

LAW OFFICES

Lynn, Jackson, Shultz & Lebrun, P.C.

LAWYERS ALSO ADMITTED IN MINNESOTA, IOWA, NORTH DAKOTA, AND WYOMING

www.lynnjackson.com

Member of Lex Mundi

A Global Association of 125 Independent Law Firms

135 E. COLORADO BOULEVARD

SPEARFISH, SD 57783-2755

605-722-9000

FAX 605-722-9001

909 St. JOSEPH STREET

SUITE 800

RAPID CITY, SD 57701-3301

605-342-2592

FAX 605-342-5185

110 N. MINNESOTA AVENUE

SUITE 400

SIOUX FALLS, SD 57104

605-332-5999

FAX 605-332-4249

REPLY TO: Sioux Falls 605-332-5999

From the office of Miles F. Schumacher

e-mail address: mschumacher@lynnjackson.com

July 29, 2019

Via Electronic Filing

Ms. Patricia Van Gerpen
Executive Director
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501

Re: Docket #EL19-003
Application to the SD PUC for a Facility Permit to Construct
A 300 megawatt Wind Facility

Dear Ms. Van Gerpen:

Pursuant to Condition No. 41 (a)(b) and (c), Crowned Ridge Wind LLC (Crowned Ridge) submits its 30 day prior to construction compliance filings. Crowned Ridge plans to start construction on August 29, 2019.

Based on the final sound report, Crowned Ridge notes that turbine CR-49 has been permanently dropped from the array to ensure compliance with the sound requirements under all construction of turbine scenarios.

Based on the final sound report, Crowned Ridge Wind, II LLC (Crowned Ridge II) will file a letter explaining that turbine CR11-126 has been removed to ensure compliance, and will only be used if receptor CR1-C11-NP, who is actually in the Crowned Ridge II footprint, becomes a participant. Crowned Ridge II will also shift turbine CR11-133 50 feet to the east to ensure Crowned Ridge is in compliance with sound requirements.

Turbine CR-Alt 22 was been shifted approximately 33 feet to the south for constructability purposes.

020719

Ms. Patricia Van Gerpen
July 29, 2019
Page 2

Last, turbine CR-16 is a Hessler alternate turbine. In the event this alternate turbine location is allowed as a primary turbine location consistent with Condition No. 27, turbine CR-16 will be curtailed for 13 hours on an annual basis to ensure shadow flicker is below the 30 hr/year threshold at receptor CR1-C61-NP

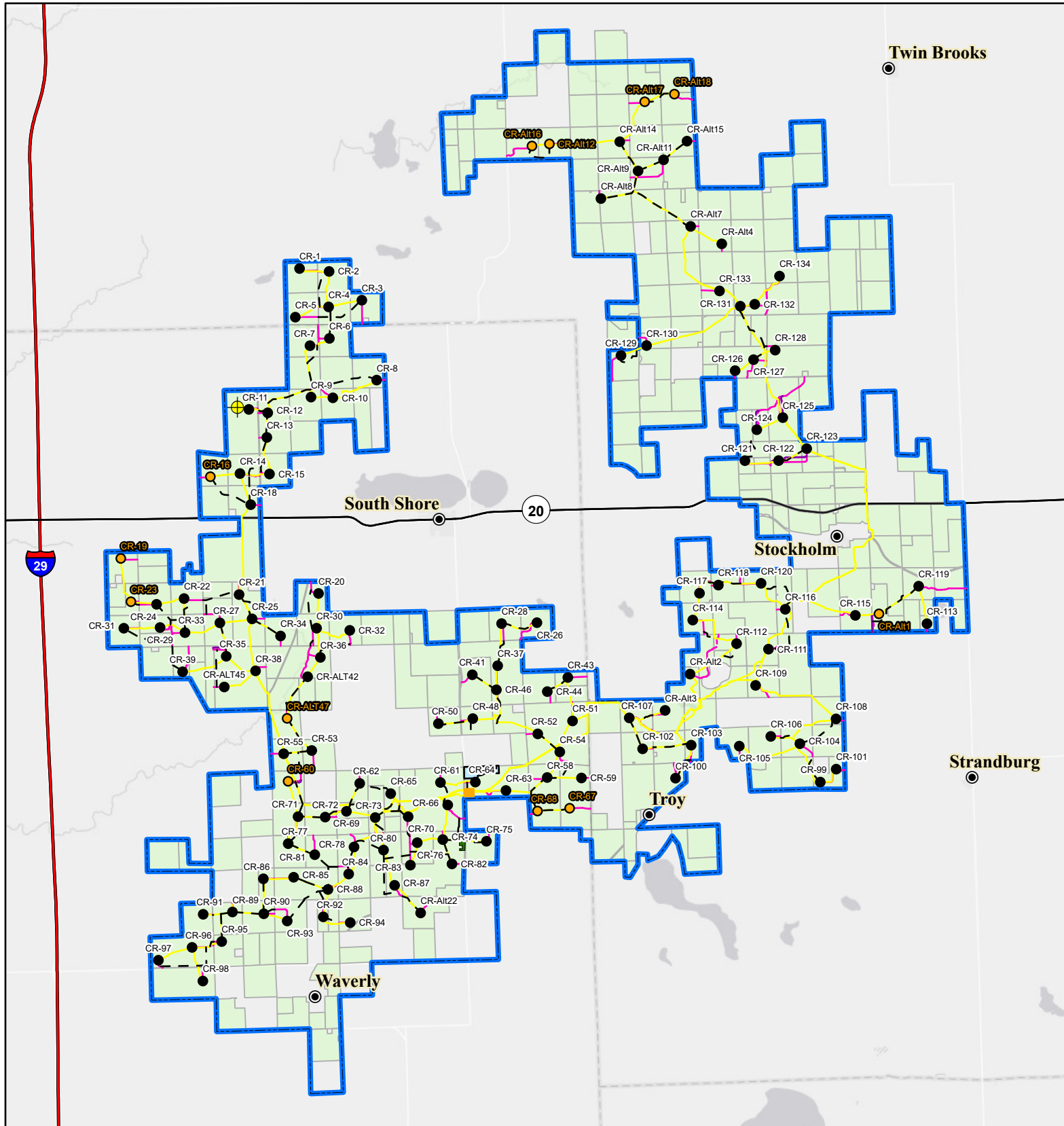
Thank you.

Yours very truly,

LYNN, JACKSON, SHULTZ & LEBRUN, P.C.



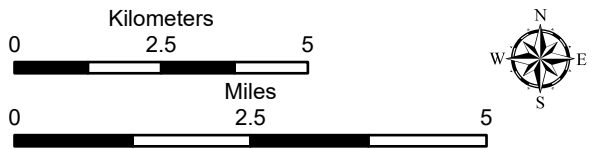
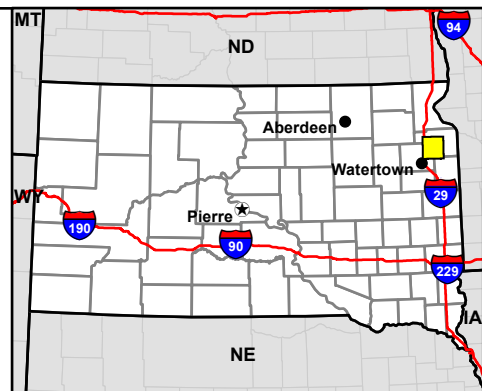
Miles F. Schumacher
MFS:kab
Enclosure



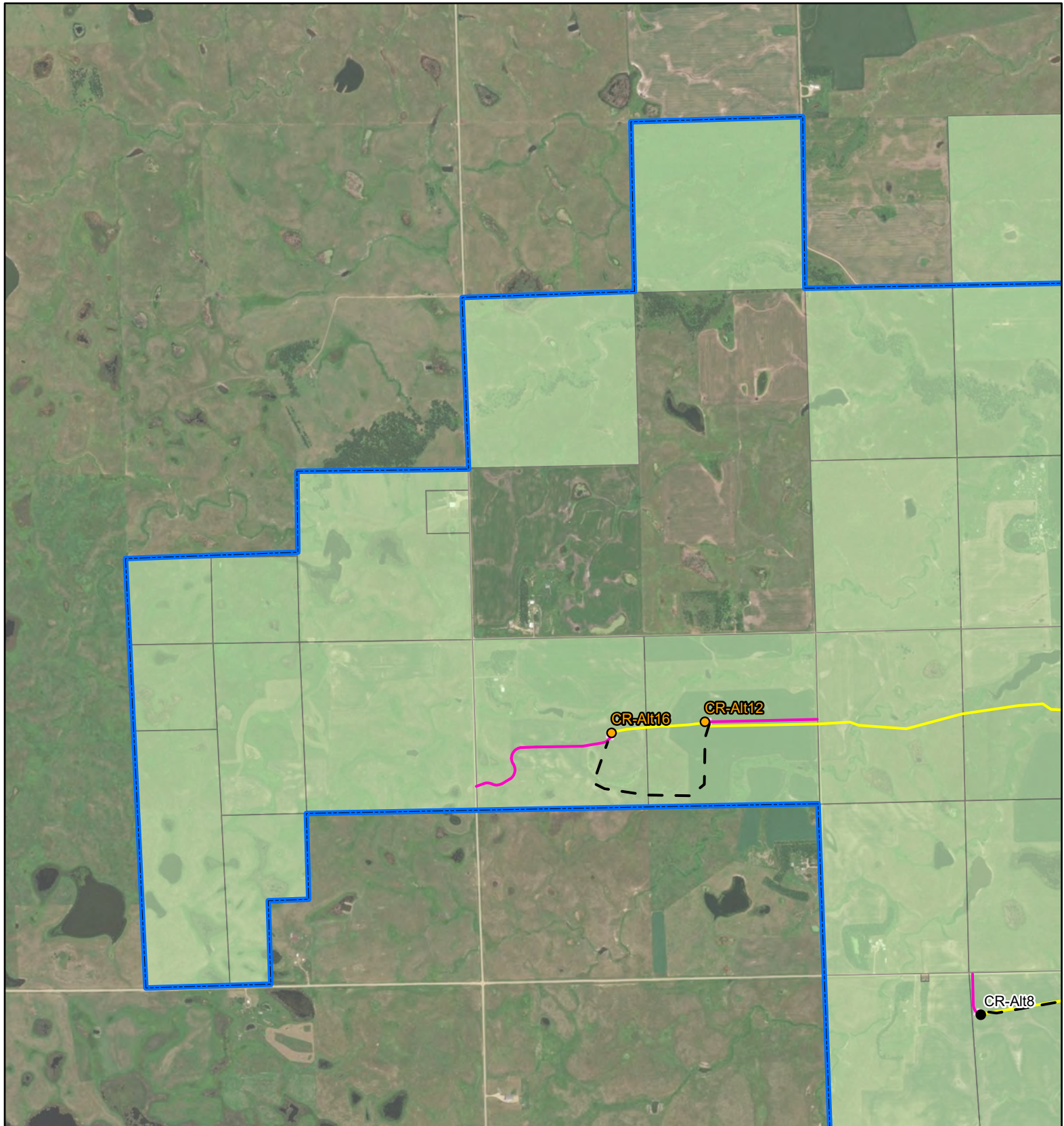
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- City
- MET Tower
- Crane Path
- Access Road
- Alternate Access Road
- Collection Line
- Interstate Highway
- State Highway
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Participating Landowner
- Project Boundary

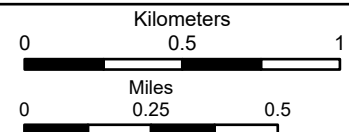
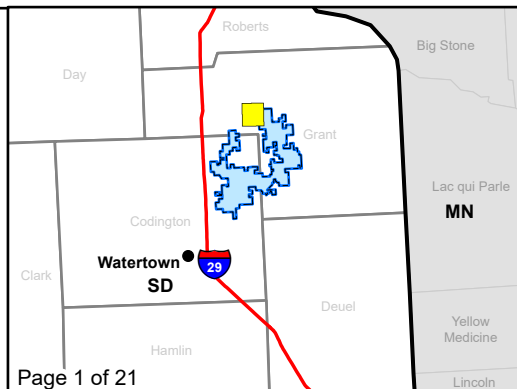


Base Map: World Light Gray Canvas Base
 Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
 Codington, Deuel, and Grant Counties, South Dakota
 020721
 Projection: NAD 1983 UTM Zone 14N
 SWCA ENVIRONMENTAL CONSULTANTS

