately 0.79 Hz (less than one alternation per second), no negative health effects to individuals with photosensitive epilepsy are anticipated.

Shadow flicker impacts are not regulated in applicable state or federal law. However, the Hyde County Zoning Ordinance Section 9-104-A-20 establishes the following requirements:

SECTION 9-104 -A-20. Flicker Analysis A Flicker Analysis shall include the duration and location of flicker potential for all receptors and road ways 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 an established dwelling and forty (40) hours per year from any occupied structure.

4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. As described above, 78 wind turbine locations were evaluated though the Project would only install up to 71 wind turbines.

The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors surrounding the Project wind turbines. The realistic impact condition scenario is based on the following:

- The elevation and position geometries of the wind turbines and surrounding receptors (potentially occupied residences). Elevations were determined using U.S. Geological Survey digital elevation model data. Positions geometries were determined using geographic information system and referenced to Universal Transverse Mercator (UTM) Zone 14 (NAD83).
- The position of the sun and the incident sunlight relative to the wind turbine and receptors on a minute-by-minute basis over the course of a year.
- Historical sunshine availability (percent of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center [NOAA 2019] for nearby Huron, South Dakota) used in this analysis are provided in Table 1.
- Estimated wind turbine operations and orientation based on wind data (wind speed and direction) measured at meteorological towers located on the Project area.
- Receptor viewpoints (i.e., house windows) were assumed to be directly facing the turbine-to-sun line of sight (“greenhouse mode”).

Table 1. Historical Sunshine Availability

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
62%	62%	62%	59%	66%	69%	76%	74%	69%	59%	51%	51%

WindPro incorporates terrain elevation contour information and the analysis accounts for terrain elevation differences. The sun’s path, with respect to each turbine location, is calculated by the software to determine the cast shadow paths every minute over a full year. Sun angles less than 3 degrees above the horizon were excluded for the reasons identified earlier in Section 3. Since shadow flicker is only an issue when at least 20 percent of the sun’s disc is covered by the blades, WindPro uses blade dimension data to calculate the maximum distance from the turbine where shadow flicker must be calculated. Beyond this distance, the turbine would not contribute to the shadow flicker impact. It should be noted however, that WindPro provides a conservative estimate of shadow flicker since obstacles such as trees, haze, and visual obstructions (window facing, coverings) are not accounted for despite the likelihood of their reducing or eliminating shadow flicker impacts to receptors.

A total of 51 residential structures were identified within and near the Project area as occupied or potentially occupied residences. These residences are considered potential shadow-flicker receptors for the purpose of this

analysis and are shown on Figure 1 and Figures 1A-1H (Attachment A). A receptor in the model is defined as a 1-meter-squared area (approximate size of a typical window), 1 meter (3.28 feet) above ground level. Approximate eye level is set at 1.5 meters (4.94 feet). In addition to the identified residential structures, Figures 1A-1H show the potential turbine locations considered.

5.0 SHADOW FLICKER ANALYSIS RESULTS

As expected, WindPro predicts that shadow flicker impacts would be greatest at locations closer to the wind turbines. Attachment A illustrates the WindPro-predicted shadow flicker impact areas.

Table 2 presents the WindPro-predicted shadow flicker impacts for the top 10 worst-case impact receptors. Table 3 summarizes the shadow flicker impact prediction statistics. The predicted shadow flicker impact for all 51 receptors is presented in Attachment B. The maximum predicted shadow flicker impact at any occupied residence receptor is 79 hours and 44 minutes per year (Receptor 26). This is approximately 1.8 percent of the potential available daylight hours. However, this receptor is participating in the Project. All non-participating receptor locations had modeled shadow flicker impacts below the ordinance threshold of 30 hours per year.

Table 2. WindPro Top 10 Expected Shadow Flicker Impacts

Receptor ID	Receptor Type	Receptor Project Participation Status	Expected Shadow Flicker Hours per Year (Hours/Year)
26	Residential	Participant	79:44
51	Residential	Participant	27:14
29	Residential	Participant	26:28
28	Residential	Participant	25:51
49	Residential	Participant	13:59
15	Residential	Non-Participant	9:38
37	Residential	Participant	7:43
5	Residential	Non-Participant	6:59
47	Residential	Participant	6:34
48	Residential	Participant	6:25

Table 3. Statistical Summary of WindPro Expected Shadow Flicker Impacts – Number of Modeled Receptors

Cumulative Shadow Flicker Time (Expected)	Number of Modeled Receptors
Total	51
= 0 Hours	38
> 0 Hours ≤ 10 Hours	8
> 10 Hours ≤ 20 Hours	1
> 20 Hours ≤ 30 Hours	3
> 30 Hours	1

6.0 CONCLUSION

The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. All of the non-participating receptor locations had modeled shadow flicker impacts below the ordinance threshold of 30 hours per year. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions that may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times. For these reasons, shadow flicker impacts are expected to be less than estimated in this conservative analysis, and shadow flicker is not expected to be a significant environmental impact. Note that the only receptor (#26) that has expected shadow flicker greater than 30 hours per year is a participating residence that is surrounded by several trees and hedges that are likely to mitigate shadow flicker impact.

7.0 REFERENCES

Epilepsy Action. 2018. Information Web Page on Photosensitive Epilepsy. British Epilepsy Association.
http://www.epilepsy.org.uk/info/photo_other.html. Accessed July 2018.

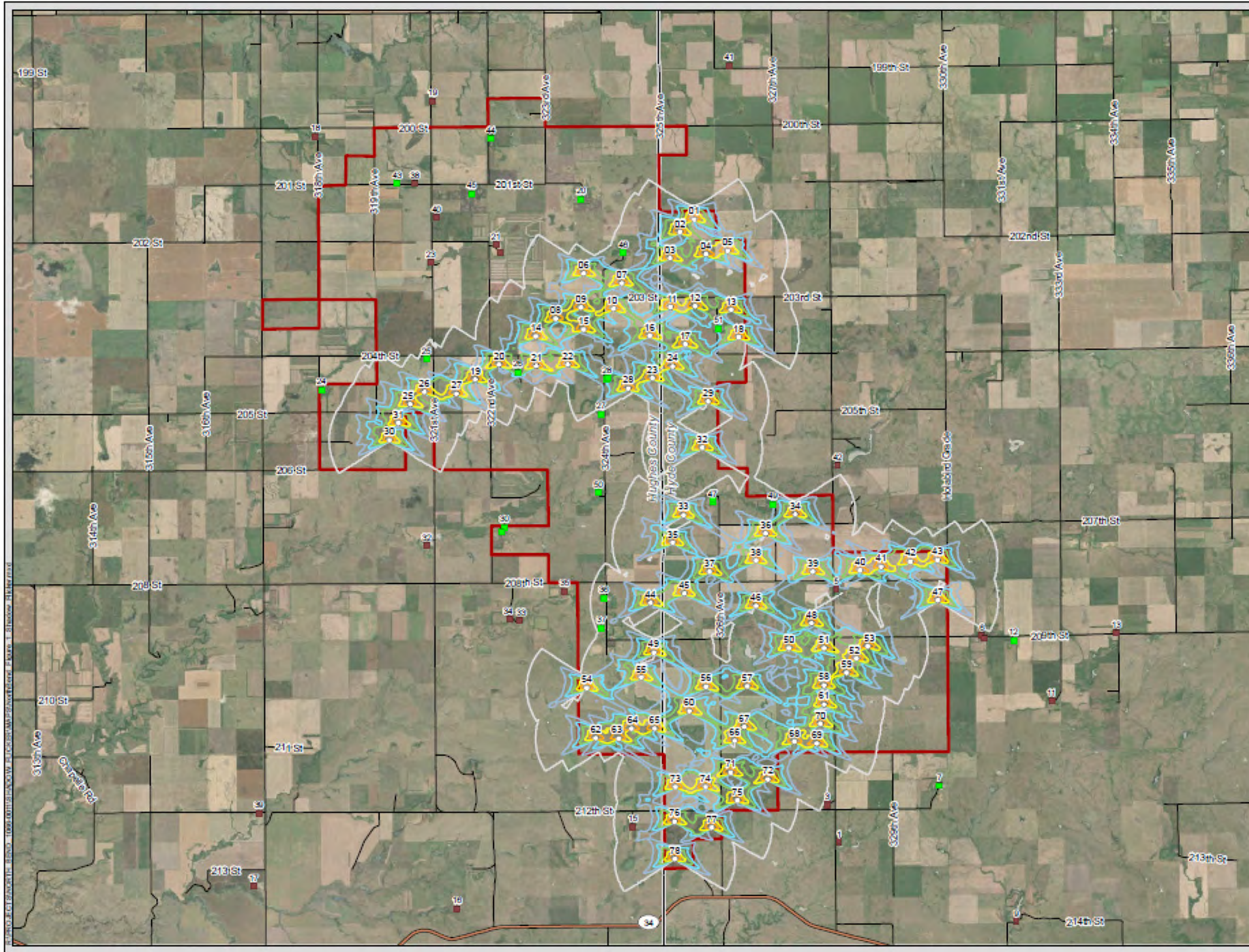
NOAA (National Oceanic and Atmospheric Administration). 2019. Comparative Climatic Data for the United States Through 2018.