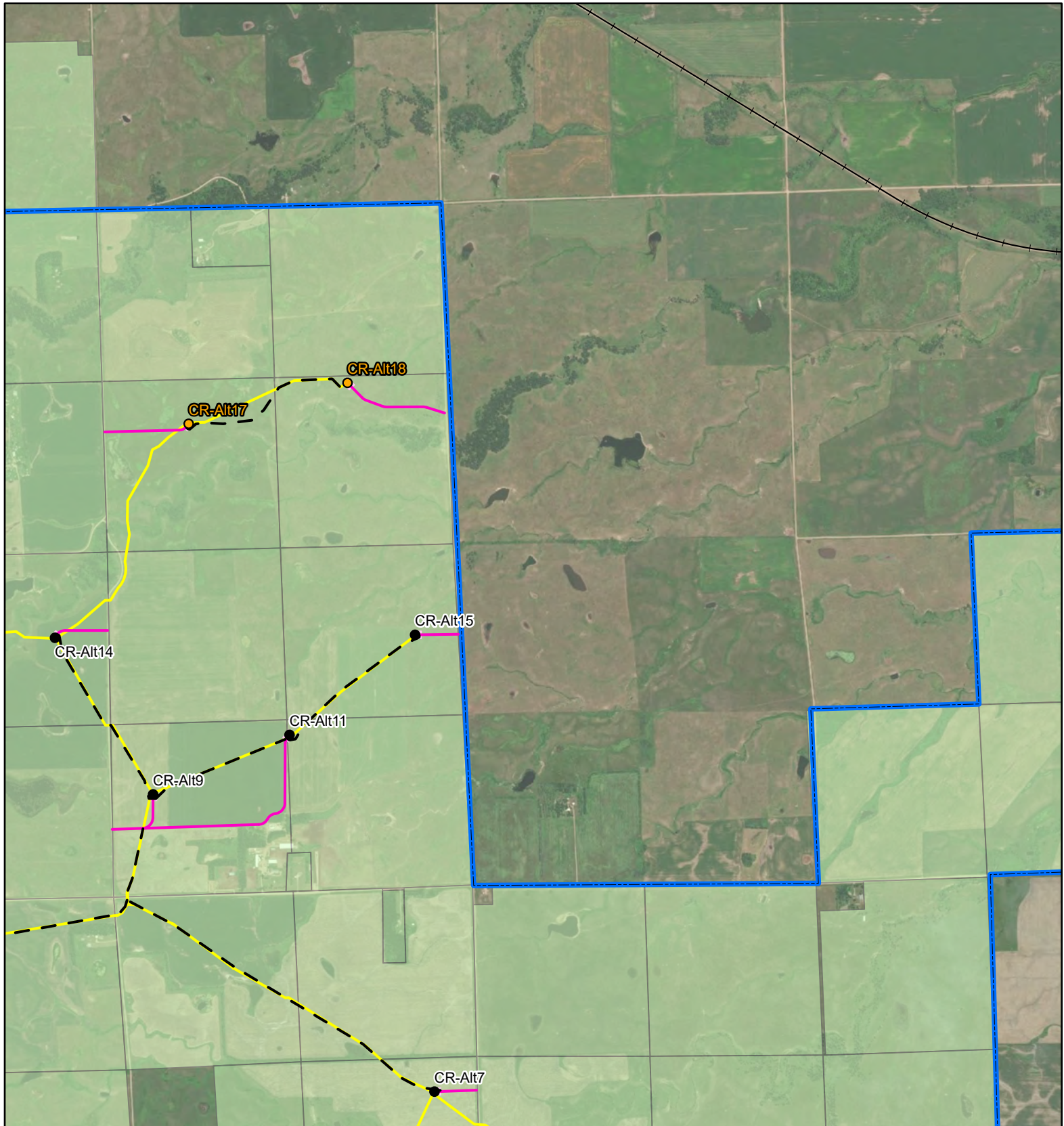


CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

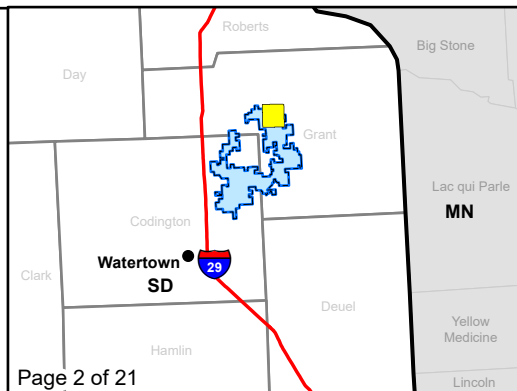


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Antelope Valley (1973),
Twin Brooks (1973)
Township/Range: T120N, R51W,
T120N, R50W
Grant County, South Dakota

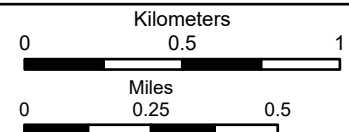


CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Page 2 of 21



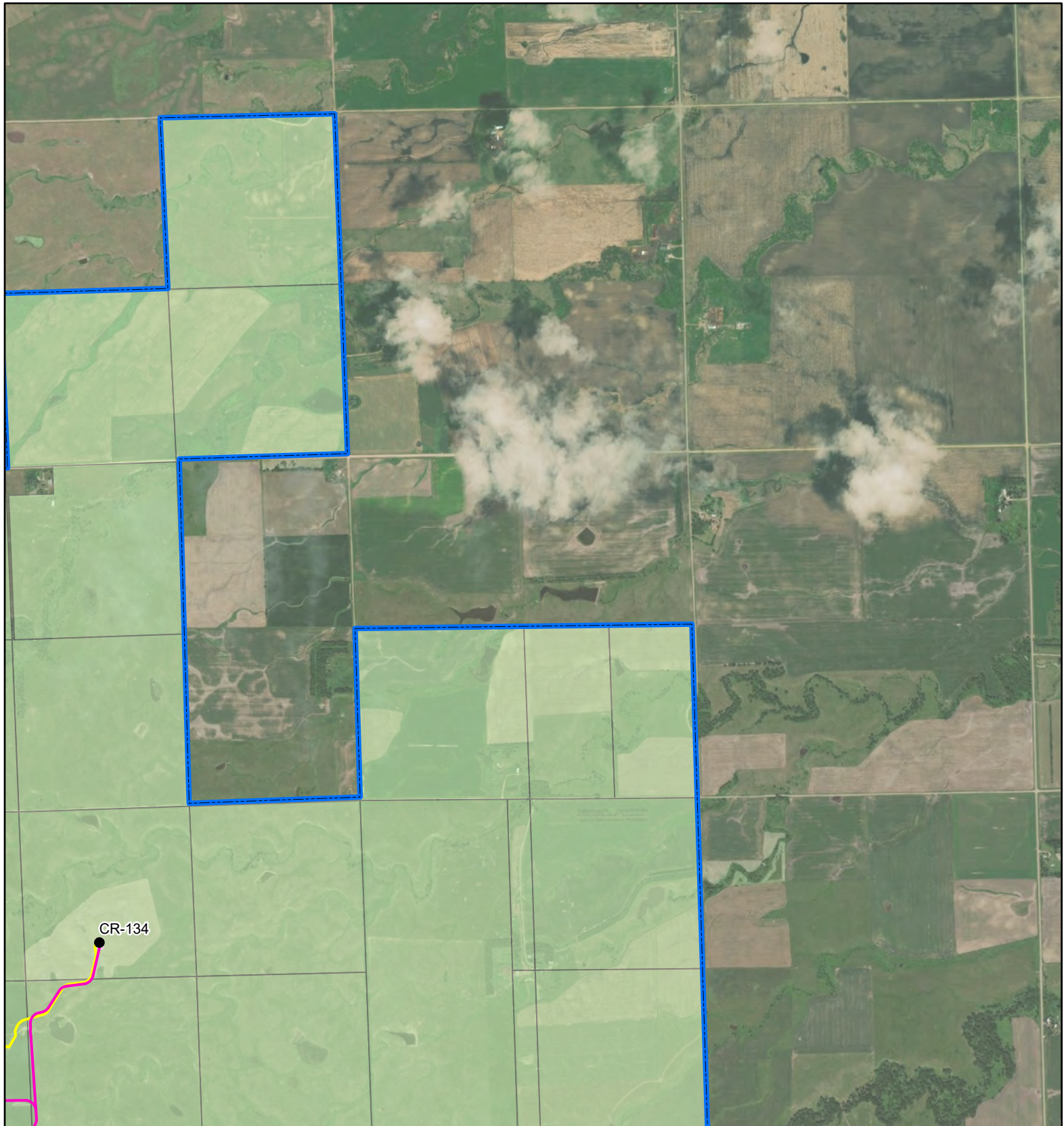
Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Twin Brooks (1973)

Township/Range: T120N, R50W

Grant County, South Dakota

Projection:

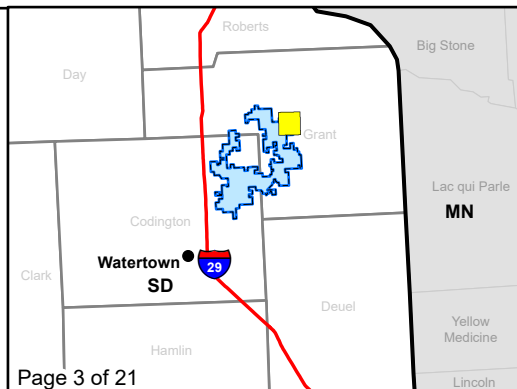
020723 **SWCA**
ENVIRONMENTAL CONSULTANTS



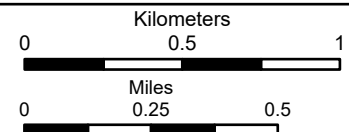
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Page 3 of 21



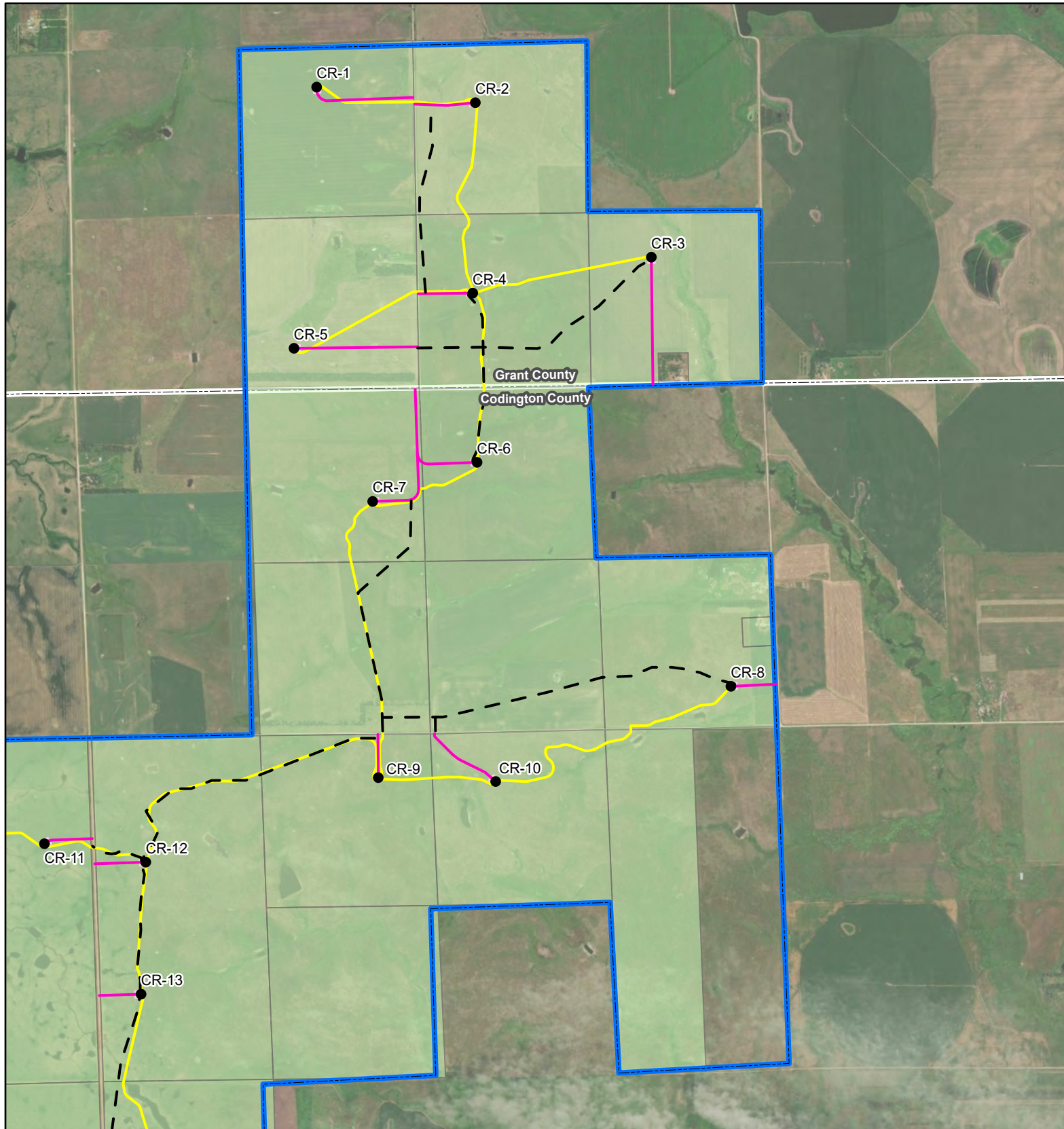
Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Twin Brooks (1973)