ATTACHMENT A. FIGURES

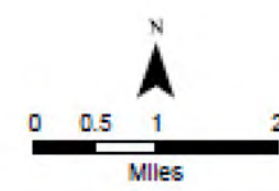
North Bend Wind Project

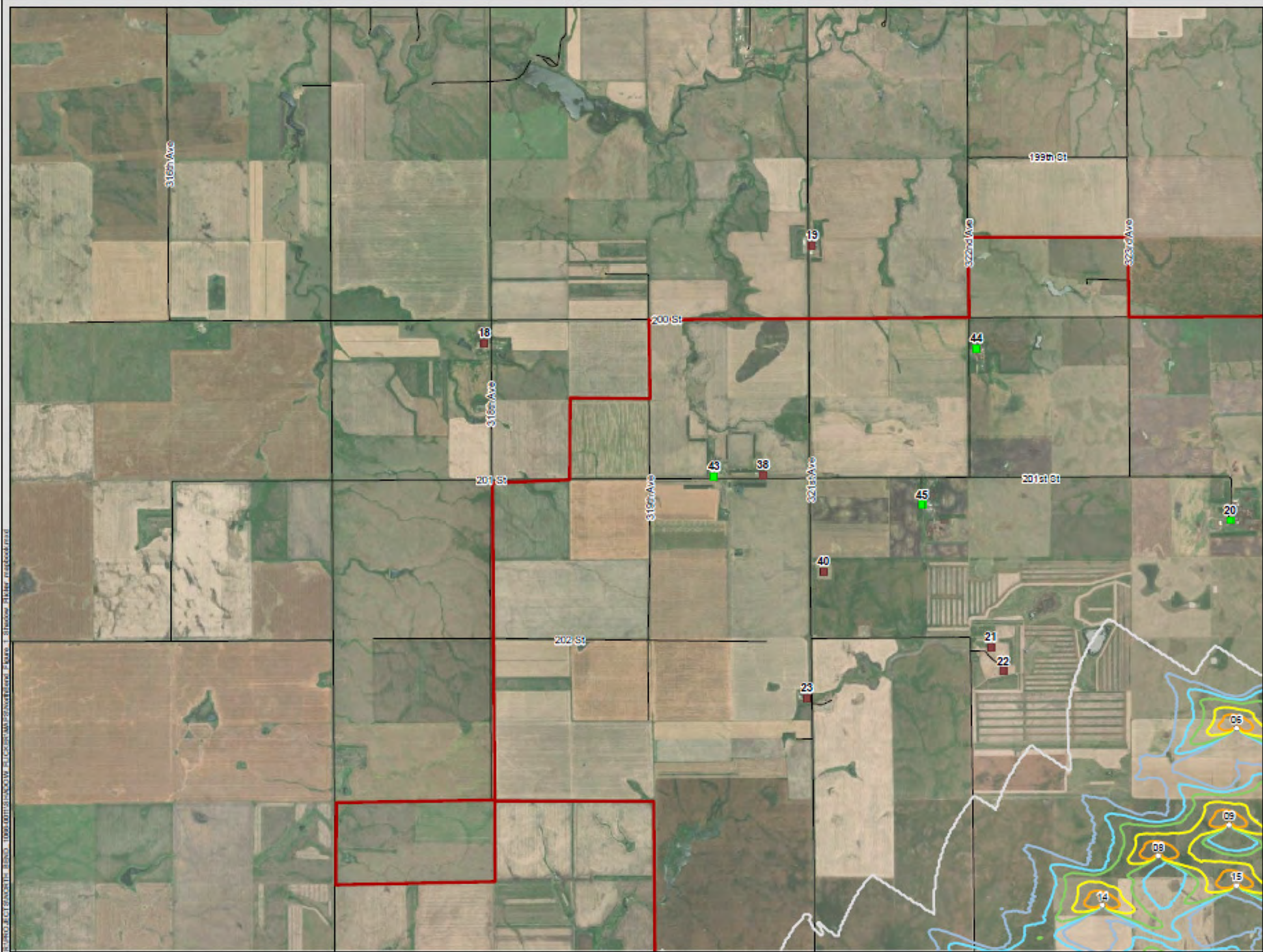
Figure 1 Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD

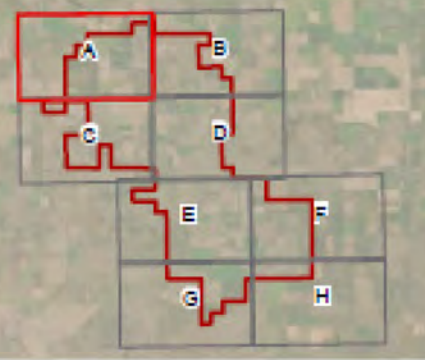
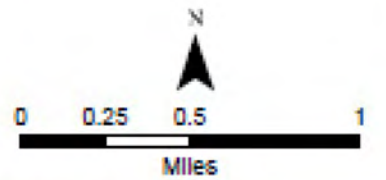


- Project Area
- Proposed Turbine
- Sensitive Receptor**
 - Participating
 - Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
 - 0 - 15
 - >15 - 30
 - >30 - 50
 - >50 - 100
 - >100 - 200
 - >200





- Project Area
- Proposed Turbine
- Sensitive Receptor**
- Participating
- Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200



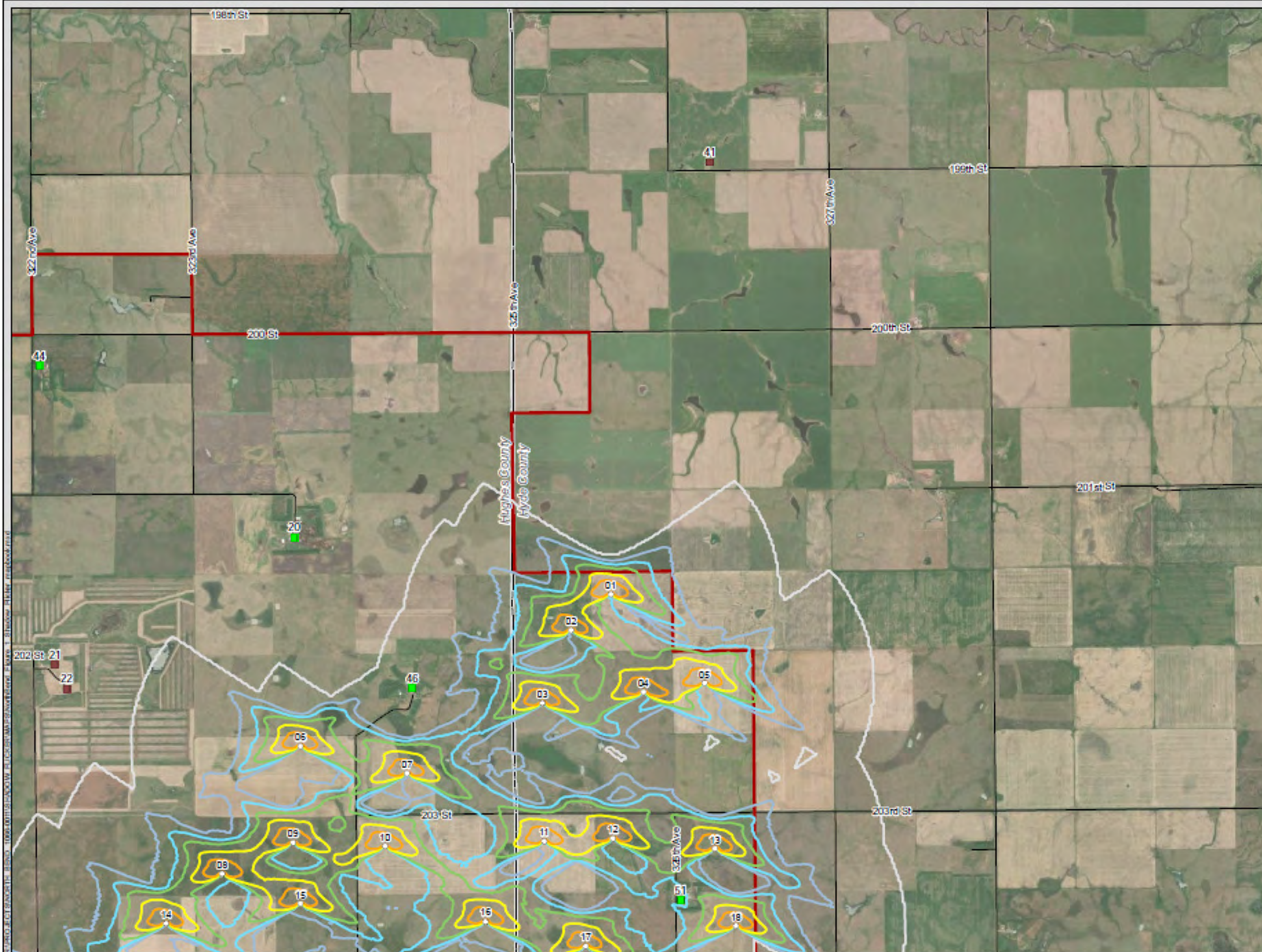
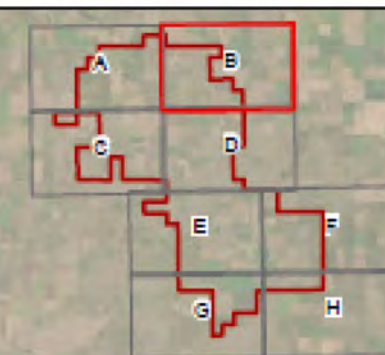
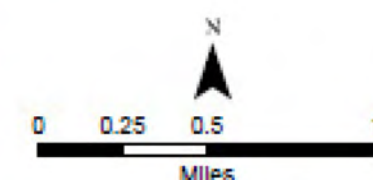


North Bend Wind Project

Figure 1B Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD

- Project Area
- Proposed Turbine
- Sensitive Receptor**
 - Participating
 - Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
 - 0 - 15
 - >15 - 30
 - >30 - 50
 - >50 - 100
 - >100 - 200
 - >200

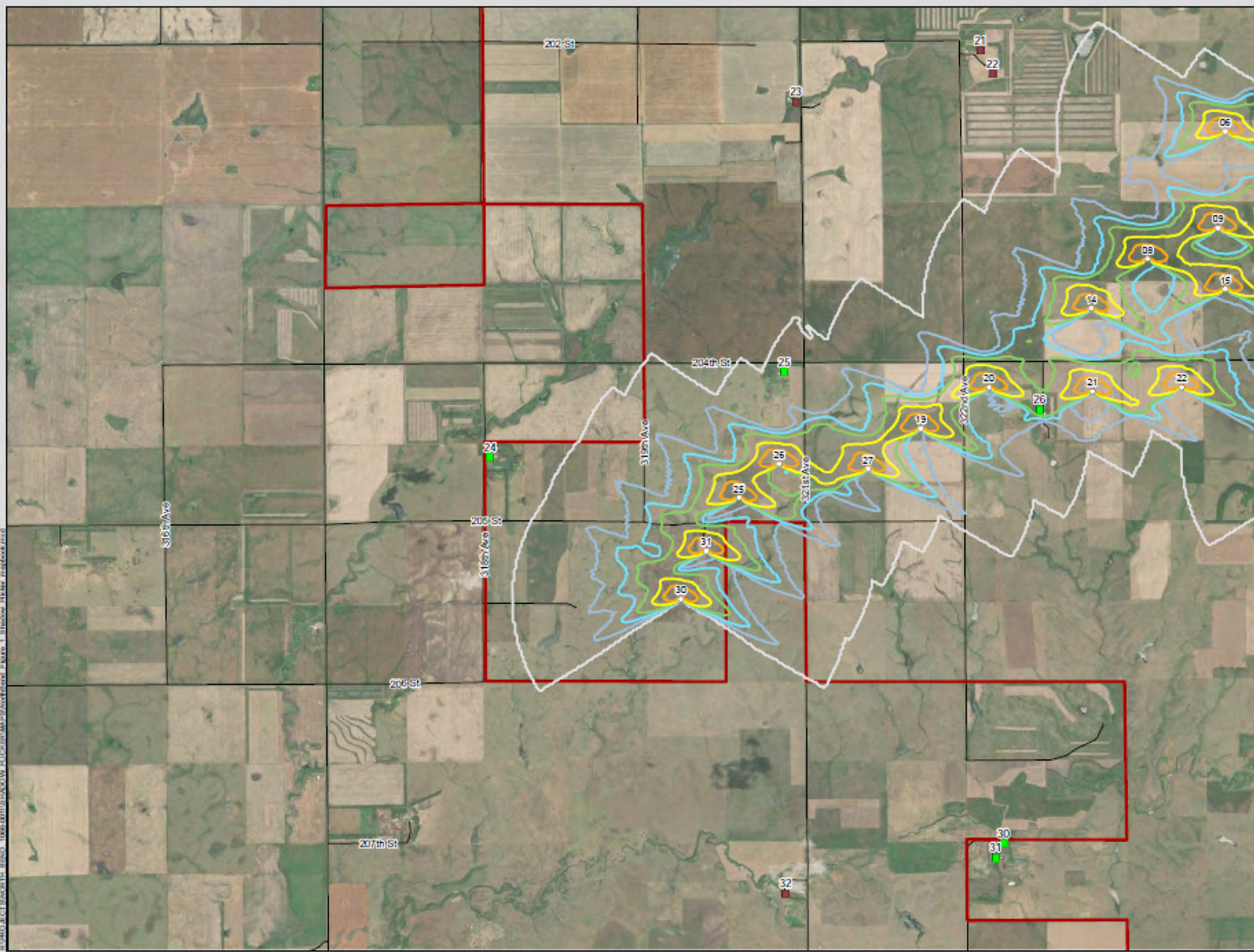




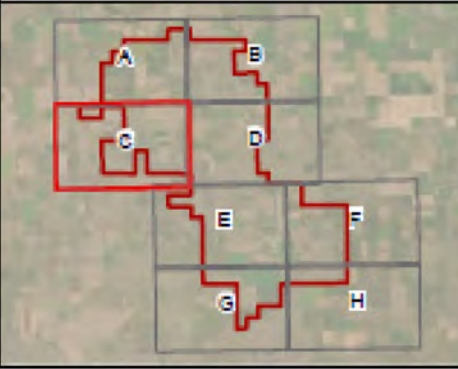
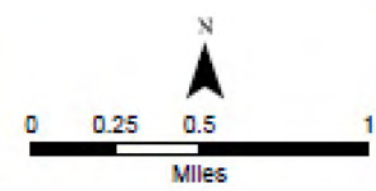
North Bend Wind Project

Figure 1C Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD



- Project Area
- Proposed Turbine
- Sensitive Receptor**
- Participating
- Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

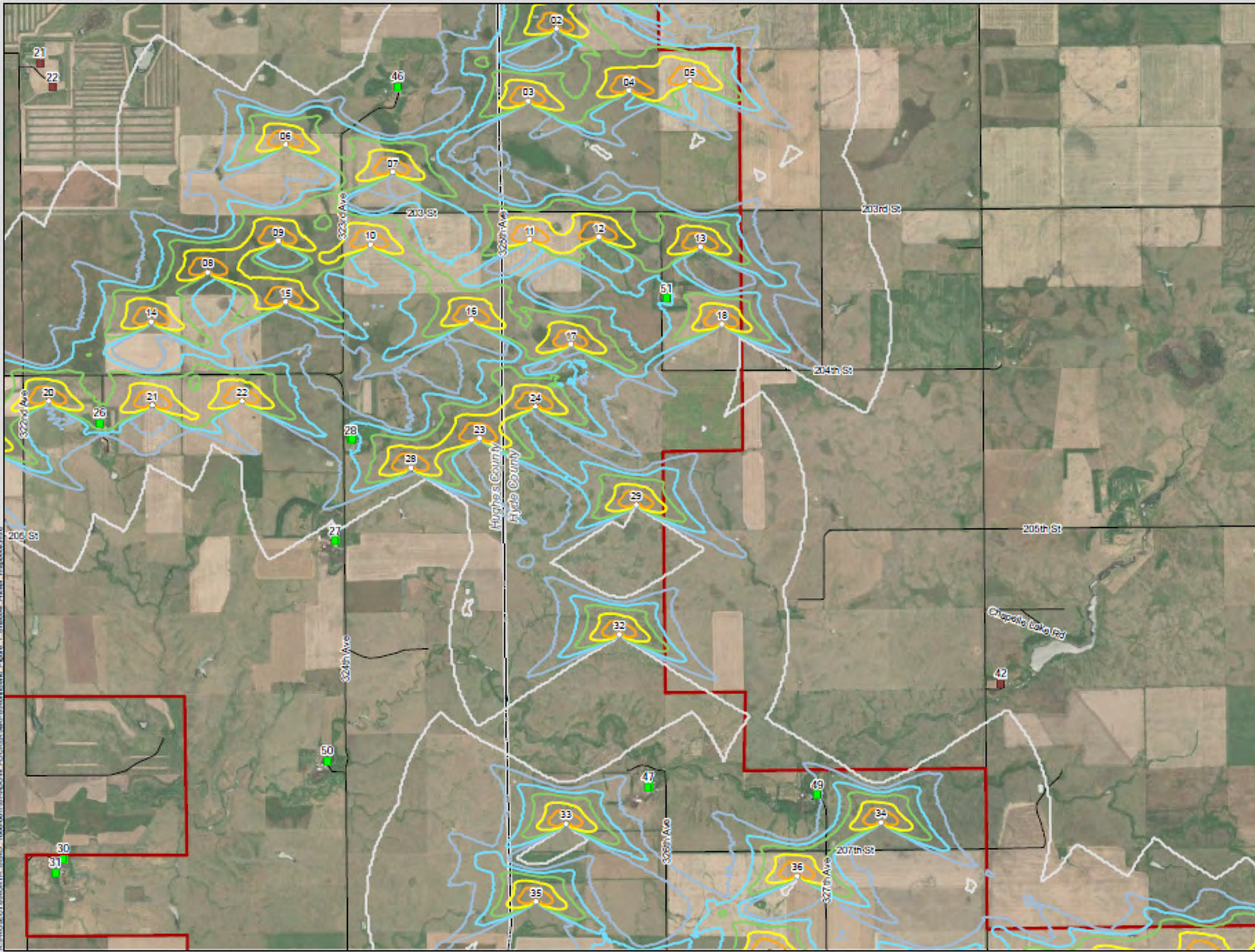




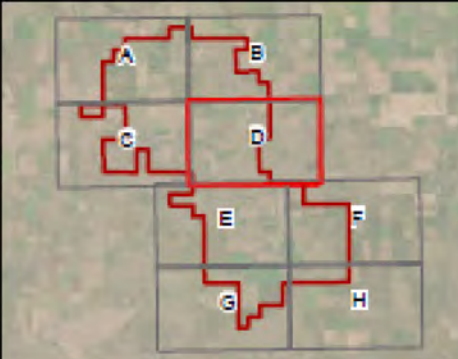
North Bend Wind Project

Figure 1D Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD



- Project Area
- Proposed Turbine
- Sensitive Receptor**
 - Participating
 - Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
 - 0 - 15
 - >15 - 30
 - >30 - 50
 - >50 - 100
 - >100 - 200
 - >200