Township/Range: T120N, R50W

Grant County, South Dakota

020724 **SWCA**
ENVIRONMENTAL CONSULTANTS

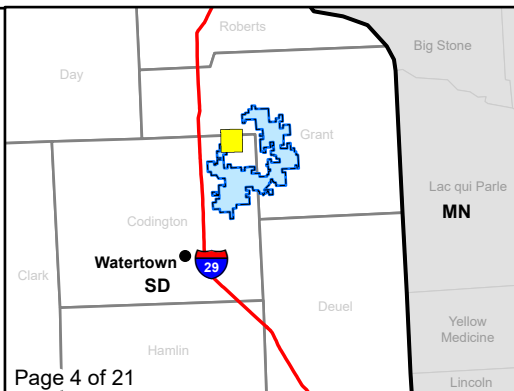
Projection:



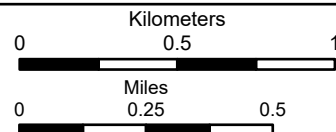
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



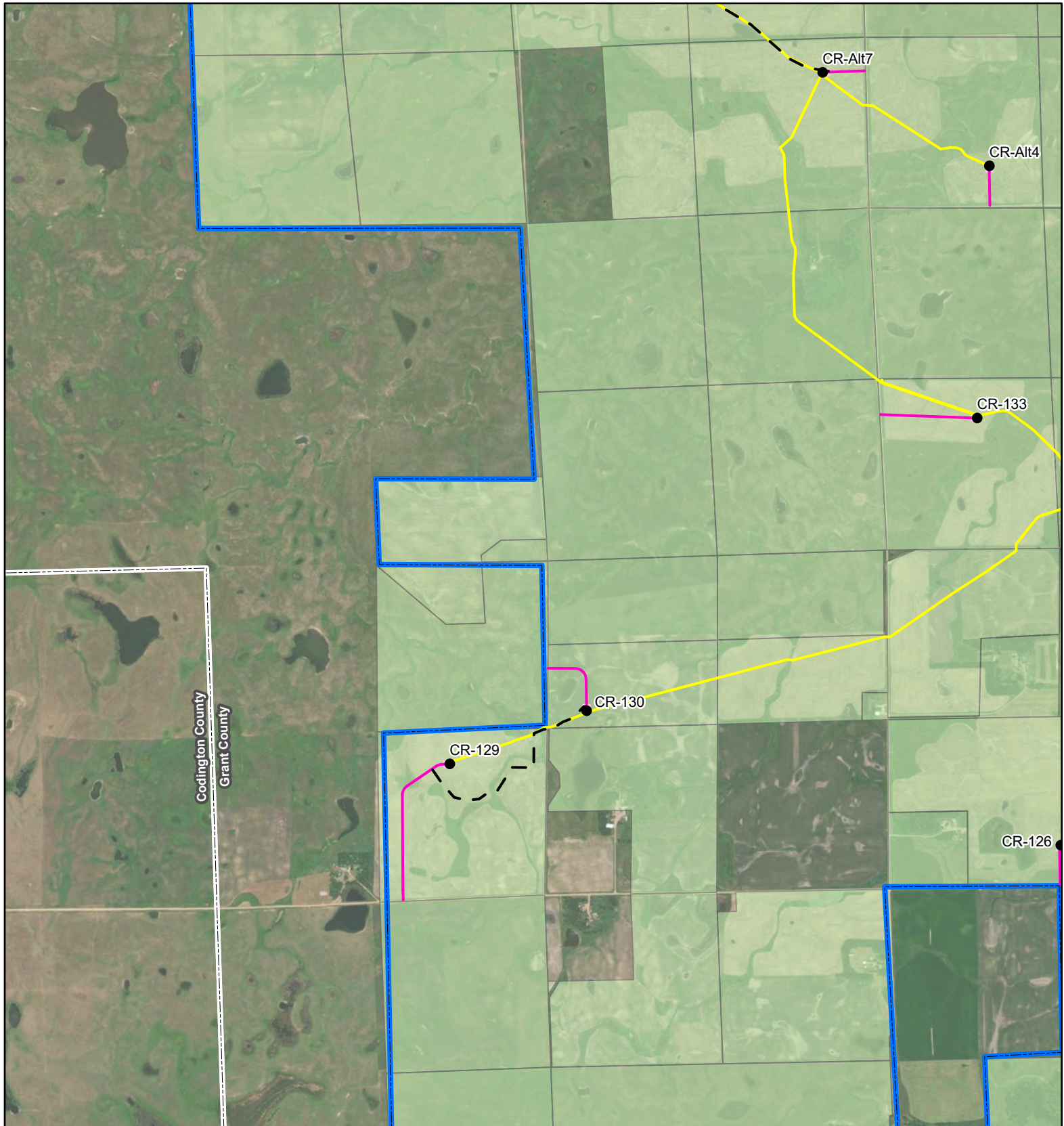
Page 4 of 21



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Antelope Valley (1973),
South Shore (1973)
Township/Range: T120N, R51W,
T119N, R51W,
Codington and Grant Counties, South Dakota

020725 **SWCA**
ENVIRONMENTAL CONSULTANTS

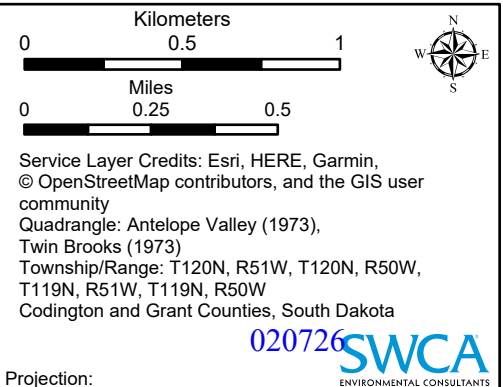
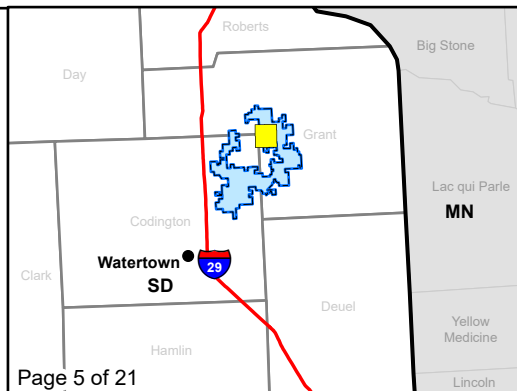
Projection:

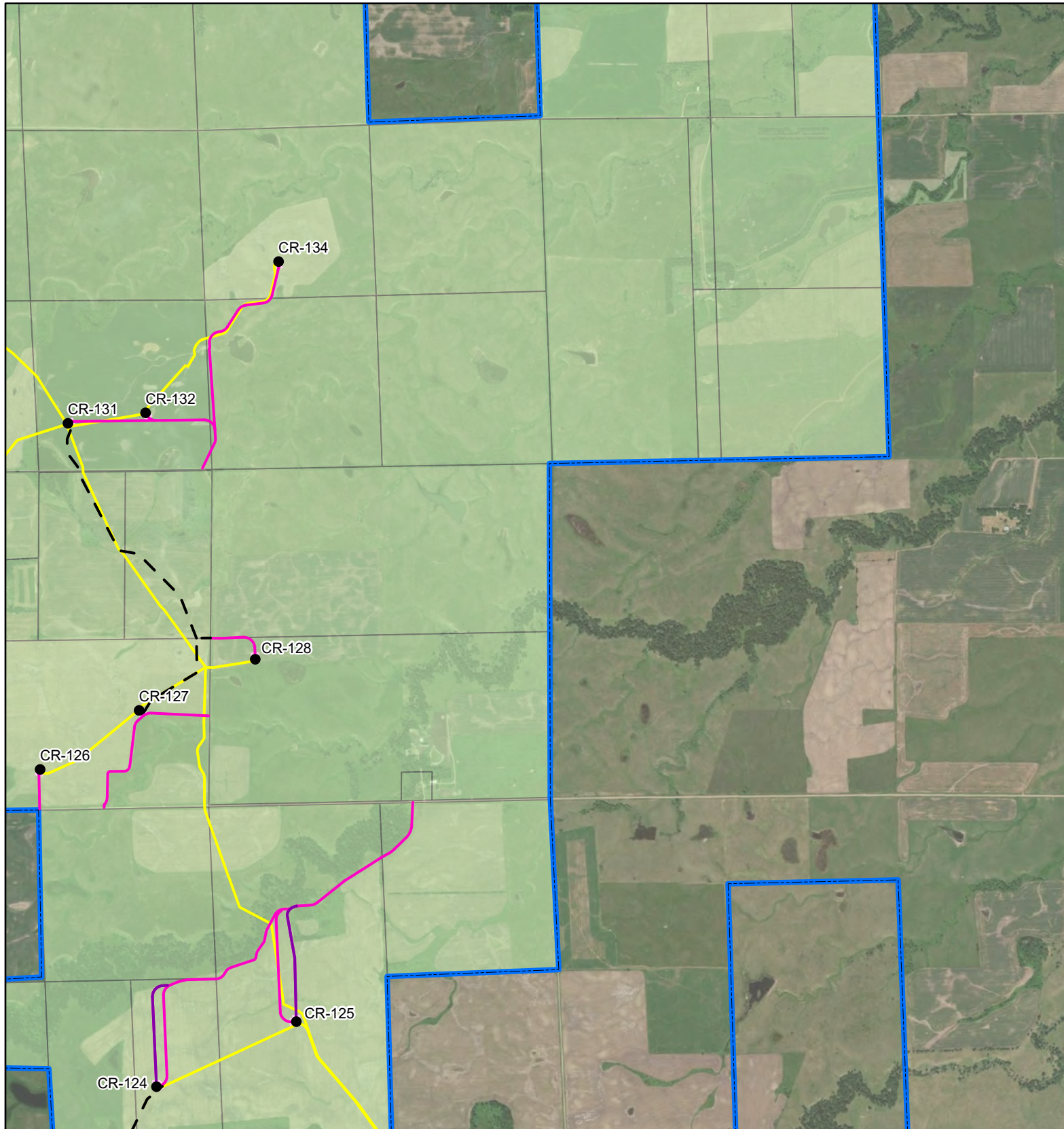


CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

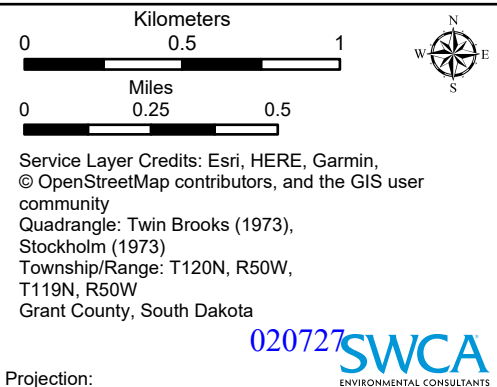
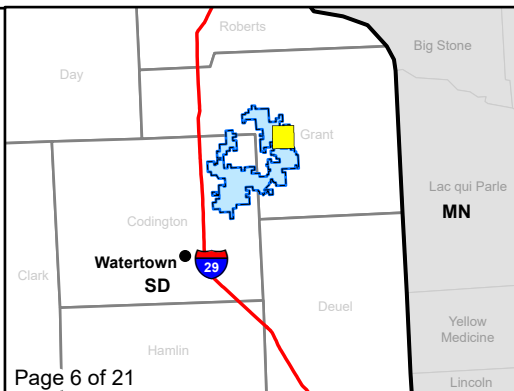