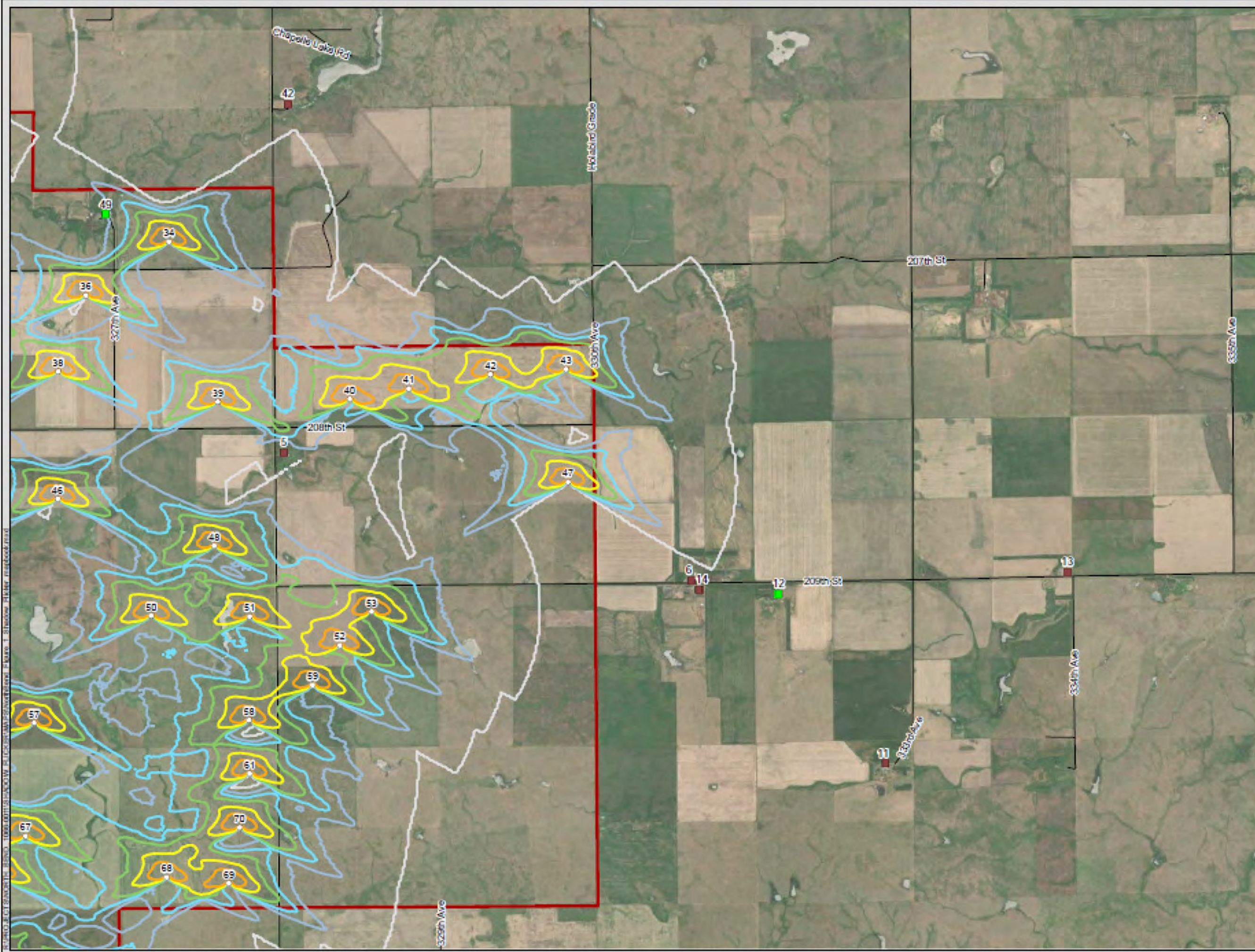
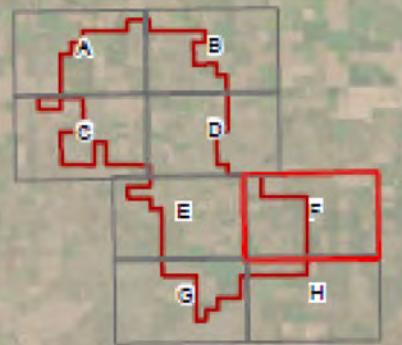
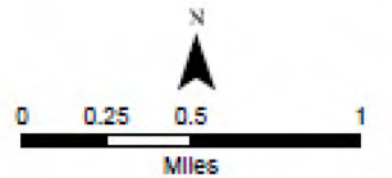


North Bend Wind Project

Figure 1F Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD

- Project Area
- Proposed Turbine
- Sensitive Receptor**
 - Participating
 - Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
 - 0 - 15
 - >15 - 30
 - >30 - 50
 - >50 - 100
 - >100 - 200
 - >200

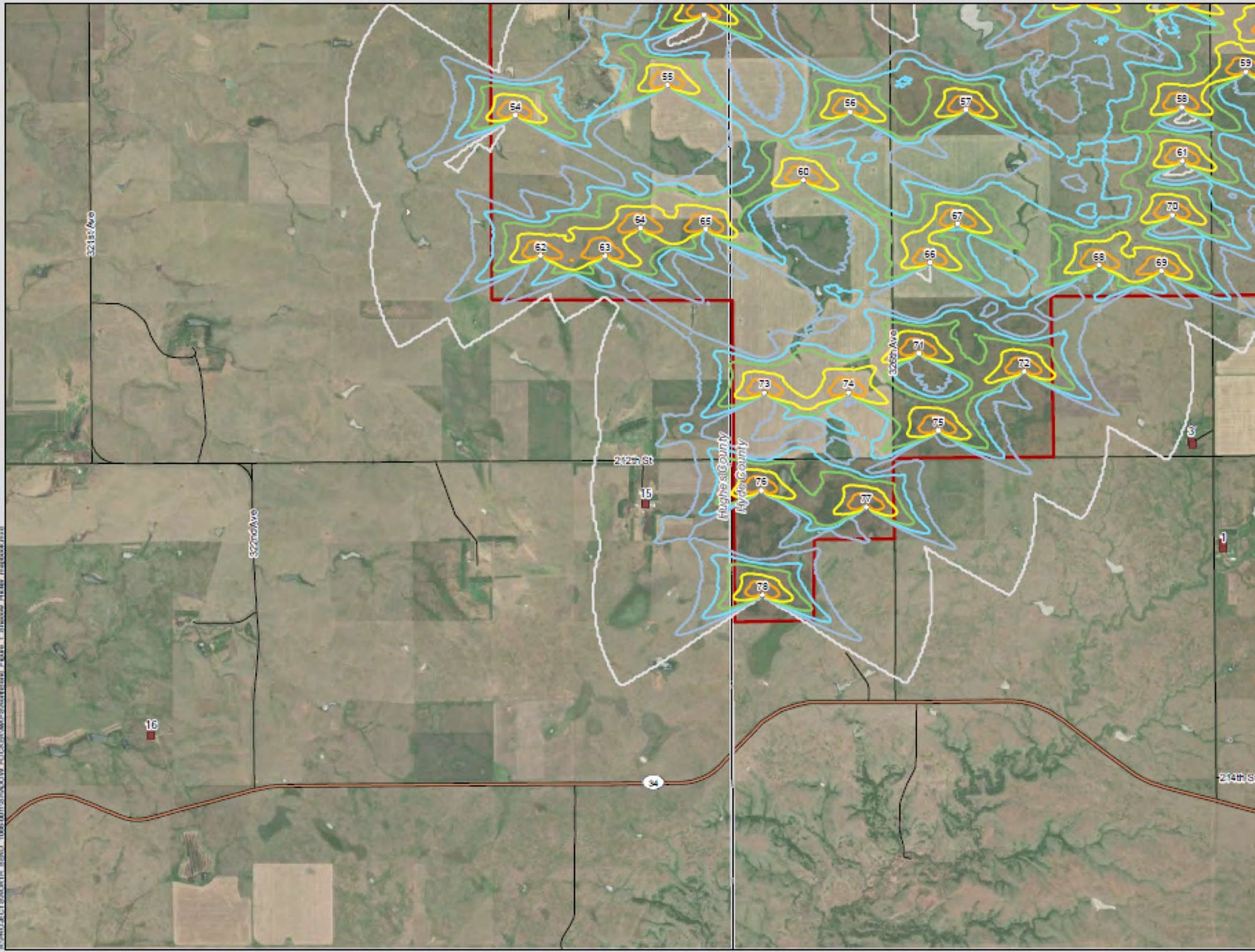




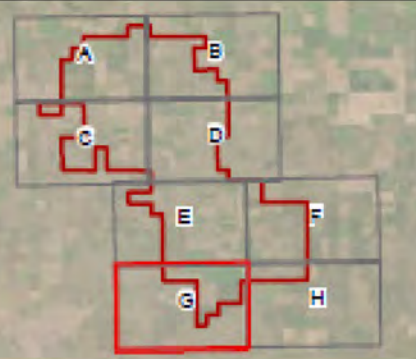
North Bend Wind Project

Figure 1G Expected Shadow Flicker Impact Area

Hughes and Hyde Counties, SD



- Project Area
- Proposed Turbine
- Sensitive Receptor**
 - Participating
 - Non-Participating
- County Boundary
- Highway/Major Road
- Local Road
- Shadow Flicker (Hours per Year)**
 - 0 - 15
 - >15 - 30
 - >30 - 50
 - >50 - 100
 - >100 - 200
 - >200



ATTACHMENT B. DETAILED SUMMARY OF WINDPRO SHADOW FLICKER ANALYSIS RESULTS

Table A-1. Detailed Summary of WindPro Shadow Flicker Analysis Results

Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Participation Status
1	451958.52	4905459.68	0:00	Non-Participant
2	451961.25	4905508.56	0:00	Non-Participant
3	451651.02	4906532.26	0:00	Non-Participant
4	451666.55	4906507.72	0:00	Non-Participant
5	452006.57	4912596.63	6:59	Non-Participant
6	456096.06	4911237.29	0:00	Non-Participant
7	454822.16	4907003.67	0:00	Participant
8	454834.31	4907004.11	0:00	Participant
9	456924.00	4903126.18	0:00	Non-Participant
10	456935.84	4903193.23	0:00	Non-Participant
11	458026.96	4909357.80	0:00	Non-Participant
12	456979.34	4911089.45	0:00	Participant
13	459894.21	4911262.03	0:00	Non-Participant
14	456174.50	4911145.59	0:00	Non-Participant
15	446161.47	4905997.12	9:38	Non-Participant
16	441158.23	4903751.87	0:00	Non-Participant
17	435412.60	4904474.20	0:00	Non-Participant
18	437506.50	4925640.83	0:00	Non-Participant
19	440821.77	4926572.35	0:00	Non-Participant
20	444986.74	4923741.15	0:00	Participant
21	442557.93	4922499.66	0:00	Non-Participant
22	442678.13	4922259.39	0:00	Non-Participant
23	440696.77	4922014.60	0:00	Non-Participant
24	437557.01	4918479.44	0:00	Participant
25	440534.66	4919290.67	2:07	Participant
26	443100.07	4918872.53	79:44	Participant
27	445445.63	4917654.54	0:00	Participant
28	445621.46	4918664.76	25:51	Participant
29	445636.78	4918674.61	26:28	Participant
30	442662.54	4914507.82	0:00	Participant
31	442582.52	4914365.18	0:00	Participant
32	440462.38	4914037.19	0:00	Non-Participant
33	443049.47	4911870.51	0:00	Non-Participant
34	442768.99	4911899.59	0:00	Non-Participant
35	444335.87	4912676.58	0:00	Non-Participant

Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Participation Status
36	445432.05	4912472.50	2:57	Participant
37	445355.76	4911622.81	7:43	Participant
38	440289.85	4924270.07	0:00	Non-Participant
39	435597.42	4906544.14	0:00	Non-Participant
40	440884.50	4923291.30	0:00	Non-Participant
41	449222.28	4927447.00	0:00	Non-Participant
42	452103.97	4916107.54	0:00	Non-Participant
43	439795.82	4924263.47	0:00	Participant
44	442457.39	4925506.86	0:00	Participant
45	441883.41	4923945.14	0:00	Participant
46	446147.85	4922206.81	4:56	Participant
47	448546.99	4915127.89	6:34	Participant
48	448560.37	4915214.35	6:25	Participant
49	450247.17	4915028.55	13:59	Participant
50	445332.30	4915443.56	0:00	Participant
51	448812.30	4920034.63	27:14	Participant

**Appendix I. A Level III Cultural Resources Inventory and Traditional Cultural Property
Survey for the North Bend Wind Project in Hughes and Hyde Counties, South Dakota**

Note to Reader: The Cultural Resources Report for the North Bend Wind Project prepared by Beaver Creek Archaeology is available upon request from:

Western Area Power Administration

Upper Great Plains Regional Office

PO Box 35800

Billings, Montana 59107-5800

Phone: 406-255-2800

**Appendix J. A Reconnaissance Architectural Survey and Viewshed Analysis of the North
Bend Wind Project in Hughes and Hyde Counties, South Dakota**

Note to Reader: A Reconnaissance Architectural Survey and Viewshed Analysis of the North Bend Wind Project in Hughes and Hyde Counties, South Dakota prepared by Beaver Creek Archaeology is available upon request from:

Western Area Power Administration

Upper Great Plains Regional Office

PO Box 35800

Billings, Montana 59107-5800

Phone: 406-255-2800

**Appendix K. Concurrence Letters from South Dakota Office of the State Historic
Preservation Officer and Crow Creek Sioux Tribe**

Casi Lathan <clathan@west-inc.com>

WEST

FW: [EXTERNAL] Re: WAPA - North Bend Wind Project, SD - request for review

1 message

Peterson, Staffan <SPeterson@wapa.gov>

Fri, Feb 11, 2022 at 9:03 AM

To: Elizabeth Lack <elack@west-inc.com>, "WILLIS Casey (ENGIE North America)" <CaseyWillis@engie.com>, Casi Lathan <clathan@west-inc.com>

Cc: "Kluth, David" <Kluth@wapa.gov>, "Gomer, Christina" <Gomer@wapa.gov>, "Russell, John" <JRussell@wapa.gov>

Hello Elizabeth - please see concurrence from the Crow Creek Sioux Tribe below. Also, our letter to the tribes requesting concurrence is attached for your records.

Best,
Staffan

From: cchistory@midstatesd.net <cchistory@midstatesd.net>**Sent:** Friday, February 11, 2022 8:13 AM**To:** Peterson, Staffan <SPeterson@WAPA.GOV>**Subject:** [EXTERNAL] Re: WAPA - North Bend Wind Project, SD - request for review

Hello, The Crow Creek Sioux Tribe THPO has reviewed the Archaeological and TCP report, the CCST agrees with the determination of "No Adverse Effect to Historic Properties"

Merle Marks
Crow Creek Sioux Tribe
THPO - Director
605.245.2221

From: "peterlengkeek" <peterlengkeek@yahoo.com>**To:** "Merle Marks" <cchistory@midstatesd.net>**Sent:** Thursday, February 10, 2022 3:47:36 PM**Subject:** Fw: WAPA - North Bend Wind Project, SD - request for review

fyi

----- Forwarded Message -----

From: Peterson, Staffan <speterson@wapa.gov>

To: peterlengkeek@yahoo.com <peterlengkeek@yahoo.com>; cchistory@midstatesd.net <cchistory@midstatesd.net>; rodneymarceaux@rst-nsn.gov <rodneymarceaux@rst-nsn.gov>; council@rst-nsn.gov <council@rst-nsn.gov>; rstthpo@rst-nsn.gov <rstthpo@rst-nsn.gov>; robertflyinghawk@gmail.com <robertflyinghawk@gmail.com>; yst.thpo@gmail.com <yst.thpo@gmail.com>; kipspottedeagle247@gmail.com <kipspottedeagle247@gmail.com>

Sent: Thursday, February 10, 2022, 09:27:42 AM CST

Subject: WAPA - North Bend Wind Project, SD - request for review

Dear Sirs - We hope this finds you well today. We are contacting you regarding the North Bend Wind project in Hughes and Hyde Counties, SD which proposes to interconnect to WAPA's transmission line. Attached is a letter summarizing our agency's efforts to comply with the National Historic Preservation Act - Sec. 106 for the project and a determination of effect. Also attached is an archaeological and Traditional Cultural Property report. Hard copies can be mailed to your office upon request. If you have any questions feel free to reach out. My contact info is below. We look forward to your response.

Thanks much,
Staffan

Staffan Peterson Ph.d. | Archaeologist & Tribal Liaison

Western Area Power Administration, Upper Great Plains Region

2900 4th Avenue North, PO Box 35800, Billings, MT 59101-1266

(0) 406-255-28131 (M) 406-598-75781 speterson@wapa.gov



WAPA to THPOs - NBW FINAL Project Letter 20220209.pdf
183K



Department of Energy
Western Area Power Administration
Upper Great Plains Customer Service Region
P.O. Box 35800
Billings, MT 59107-5800

February 9, 2022

Re: Interconnection Request for the North Bend Wind Project, Hughes and Hyde Counties, South Dakota.

Dear Tribal Leader:

This letter is a follow up to our letter initiating consultation with your office dated Jan. 5, 2021, regarding Western Area Power Administration's (WAPA) interconnection request from ENGIE LLC for their proposed North Bend Wind Project (Project). In that letter, WAPA requested general information from you regarding the presence of properties of traditional religious and cultural importance (PTRCI) and traditional cultural properties (TCP) within the Project footprint. This letter summarizes WAPA's efforts to date to comply with the requirements of the National Historic Preservation Act for the undertaking.

The project location is three miles south of the town of Harrold, in Hughes County, South Dakota. The proposed Project would interconnect with WAPA's existing Fort Thompson to Oahe 230-kV transmission line. The proposed project's overall location and design has not changed from that described in our initial letter, except for minor adjustments to avoid effects to archaeological resources, as described below.

Tribal Involvement in Survey and Ongoing Consultation

On Jan 5, 2021, WAPA reached out to eleven Native American tribes initiating government-to-government consultation, pursuant to Section 106 of the National Historic Preservation Act, seeking the tribes' views or concerns about the proposed Project. In response, representatives from the Crow Creek Sioux Tribe, the Rosebud Sioux Tribe, and the Yankton Sioux Tribe requested participation in the TCP field studies. Tribal Cultural Specialists Odell St. John, Jr. (Crow Creek Sioux Tribe), Dwight Luxon (Rosebud Sioux Tribe), and Lonnie Provost (Yankton Sioux Tribe) completed the TCS survey between Aug. 3-12, 2021. The results of the survey, as presented in the attached report and in this letter, are being shared with the tribes that have expressed interest in consultation for this project, for review and comment.

Efforts to Identify Historic Properties

Previously, WAPA proposed an area of potential effect (APE) for potential ground disturbance and visual effects, in consultation with the South Dakota State Historic Preservation Office (SHPO). WAPA received concurrence from the SHPO for the proposed APE in a letter dated Jan. 29, 2021. ENGIE's contractor Beaver Creek Archaeology has since completed both archaeological and architectural field studies and reporting. An archaeological and TCP report of investigations titled "*A Level III Intensive Cultural Resource Inventory and Traditional Cultural*

Property Survey for the North Bend Wind Project in Hughes and Hyde Counties, South Dakota” is hereby submitted to your office for your review and comment (att.).

The records search for the archaeological study identified one unevaluated prehistoric site and five architectural sites (including one eligible bridge, two ineligible bridges, one unevaluated structure, and one ineligible structure) located within a 1.5-mile buffer of the preliminary project area. No previously recorded cultural resources were identified within the APE. During the 2021 intensive pedestrian survey, 13 new cultural resources were encountered, including 11 prehistoric stone feature sites and two architectural sites. Each of the stone feature sites has been recommended as eligible for nomination to the National Register of Historic Places (NRHP) and avoidance measures are recommended. The two architectural sites have been recommended as ineligible for nomination to the NRHP and no specific avoidance measures are recommended. Additionally, 30 TCPs were identified by tribal representatives during the TCP inventory, including both physical and non-physical surface expressions and an isolated find. As noted in the report, three TCP sites were identified on the one parcel of state land associated with the project (BCA21-1304-Sites 09, 33, and 33a). All TCPs identified have been documented on a TCP form. WAPA agrees with all recommendations of NRHP eligibility contained in that report.

A report of investigations for architectural properties titled “*A Reconnaissance Architectural Survey and Viewshed Analysis of the North Bend Wind Project in Hughes and Hyde Counties, South Dakota*” was also completed. The records search for this study identified forty-four buildings and structures of historic age, and these were recorded with SHPO. Five of these sites were either previously determined eligible or were recommended NRHP-eligible or potentially NRHP eligible-unevaluated. All five of these resources are sited between 0.34 to 1.5 miles from at least one proposed NBWP turbine location. No architectural resources were identified on state-owned land. WAPA agrees with all recommendations of NRHP eligibility made in this report. This architectural report is available for review upon request.

Visual and Auditory Effects

In order to assess potential visual and auditory effects to architectural properties, viewshed and auditory analyses were completed, as described in the architectural report. The viewshed analysis for this project resulted in a finding that five eligible, listed, or potentially eligible-unevaluated properties were within the APE the project. These properties were also identified as being within the viewshed of the of existing nearby Triple H wind project. The architectural survey determined that the Chad Husted Farmstead Barn (HU00000616 at Site ID:26249), the Paul Knox Farmstead House (HE00200002 at Site ID: 26221), and the Klebsch Farmstead Barn (HE01400003 at Site ID: 69189) are surrounded by modern structures and also views of the existing Triple H project, impacting integrity of setting at each of these locations. The Misterek Farmstead Barn (HU01400002 at Site ID: 69132) is surrounded by historic structures that are dilapidated due to continued neglect, impacting the integrity of its setting. At all four farmstead properties, existing vegetative screening (tree rows and shelterbelts) minimizes the visibility of the proposed turbines. Bridge No. 35-010-366 (HE00000009 at Site ID: 48510) lacks such screening from views of the project. However, while a visual impact on a historic bridge can diminish integrity of setting, it does not in itself diminish eligibility, unless the relationship of the bridge to the topographic feature necessitating its construction is also impacted. The project would not alter this relationship, nor would it create any physical impacts to the bridge. Therefore, the project would not have any adverse visual effects on any eligibility-conferring aspects of architectural properties within the APE.

The auditory analysis resulted in a finding that the project will not generate sound greater than background noise on any of the eligible, listed, or potentially eligible–unevaluated architectural properties within the APE. Therefore, the project would not have any adverse acoustic effects on any eligibility-conferring aspects of such properties.

Avoidance, Minimization, and Mitigation Measures

As noted in the archaeological report, the project footprint has been modified so that impacts to all archaeological and TCP sites will be avoided during construction activities, and will have at least a 50' buffer marked with construction fencing. As the project would not have any adverse physical, visual, or auditory effects on for the architectural resources identified, no avoidance, minimization, or mitigation measures are necessary for those properties.

Determination of Effect

Because all eligible, listed, or potentially eligible-unevaluated archaeological and TCP sites within the APE will be avoided by the project, and because all eligible, listed, or potentially eligible–unevaluated architectural properties within the APE will not experience any adverse effects as a result of this project, WAPA has determined that the undertaking will have no adverse effect on historic properties.

Pursuant to 36 CFR 800.4, WAPA now requests your concurrence with its determinations of eligibility and effect for this undertaking. If you have any questions, please feel free to contact me at 406-255-2813 or speterson@wapa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'SP', is centered below the text 'Sincerely,'.

Staffan Peterson
Archaeologist and Tribal Liaison

Attachment:

Report: A Level III Intensive Cultural Resource Inventory and Traditional Cultural Property Survey for the North Bend Wind Project in Hughes and Hyde Counties, South Dakota

Cc:

David Kluth, WAPA

Brian O'Donnchadha, WAPA



January 31, 2022

Mr. Staffan Peterson
Department of Energy
Western Area Power Administration
PO Box 35800
Billings, MT 59107-5800

SECTION 106 PROJECT CONSULTATION

Project: 21011101 IF - Interconnection Request for the North Bend Wind Project
Location: Hughes and Hyde Counties
(WAPA)

Dear Mr. Peterson:

Thank you for the opportunity to comment on the above referenced project pursuant to 54 U.S.C. 306108, also known as Section 106 of the National Historic Preservation Act of 1966 (as amended). The South Dakota Office of the State Historic Preservation Officer (SHPO) concurs with your determination regarding the effect of the proposed undertaking on the non-renewable cultural resources of South Dakota.

On January 31, 2022, we received your letter dated January 27, 2021, containing your agency's determinations of eligibility for the properties recorded during identification efforts and the determination of effect for the proposed undertaking. Previously, in an email dated November 22, 2021, David Kluth of Western Area Power Administration supplied a digital copy of the report titled "A Level III Intensive Cultural Resource Inventory and Tribal Cultural Property Survey for the North Bend Wind Project in Hughes and Hyde Counties, South Dakota" by Amanda Baker of Beaver Creek Archaeology. Additionally, in an email dated January 25, 2021, you supplied a digital copy of the report titled "A Reconnaissance Architectural Survey and Viewshed Analysis of the North Bend Wind Project in Hughes and Hyde Counties, South Dakota" by Emilie S. Arnold and Amanda Baker of Beaver Creek Archaeology.

Ms. Baker's 2021 intensive cultural resource inventory and tribal cultural property survey report indicates that an archaeological survey was conducted in 2020 of the preliminary turbine layout followed by an archaeological and Traditional Cultural Property (TCP) survey of the finalized project alignment and ancillary features. Ms. Arnold's and Ms. Baker's architectural survey report indicates that 44 structures of historic age were identified within the Area of Potential Effects (APE). Your letter indicates that WAPA agrees with all recommendations contained within the reports regarding the eligibility of properties to the National Register of Historic Places.

Based upon the information provided, SHPO has the following comments and concurrences regarding properties recorded during the identification efforts:

- 39HU0078 was previously recorded and revisited during the preliminary 2020 survey and was not fully evaluated for listing in the National Register. 39HU0078 should be considered Unevaluated for listing in the National Register of Historic Places.
- The following 10 archaeological sites were newly recorded during the preliminary 2020 survey and should be considered Eligible for listing in the National Register of Historic Places:

39HE0091	39HE0092	39HE0093	39HE0094	39HU0452
39HU0453	39HU0454	39HU0455	39HU0458	39HU0459
- 39HU0456 and 39HU0457 were newly recorded during the preliminary 2020 survey but were not fully evaluated for listing in the National Register. 39HU0456 and 39HU0457 should be considered Unevaluated for listing in the National Register of Historic Places.
- 39HU0448 was newly recorded during the 2021 finalized layout survey and should be considered Not Eligible for listing in the National Register of Historic Places.
- The following 11 archaeological sites were newly recorded during the 2021 finalized layout survey and should be considered Eligible for listing in the National Register of Historic Places:

39HE0083	39HE0084	39HE0085	39HE0086
39HE0087	39HE0088	39HE0089	39HE0090
39HU0450	39HU0451		39HU0449

Please note that Table 1 and page 20 of Ms. Baker's 2021 report refer to 39HU0449, 39HU0450, and 39HU0451 as 39HE449, 39HE450, and 39HE451, respectively

- The following 30 Traditional Cultural Properties were newly recorded during the 2021 finalized layout survey and should be considered Eligible for listing in the National Register of Historic Places:

	BCA21-1304-Site2	BCA21-1304-Site5
BCA21-1304-Site5a	BCA21-1304-Site6	BCA21-1304-Site7
BCA21-1304-Site8	BCA21-1304-Site9	BCA21-1304-Site12
BCA21-1304-Site14	BCA21-1304-Site14a	BCA21-1304-Site16
BCA21-1304-Site17	BCA21-1304-Site18	BCA21-1304-Site18a
BCA21-1304-Site19	BCA21-1304-Site21	BCA21-1304-Site21a
BCA21-1304-Site22	BCA21-1304-Site23	BCA21-1304-Site25
BCA21-1304-Site26	BCA21-1304-Site26a	BCA21-1304-Site27
BCA21-1304-Site27a	BCA21-1304-Site29	BCA21-1304-Site31
BCA21-1304-Site32	BCA21-1304-Site33	BCA21-1304-Site33a
BCA21-1304-IF1		

Please note that Table 1 of Ms. Baker's 2021 report lists the site numbers for the TCPs as BCA21-1333-Site# instead of BCA21-1304-Site#

- 39 structures identified in Ms. Arnold's and Ms. Baker's architectural survey report were recommended Not Eligible for listing in the National Register, while 2 structures were recommended Eligible, and 3 structures remain unevaluated. Survey data for all properties identified in the architectural survey report were entered into SHPO's architectural survey site CRGRID in the fall of 2021, and SHPO agreed with the surveyor's recommendations through the CRGRID site forms. Your letter dated January 27, 2022, agrees with the recommendations of eligibility in Ms. Arnold's and Ms. Baker's report, and SHPO concurs with your determination of eligibility for these structures.

Five architectural properties located within the APE that remain unevaluated or have been determined eligible for the National Register will not be impacted by ground disturbing activities but lie within the 1.5 mile viewshed of the proposed wind farm. Based on the information provided, HE00000009 (Bridge No. 35-010-366) has been determined eligible under criterion C for its architectural qualities, and therefore its eligibility will not be adversely affected by changes to the viewshed. The other four structures--the Misterek Farmstead Barn (HU01400002), Chad Husted Farmstead Barn (HU00000616), Paul Knox Farmstead House (HE00200002), Klebsch Farmstead Barn (HE01400003)--are individual structures located on farm sites where the historic settings have been altered by the addition of modern infrastructure. The visual impacts of the wind farm on these sites would be minimal given the already disturbed viewshed of for these structures.

Therefore, SHPO concurs with your determination of "No Adverse Effect" for the proposed undertaking, provided the following stipulations are met: 1) All archaeological properties and TCPs which are Eligible for listing in the National Register of Historic Places or are currently unevaluated for listing in the National Register of Historic Places will be avoided by a minimum of a 50-foot buffer marked with construction fencing. 2) Changes in the location or nature of project activities, such as the need to construct additional access roads or other ancillary features, will require the submission of additional documentation pursuant to 36 C.F.R. § 800.4 and 36 C.F.R. § 800.11.