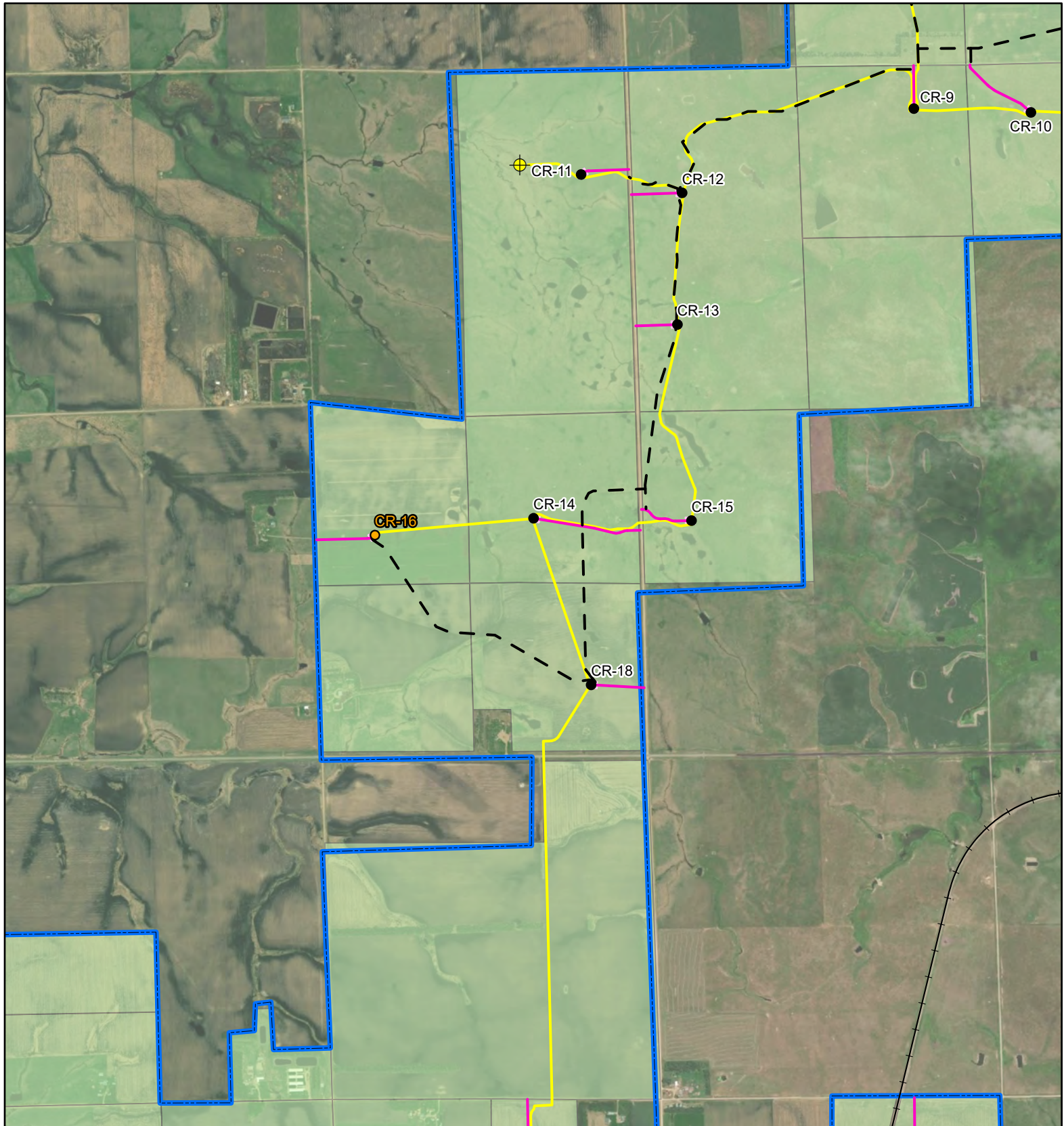


CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

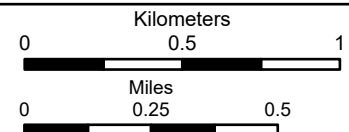
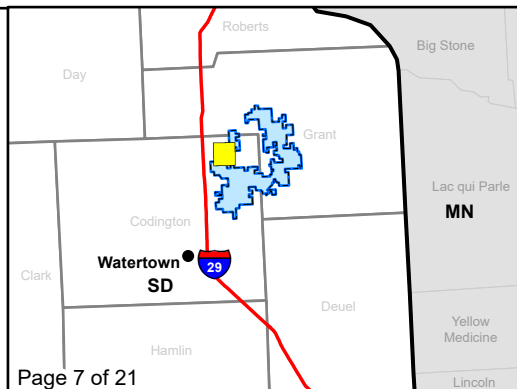




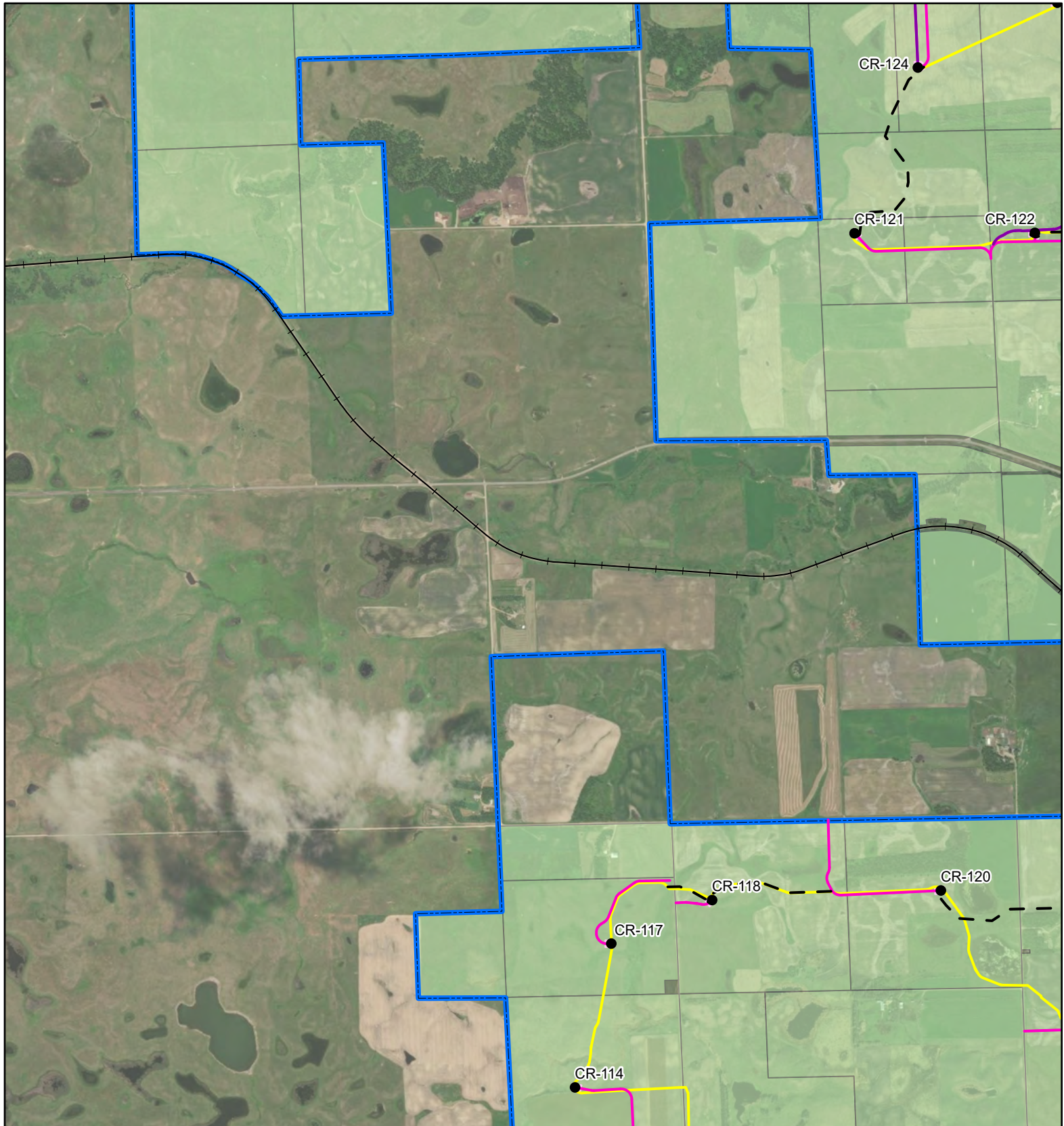
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



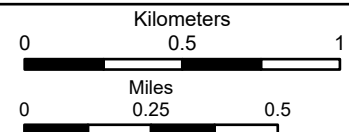
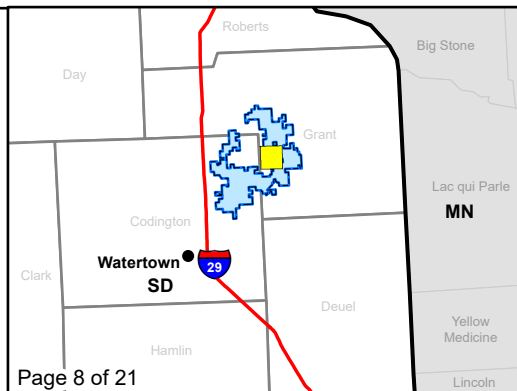
Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community
 Quadrangle: Still Lake NE (1970), Antelope Valley (1973), Still Lake SE (1970), South Shore (1973)
 Township/Range: T119N, R52W, T119N, R51W
 Codrington County, South Dakota



CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

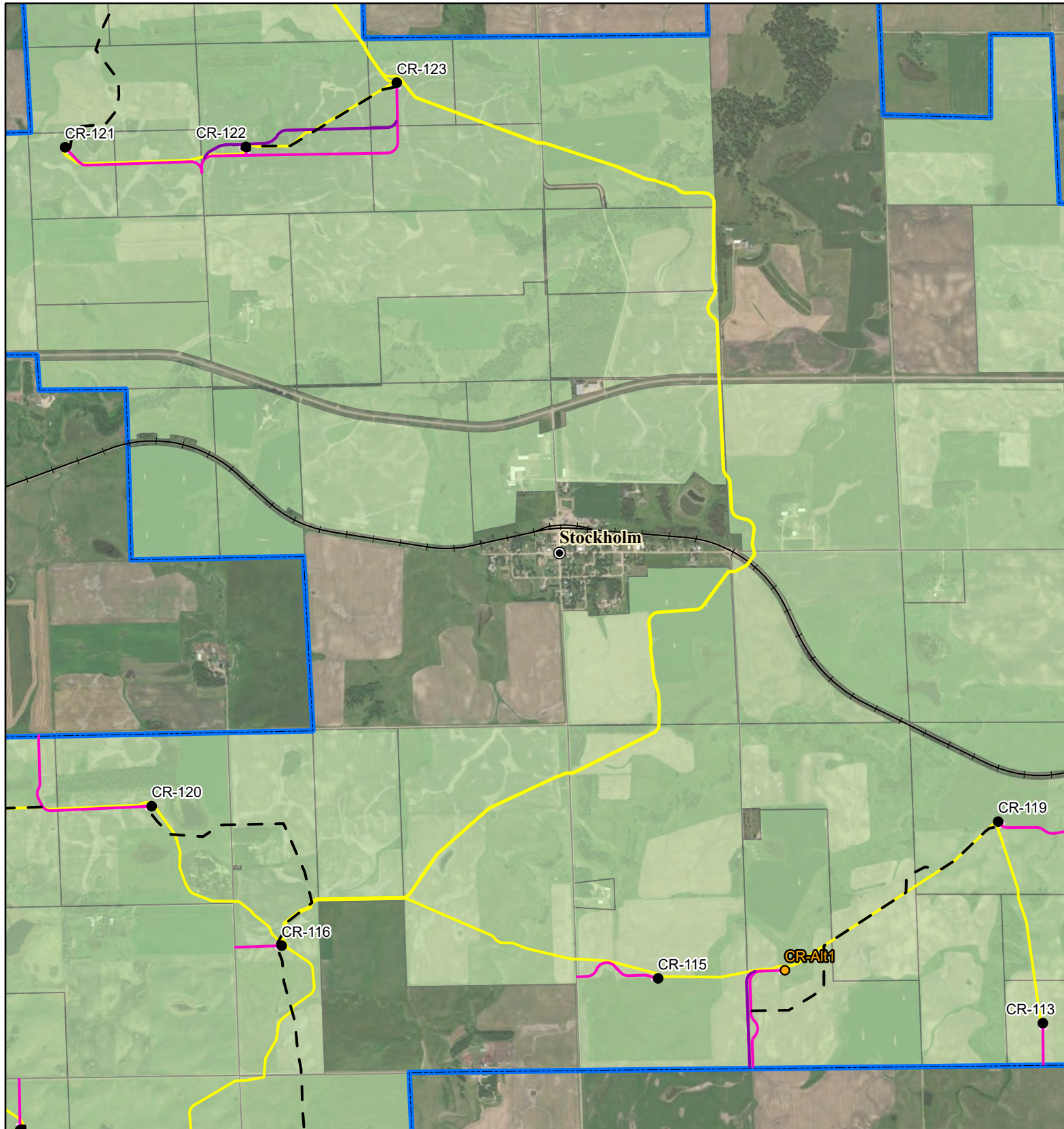


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Stockholm (1973), Antelope Valley (1973),
Twin Brooks (1973), South Shore (1973)
Township/Range: T119N, R50W