Please continue to engage in meaningful consultation with our Tribal Partners regarding the proposed undertaking and its effects on historic properties. Concurrence of the SHPO does not relieve the federal agency official from consulting with other appropriate parties, as described in 36 C.F.R. § 800.2(c).

Please note that, if any properties which were recorded during the Tribal Cultural Property Survey contain archaeological components, those properties also should be recorded as archaeological sites. Ms. Baker's 2021 report indicates that BCA21-1304-Site29 and BCA21-1304-IF1 contained lithics. If these TCPs or any other TCPs do contain an archaeological component, please record the archaeological component on an Archaeological Research Center Site Form and obtain a Smithsonian Institution Trinomial site number for the property.

If historic properties are discovered or unanticipated effects on historic properties are found after the agency official has completed the Section 106 process, the agency official shall avoid, minimize or mitigate the adverse effects to such properties and notify the SHPO and Indian

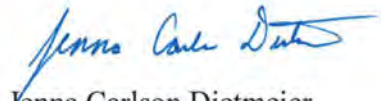
tribes that might attach religious and cultural significance to the affected property within 48 hours of the discovery, pursuant to 36 C.F.R. § 800.13.

If a project-specific unanticipated discoveries plan will be developed for the North Bend Wind Project, SHPO requests the opportunity to consult and provide comment on the plan.

Should you require any additional information, please do not hesitate to contact Jenna Carlson Dietmeier at Jenna.CarlsonDietmeier@state.sd.us or at (605)773-8370.

Sincerely,

Ted M. Spencer
State Historic Preservation Officer



Jenna Carlson Dietmeier
Review & Compliance Coordinator

CC: David Kluth - Western Area Power Administration
Jon Thurber - South Dakota Public Utilities Commission
Darren Kearney - South Dakota Public Utilities Commission
Merle Marks - Tribal Historic Preservation Officer, Crow Creek Sioux Tribe
Ione Quigley - Tribal Historic Preservation Officer, Rosebud Sioux Tribe
Kelli Huapapi - Tribal Historic Preservation Officer, Yankton Sioux Tribe
Jane Watts - Archaeological Research Center, Rapid City
Brian Huot - Archaeological Research Center, Rapid City

Appendix L. Scoping Documentation



Department of Energy
Western Area Power Administration
Upper Great Plains Customer Service Region
P.O. Box 35800
Billings, MT 59107-5800
1/6/21

B0401.BL

Dear Customers and Interested Parties:

This letter is to notify you of the proposed North Bend Wind Project (Project) and to request your input on the Project. The Project would involve construction of a 200 megawatt (MW) wind farm generating facility that includes approximately 90 turbines and associated pads. Other project components would include an underground power collection system, a new substation, a new overhead transmission line, access roads, and a maintenance and operation center. The project would be located on private land approximately four (4) miles south of Harrold, in Hughes and Hyde counties, South Dakota (see enclosed map).

The Project would interconnect with Western Area Power Administration's (WAPA) Fort Thompson – Oahe 230 kV transmission line. As a result, WAPA will provide federal oversight of the preparation of an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). 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, and tribal governments to identify issues and alternatives that will help WAPA define the scope of the EA. Due to the COVID-19 pandemic, an online virtual public scoping meeting 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 Thursday, January 28, 2021, from 6:30 to 8:00 p.m. CST, via WebEx. Participants can join by computer, telephone, or other device (see enclosed instructions). The scoping meeting will be recorded.

Comments may be submitted in the following ways:

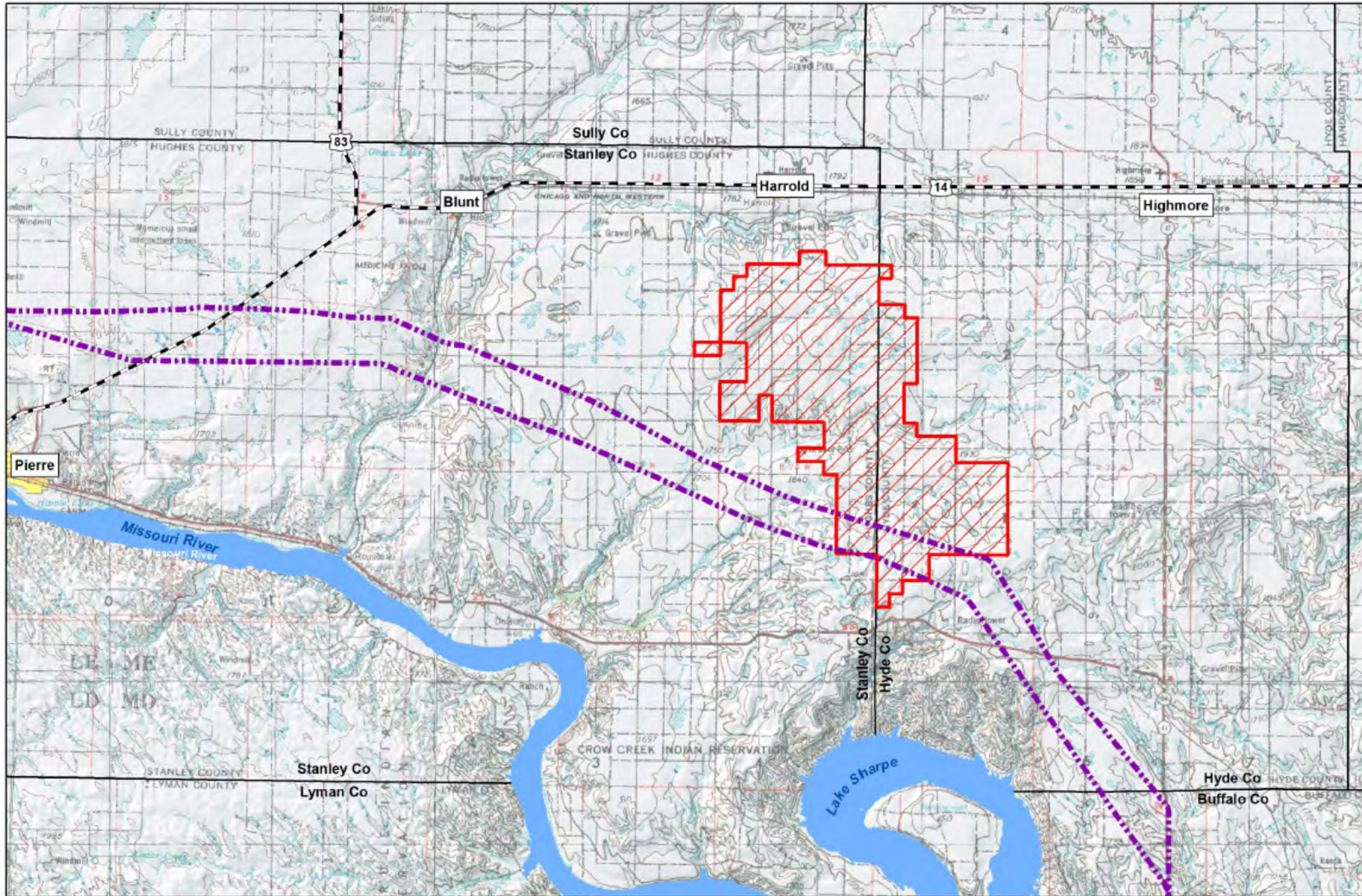
- By mail to:
Western Area Power Administration
Attn: Ms. Christina Gomer
2900 4th Avenue North
Billings, MT 59101
- By phone by calling:
(406) 255-2811 to speak with a WAPA representative
or
(605) 782-8199 to leave a voicemail.
- By email to gomer@wapa.gov
- By participating in the virtual public scoping meeting.
- By completing on online comment form available at:
<https://www.wapa.gov/regions/UGP/Environment/Pages/NorthBendWind.aspx>

For your input to be considered during preparation of the draft EA, WAPA requests comments be postmarked no later than **March 1, 2021**. 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
NEPA Coordinator

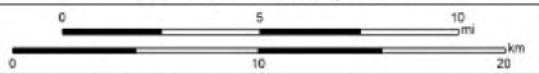
Enclosures - 3
Project Area Map
Virtual Meeting Instruction Sheet
Comment Form



North Bend Wind Project

Location

Data Source: ESRI USA Topo 2013
 Coordinate System: UTM, NAD83, zone 14N
 Map produced on 12/22/2020 by T. Thorn



Map Features

- Project Area**
- WAPA 230 kV Fort Thompson-Oahe Transmission Lines**
- County Boundaries**
- Major Lakes/Rivers**
- US Highways**



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here

Ms. Christina Gomer
NEPA Coordinator - Upper Great Plains Region
Western Area Power Administration
2900 4th Avenue North
Billings, MT 59101

Instructions for the Online Virtual Public Scoping Meeting North Bend Wind Project Environmental Assessment

Please review the following instructions, tips, and ground rules below in advance of the meeting.

Virtual Meeting Instructions:

Those interested in participating in the virtual meeting can do so in two ways, both of which will provide opportunities to make a public comment:

- Video: Joining by computer, smartphone, or tablet will allow participants to both see and hear the presentation. We encourage users to test the connection prior to the event to ensure best results.
 - For computer users, Google Chrome or Mozilla Firefox gives the best results.
 - Users of other devices will likely need to download the free Webex app from the Apple App Store or the Google Play Store.
- Audio: Joining by phone will allow participants to hear the presentation but not see it:



Public Scoping Meeting

6:30 pm – 8:00 pm CST, Thursday, January 28, 2021

Video (preferred):

<https://meethdr.webex.com/meethdr/j.php?MTID=m41811c824f1a8488b3e50f2810463225>

Meeting number (access code): 146 362 5508

Meeting password: ZPu3bt3MpC6

Call in only:

Phone: 1-408-418-9388

Meeting number (access code): 146 362 5508

Virtual Meeting Tips:

- The meeting materials (presentations and maps) will be available for review prior to the meeting. These materials can be accessed at <https://www.wapa.gov/regions/UGP/Environment/Pages/NorthBendWind.aspx>
- Prior to the meeting, access the Webex link above and download any needed software or click to participate via web browser. This may take a few minutes, so it is best to download software in advance of the meeting.
- To hear audio when connecting through the Webex link, please make sure the volume on your computer speakers is on and no programs with audio features (e.g., Skype, Pandora, YouTube, music players) are open that may interfere with the online meeting audio.
- The meeting will be recorded for notetaking purposes.