Grant County, South Dakota

020729 **SWCA**
ENVIRONMENTAL CONSULTANTS

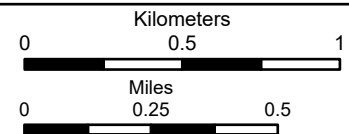
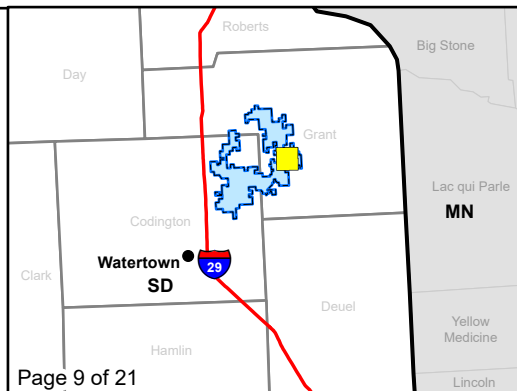
Projection:



CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

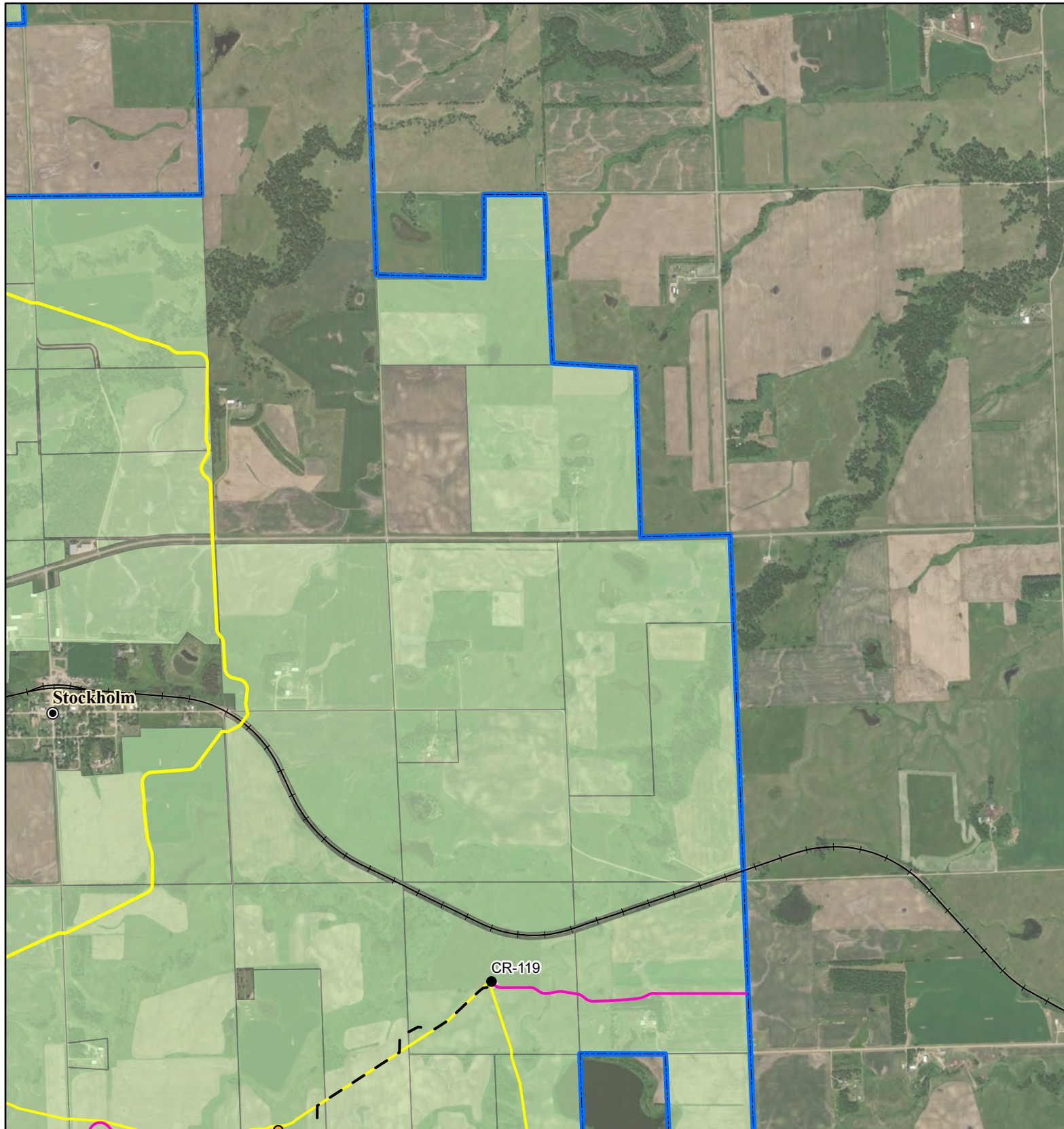


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Stockholm (1973)

Township/Range: T119N, R50W

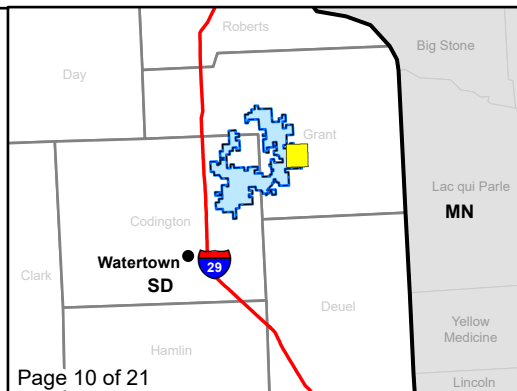
Grant County, South Dakota

020730 **SWCA**
ENVIRONMENTAL CONSULTANTS

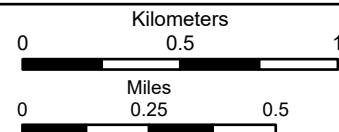


CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⦿ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



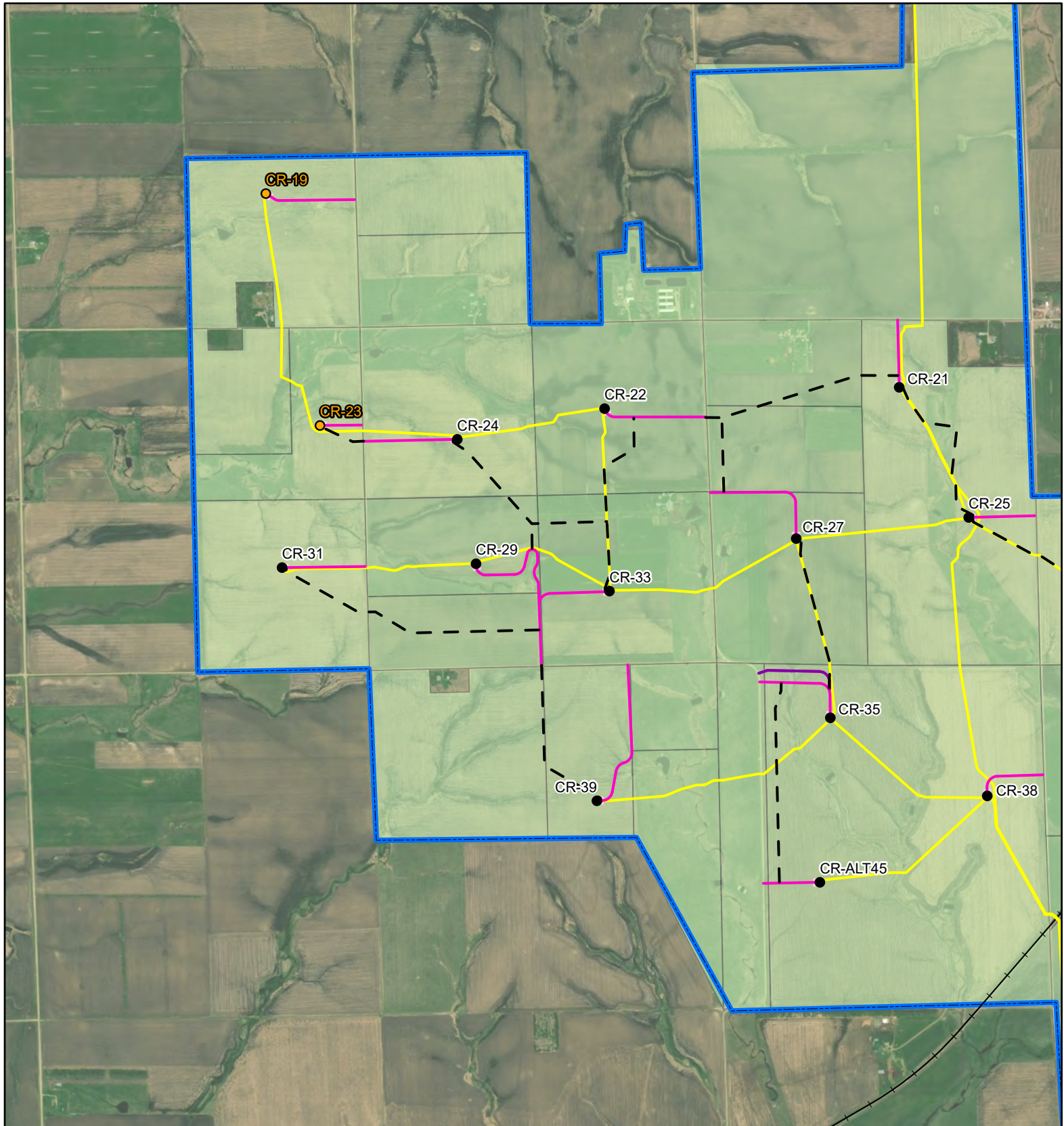
Page 10 of 21



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Twin Brooks (1973),
Stockholm (1973)
Township/Range: T119N, R50W,
T119N, R49W
Grant County, South Dakota

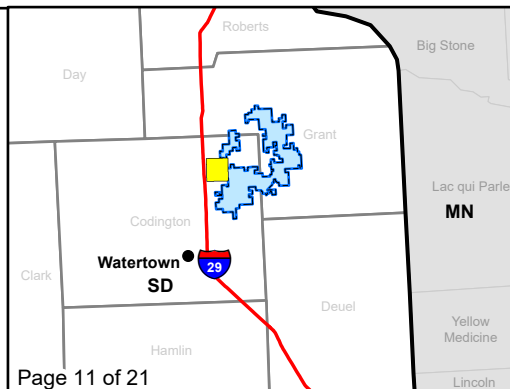
020731 **SWCA**
ENVIRONMENTAL CONSULTANTS

Projection:

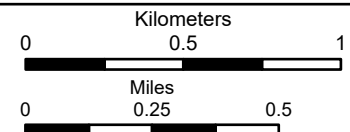


CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



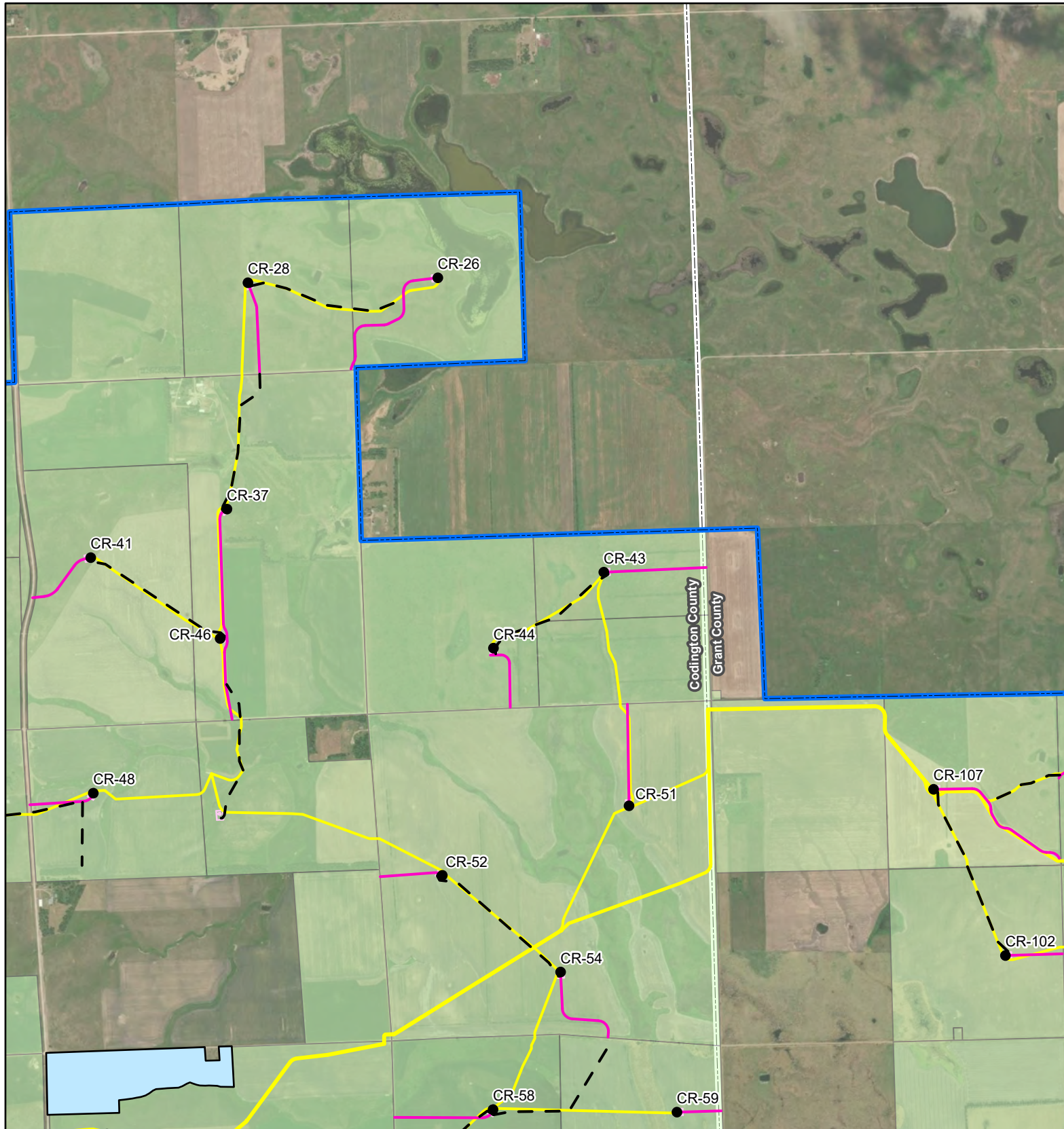
Page 11 of 21



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Still Lake SE (1970),
South Shore (1973)
Township/Range: T119N, R52W, T119N, R51W,
T118N, R52W, T118N, R51W
Codrington County, South Dakota

020732 **SWCA**
ENVIRONMENTAL CONSULTANTS

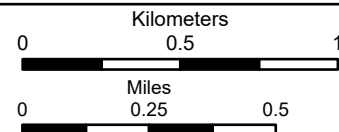
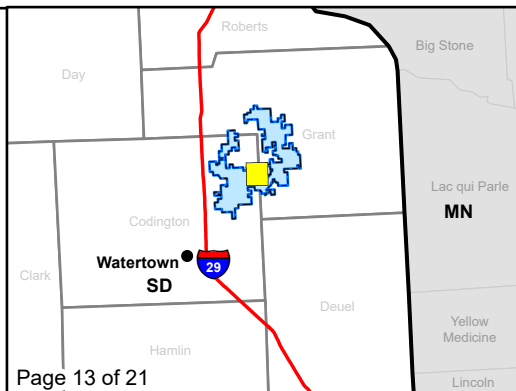
Projection:



CRI PUC Compliance

Crowned Ridge Wind Farm

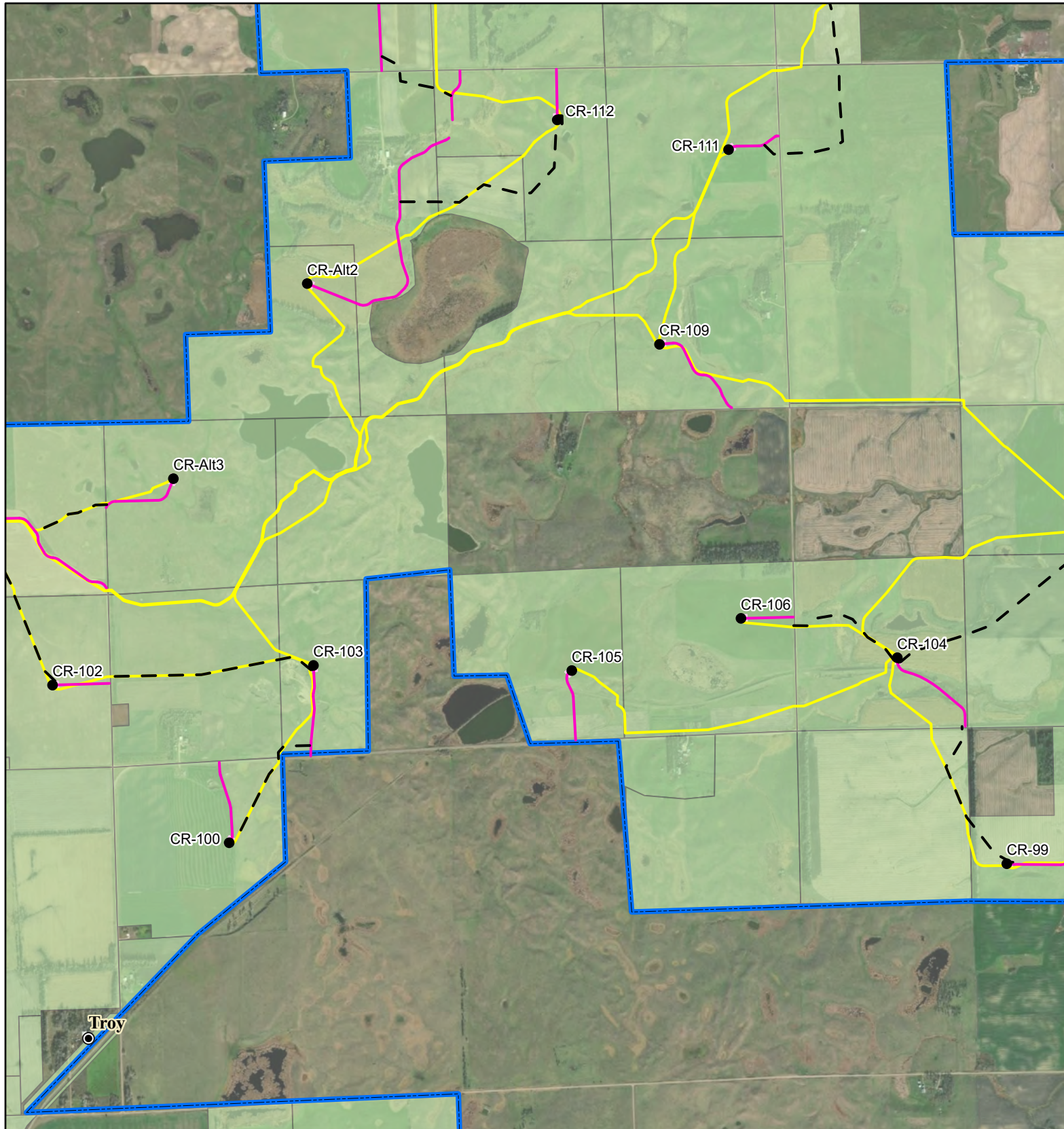
- Primary Turbine
- Alternate Turbine
- MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: South Shore (1973),
Stockholm (1973)
Township/Range: T119N, R51W, T119N, R50W,
T118N, R51W, T118N, R50W
Codington and Grant Counties, South Dakota

020734 **SWCA**
ENVIRONMENTAL CONSULTANTS

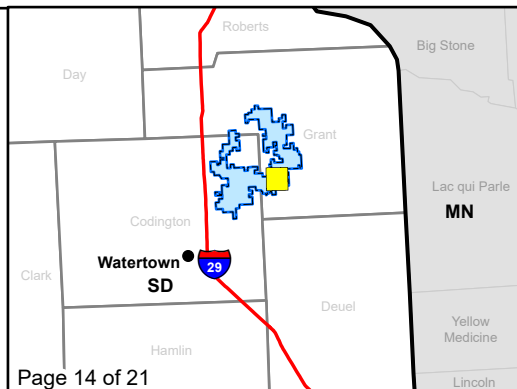
Projection:



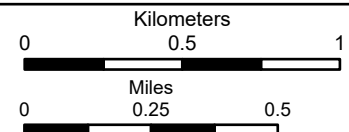
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Page 14 of 21

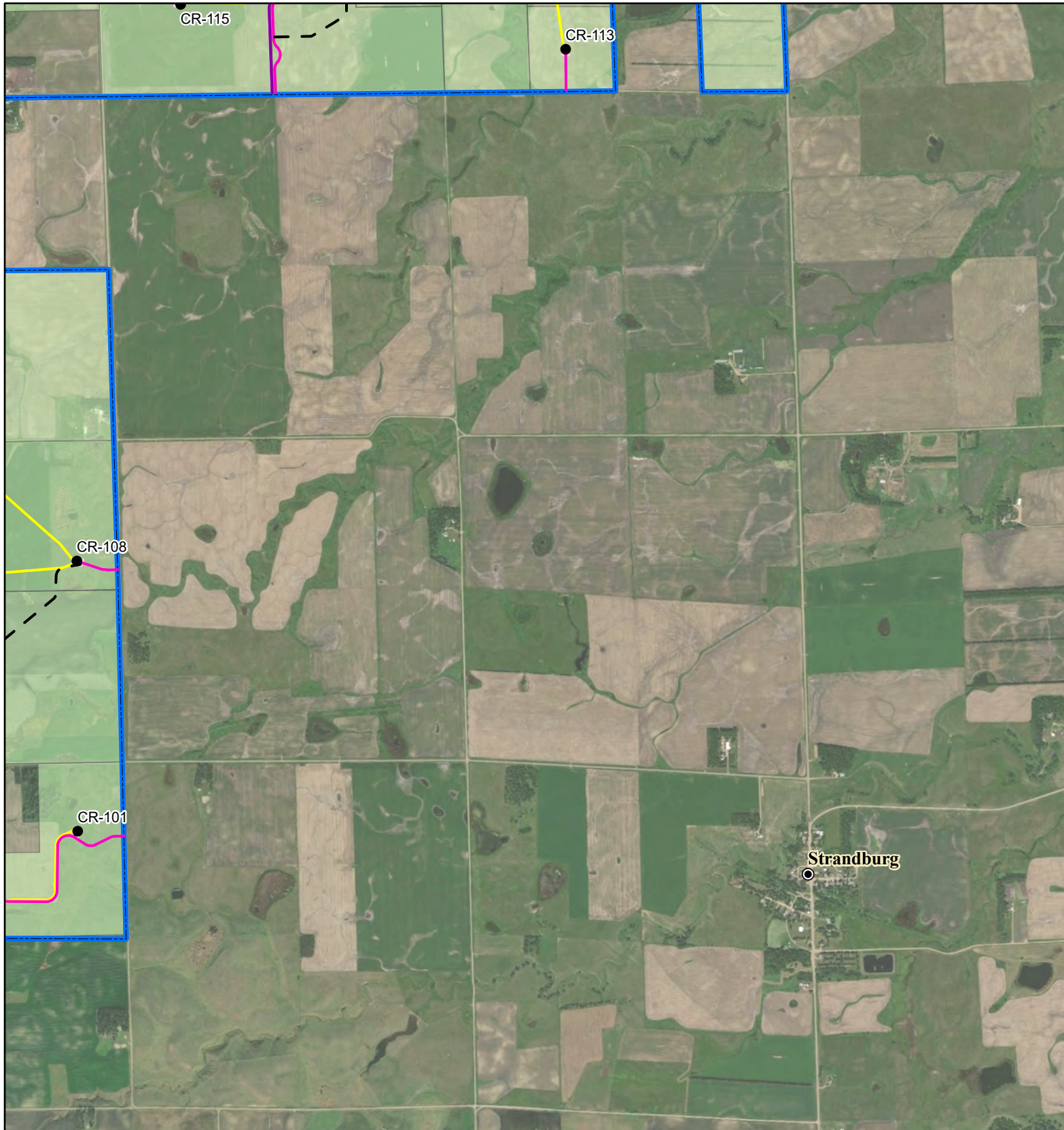


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Stockholm (1973)