Ground Rules:

- Attendees will be muted during the presentation to help minimize sound issues.
- The meeting will begin with introductions and a presentation.
- Following the presentation, attendees can ask questions or submit a formal comment.
- Following the presentation, attendees can ask questions or submit a formal comment by “raising their hand” (see below) to ask a question or comment verbally, or use the chat tool for written questions and comments. For those joining by phone only, use *3 to raise your hand to be called on to comment verbally.



- If submitting a comment verbally or via chat, WAPA requests that you provide your name and the organization you represent, if applicable.
- Communications from the public regarding this project, including commenters' names, will become part of the public record. If you wish for WAPA to withhold your name and/or other personally identifiable information, please state this prominently at the beginning of your comment. Persons requesting such confidentiality should be aware that, under the Freedom of Information Act, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets.
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- Comments posted after the close of a designated comment period (ending March 1, 2021) will be accepted but may not be able to be given full consideration.
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Department of Energy
Western Area Power Administration
Upper Great Plains Customer Service Region
P.O. Box 35800
Billings, MT 59107-5800

1/6/21

B0401.BL

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WAPA is announcing a public scoping period for the Project. The scoping period provides an opportunity for the general public, government agencies, and tribal governments to identify issues and alternatives that will help WAPA define the scope of the EA.

Due to the COVID-19 pandemic, an online virtual agency scoping meeting will be held to provide an opportunity for interested parties to discuss the Project with resource specialists. The meeting will be held on Thursday, January 28, 2021, from 10:00 a.m. to 12:00 p.m. CST, via WebEx. An online virtual public scoping meeting will be held on Thursday, January 28, 2021, from 6:30 to 8:00 p.m. CST, via WebEx. Participants can join by computer, telephone, or other device (see enclosed instructions). Agencies are invited to attend one or both meetings.

Comments may be submitted in the following ways:

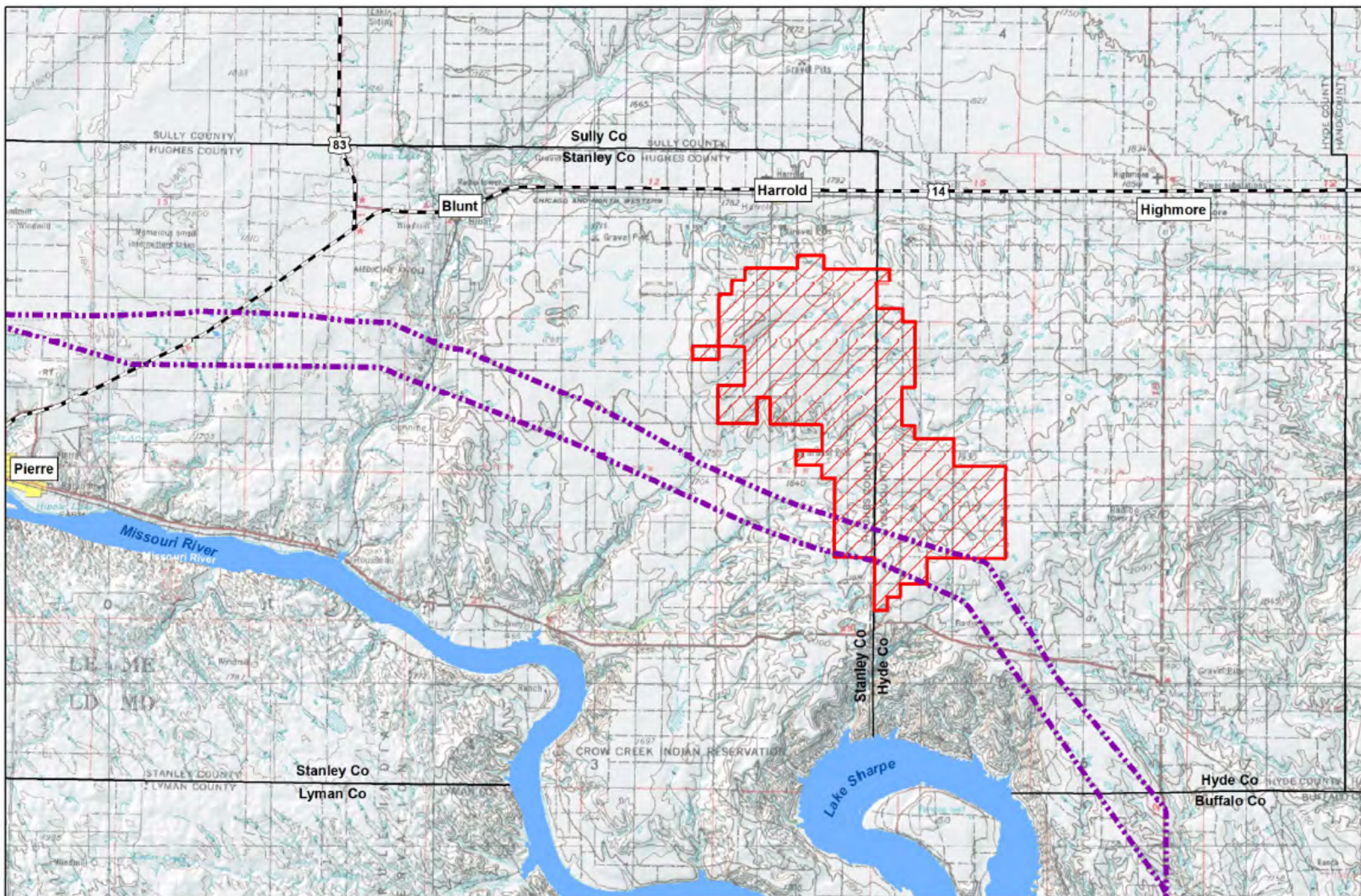
- By mail to:
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Attn: Ms. Christina Gomer
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(406) 255-2811 to speak with a WAPA representative
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Christina Gomer
NEPA Coordinator

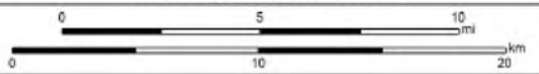
Enclosures - 3
Project Area Map
Virtual Meeting Instruction Sheet
Comment Form



North Bend Wind Project

Location

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 Map produced on 12/22/2020 by T. Thorn



Map Features

- Project Area**
- WAPA 230 kV Fort Thompson-Oahe Transmission Lines**
- County Boundaries**
- Major Lakes/Rivers**
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Agency Scoping Meeting

10:00 am – 12:00 pm, Thursday CST, January 28, 2021

Video (preferred):

<https://meethdr.webex.com/meethdr/j.php?MTID=m7d06d343dc6818498f9e122499378193>

Meeting number (access code) 146 580 9672

Meeting password: P4HxJmb3KX5

Call in only:

1-408-418-9388

Meeting number (access code) 146 580 9672

Public Scoping Meeting

6:30 pm – 8:00 pm, Thursday CST, January 28, 2021

Video (preferred):

<https://meethdr.webex.com/meethdr/j.php?MTID=m41811c824f1a8488b3e50f2810463225>

Meeting number (access code): 146 362 5508

Meeting password: ZPu3bt3MpC6

Call in only:

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Ms. Christina Gomer
NEPA Coordinator - Upper Great Plains Region
Western Area Power Administration
2900 4th Avenue North
Billings, MT 59101

Capital Journal

AFFIDAVIT OF PUBLICATION

State of South Dakota, County of Hughes

Jackie Odom of said county, being, first duly sworn, on oath says: That he/she is the publisher or an employee of the publisher of the Capital Journal, a daily newspaper published in the City of Pierre in said County of Hughes and State of South Dakota; that he/she has full and personal knowledge of the facts herein stated, that said newspaper is a legal newspaper as defined in SDCL 17-2-2.1 through 17-2-2.4 inclusive, that said newspaper has been published within the said County of Hughes and State of South Dakota, for at least one year next prior to the first publication of the attached public notice, and that the legal/display advertisement headed Public Input Encouraged

a printed copy of which, taken from the paper in which the same was published, and which is hereto attached and made a part of this affidavit, was published in said newspaper for 8 successive week(s) to wit:

01/12/2021 01/14/2021 01/16/2021 01/19/2021 01/21/2021
01/23/2021 01/26/2021 01/28/2021

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Signed: Jackie Odom

subscribed and sworn to before me this 28th day of January 2021

Maq. Baker

Notary Public in and for the County of Hughes, South Dakota.
My Commission expires 02/19/2021

Capital Journal

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SNAXLP 18120

8tdly 1/12, 1/14, 1/16, 1/19,
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Video (preferred):
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Meeting number (access code): 146 362 5508

Meeting password:
ZPu3bt3MpC6

Call in only: Phone: 1-408-418-9388; Meeting number (access code): 146 362 5508

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 phone to (406) 255-2811

By voicemail to (605) 782-8199

By email to gomer@wapa.gov

Comments should be post-marked no later than March 1, 2021.

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Highmore Herald. 2021. "Public Input Encouraged!" *Highmore Herald*, Highmore, South Dakota. January 14, 2021, pp. 6.

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Highmore Herald. 2021. "Public Input Encouraged!" *Highmore Herald*, Highmore, South Dakota.
January 21, 2021, pp. 2.

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Highmore Herald. 2021. "Public Input Encouraged!" *Highmore Herald*, Highmore, South Dakota. January 28, 2021, pp. 9.

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