Township/Range: T119N, R50W,
T118N, R50W
Grant County, South Dakota

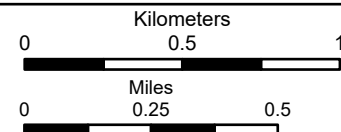
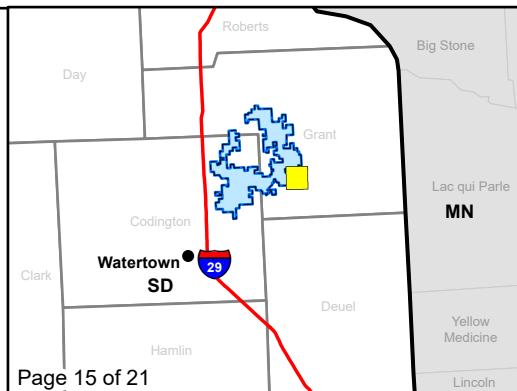
020735 **SWCA**
ENVIRONMENTAL CONSULTANTS

Projection:



CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner

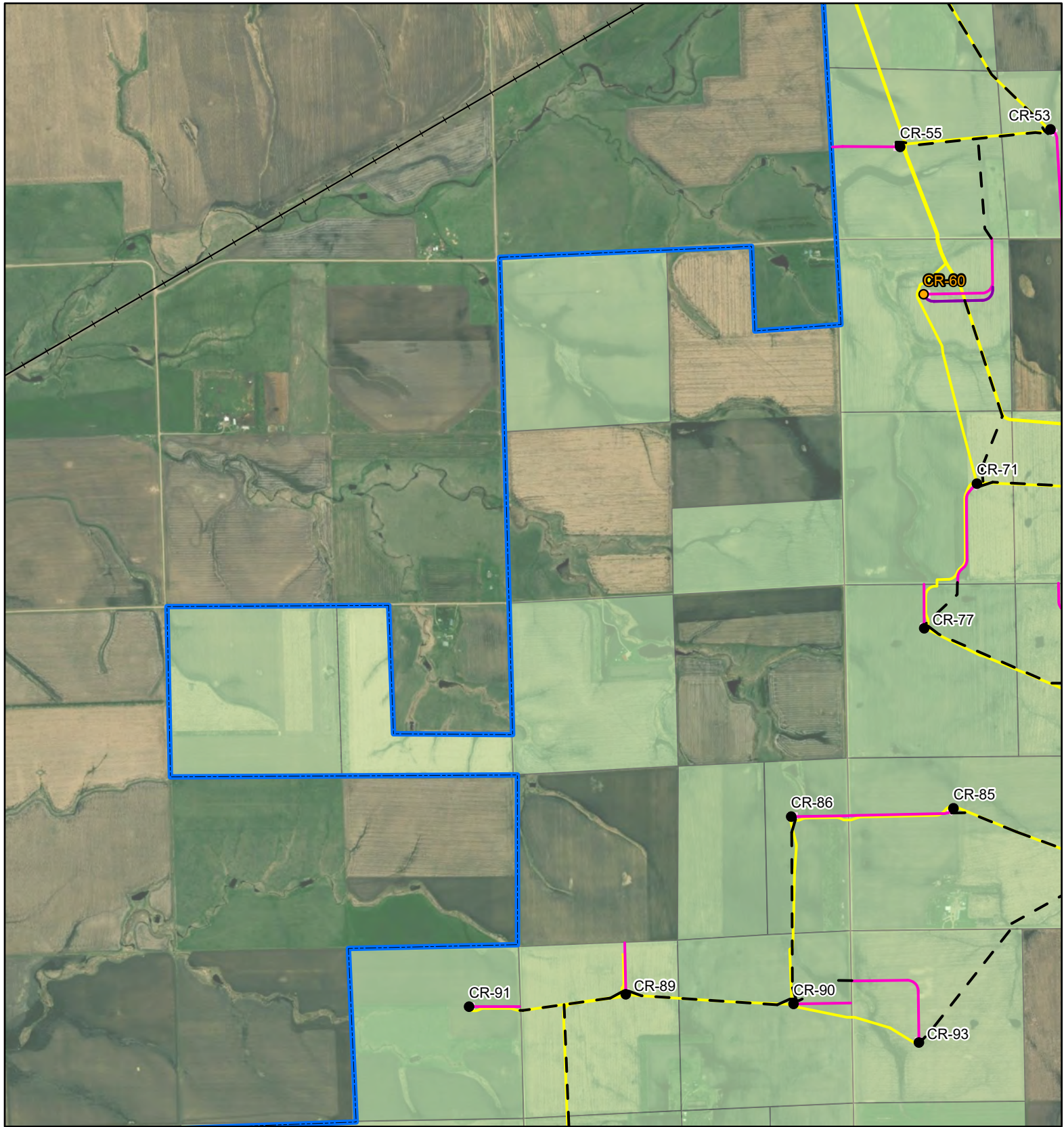


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Stockholm (1973)

Township/Range: T119N, R50W,
T118N, R50W
Grant County, South Dakota

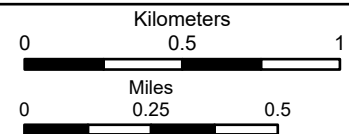
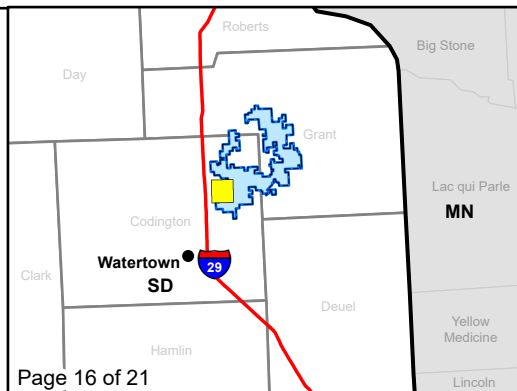
020736 **SWCA**
ENVIRONMENTAL CONSULTANTS

Projection:



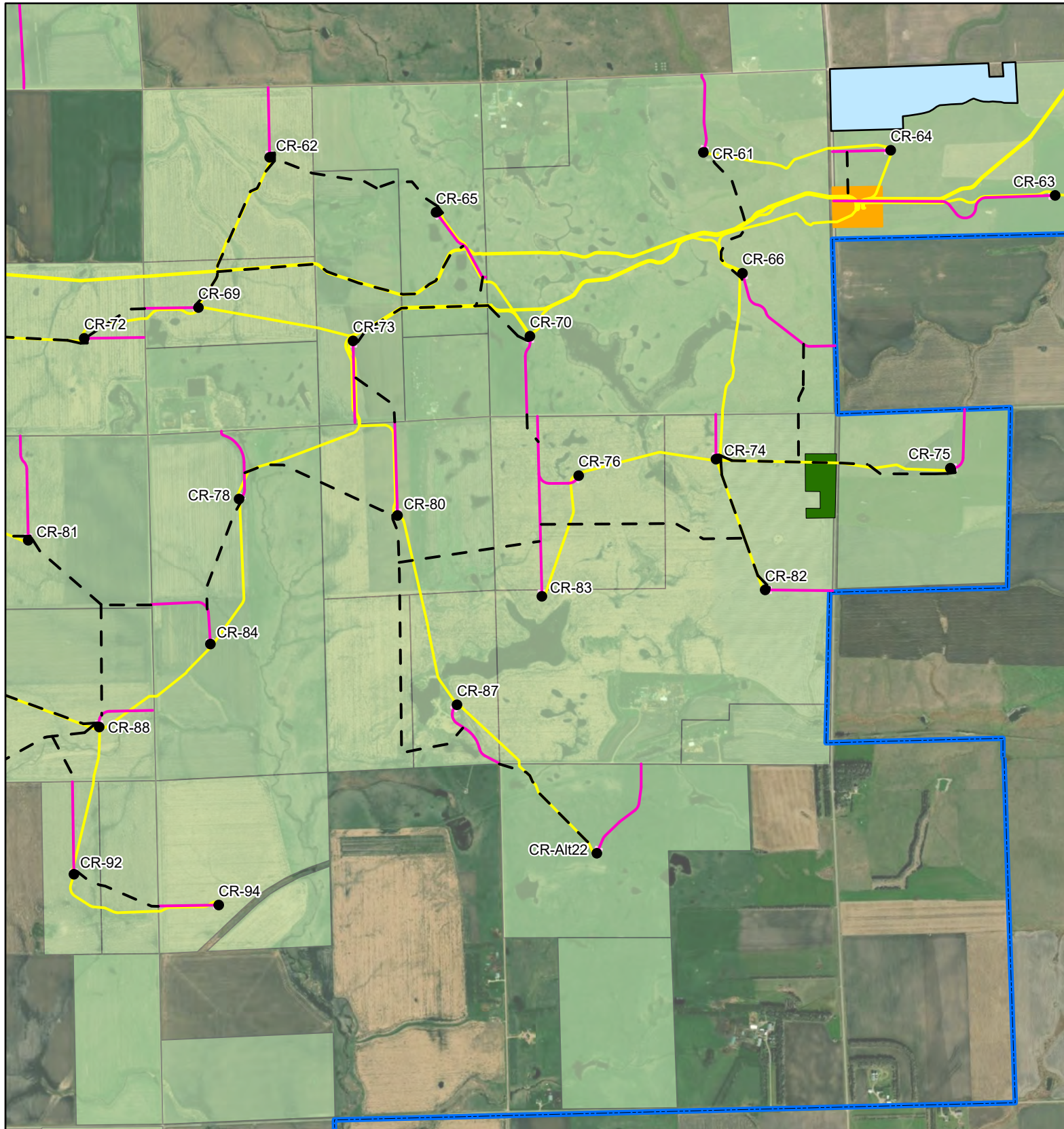
CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Still Lake SE (1970),
South Shore (1973)
Township/Range: T118N, R52W,
T118N, R51W
Codington County, South Dakota

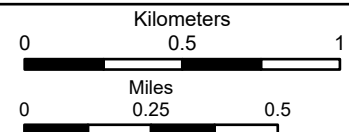
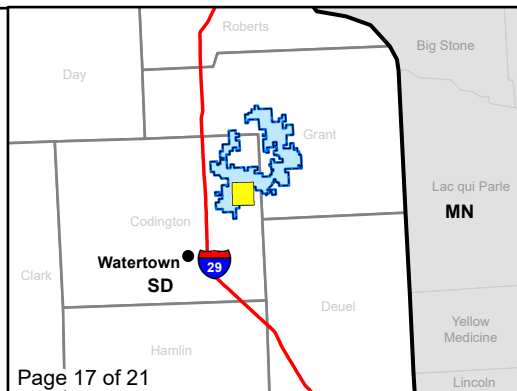
020737 **SWCA**
ENVIRONMENTAL CONSULTANTS



CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



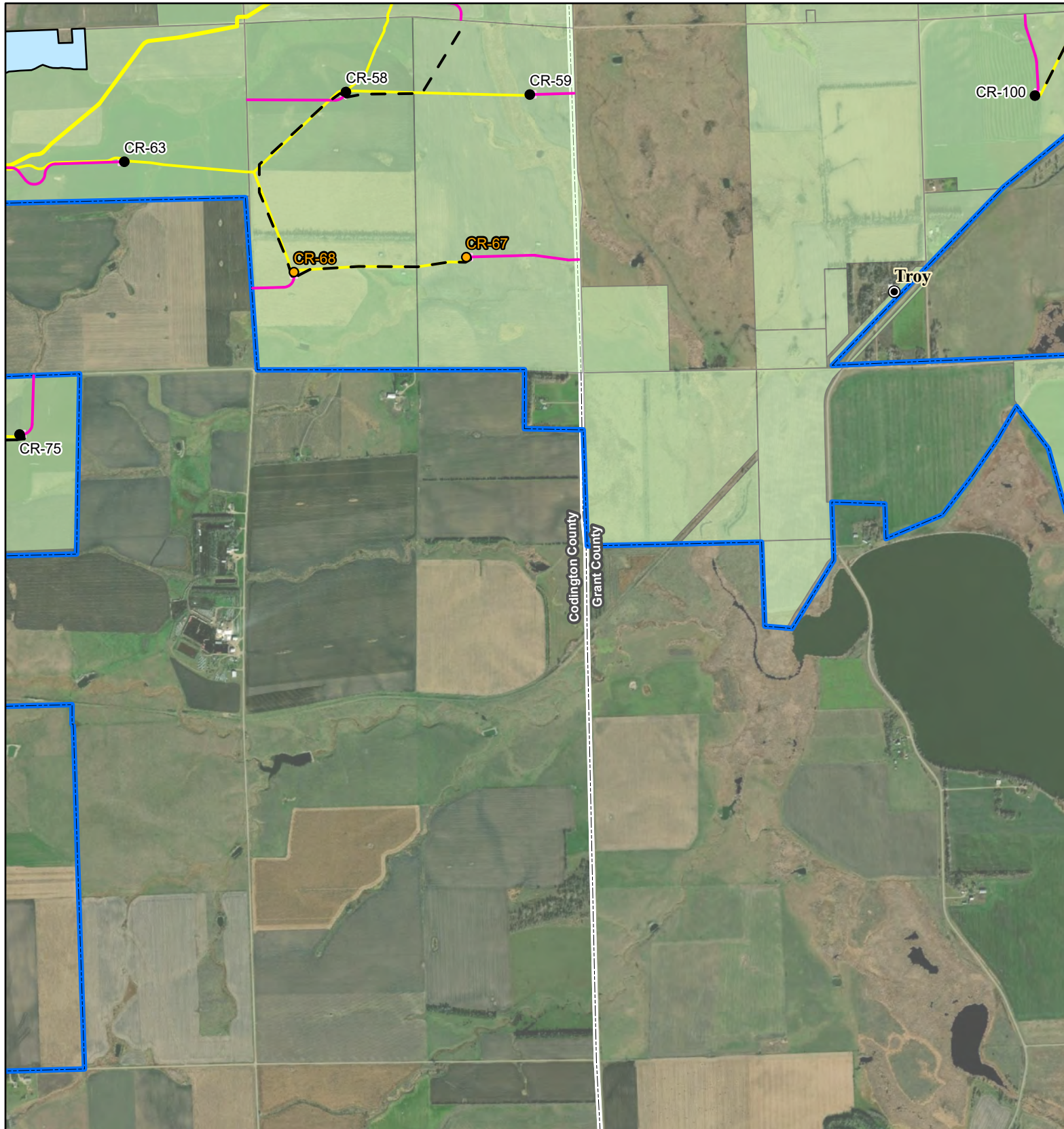
Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: South Shore (1973)

Township/Range: T118N, R51W

Codington County, South Dakota

020738 **SWCA**
ENVIRONMENTAL CONSULTANTS

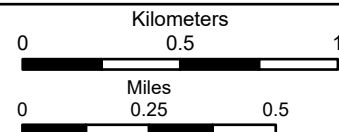
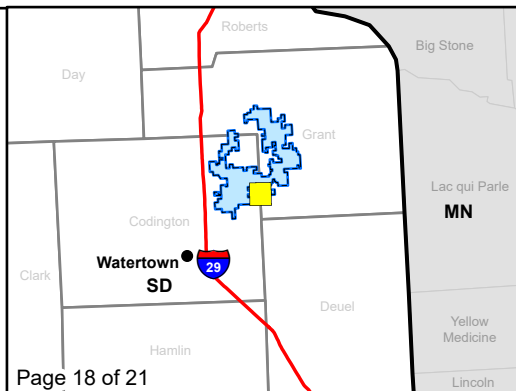
Projection:



CRI PUC Compliance

Crowned Ridge Wind Farm

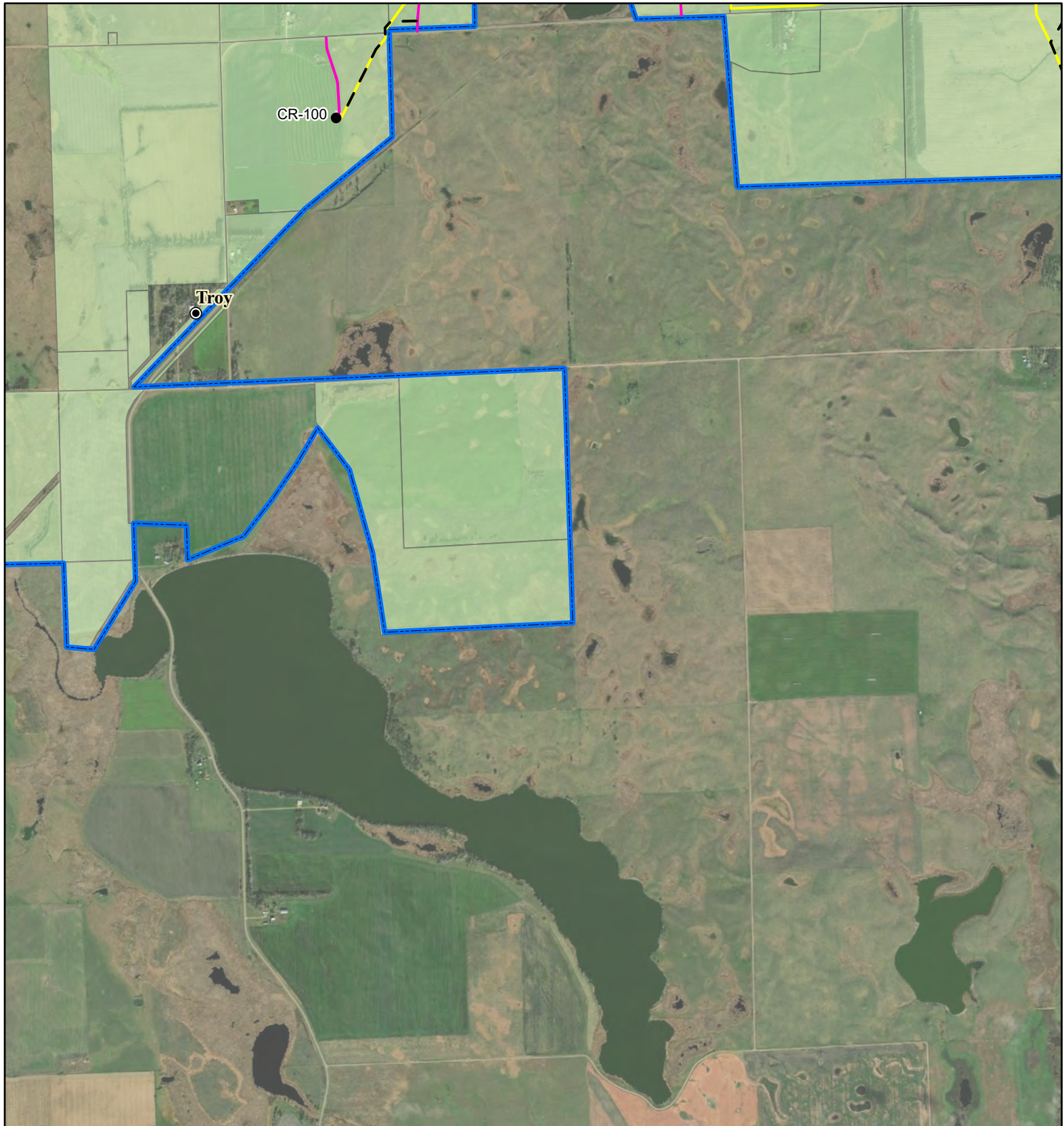
- Primary Turbine
- Alternate Turbine
- MET Tower
- City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: South Shore (1973),
Stockholm (1973)
Township/Range: T118N, R51W,
T118N, R50W
Codington and Grant Counties, South Dakota

020739 **SWCA**
ENVIRONMENTAL CONSULTANTS

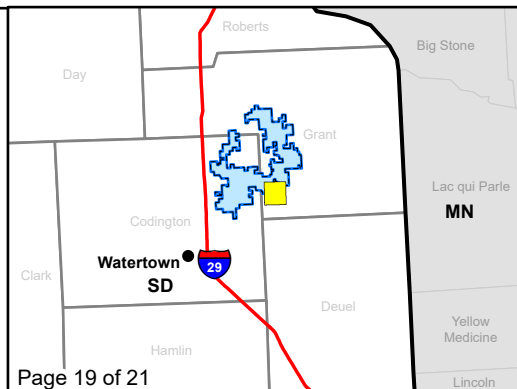
Projection:



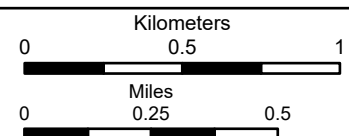
CRI PUC Compliance

Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Page 19 of 21

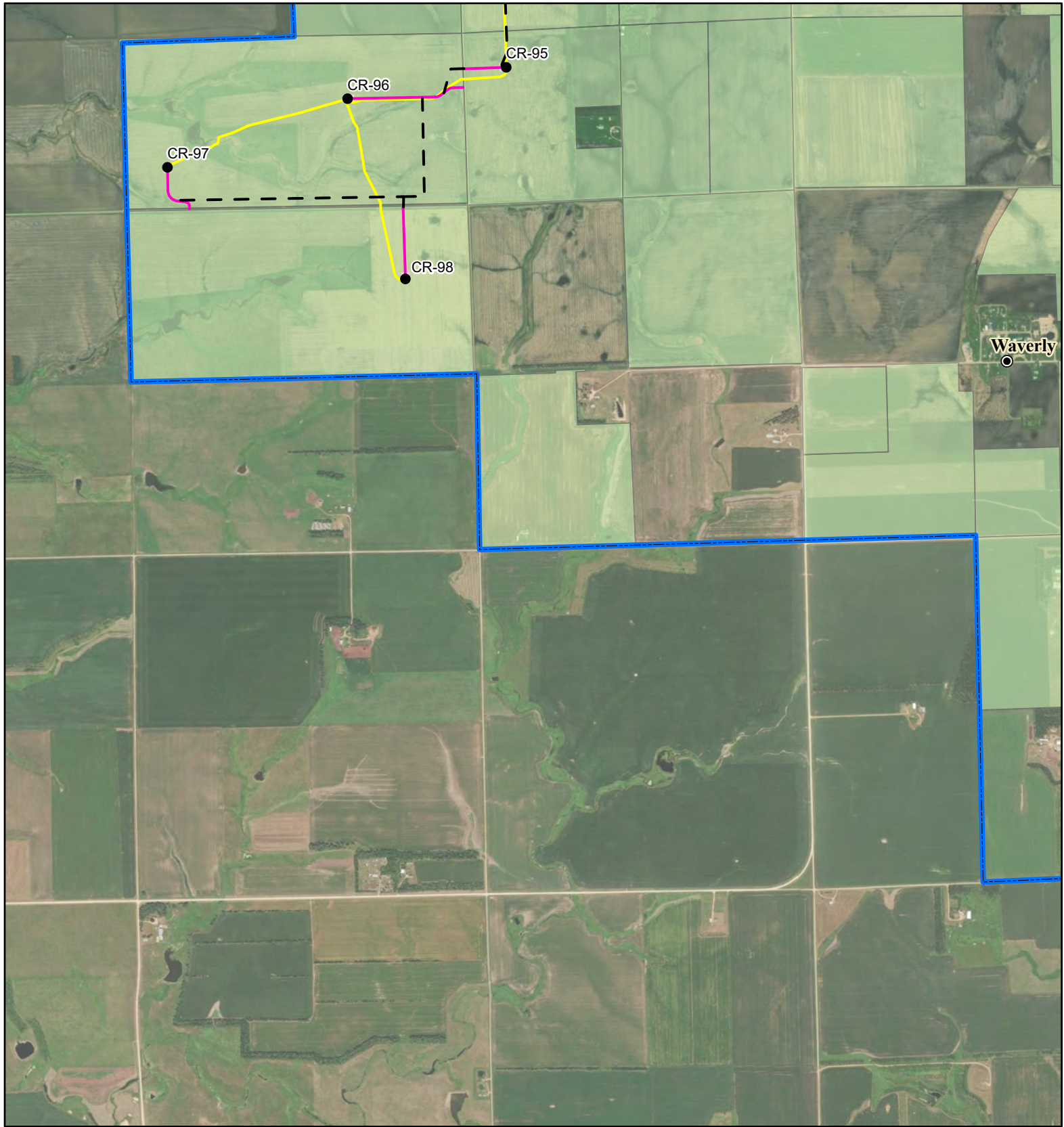


Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: South Shore (1973),
Stockholm (1973)
Township/Range: T118N, R50W

Grant County, South Dakota

020740 **SWCA**
ENVIRONMENTAL CONSULTANTS

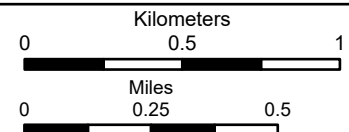
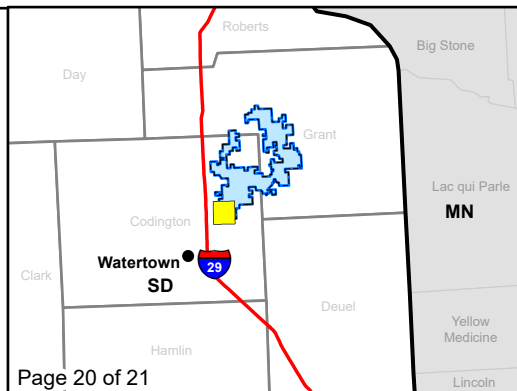
Projection:



CRI PUC Compliance

Crowned Ridge Wind Farm

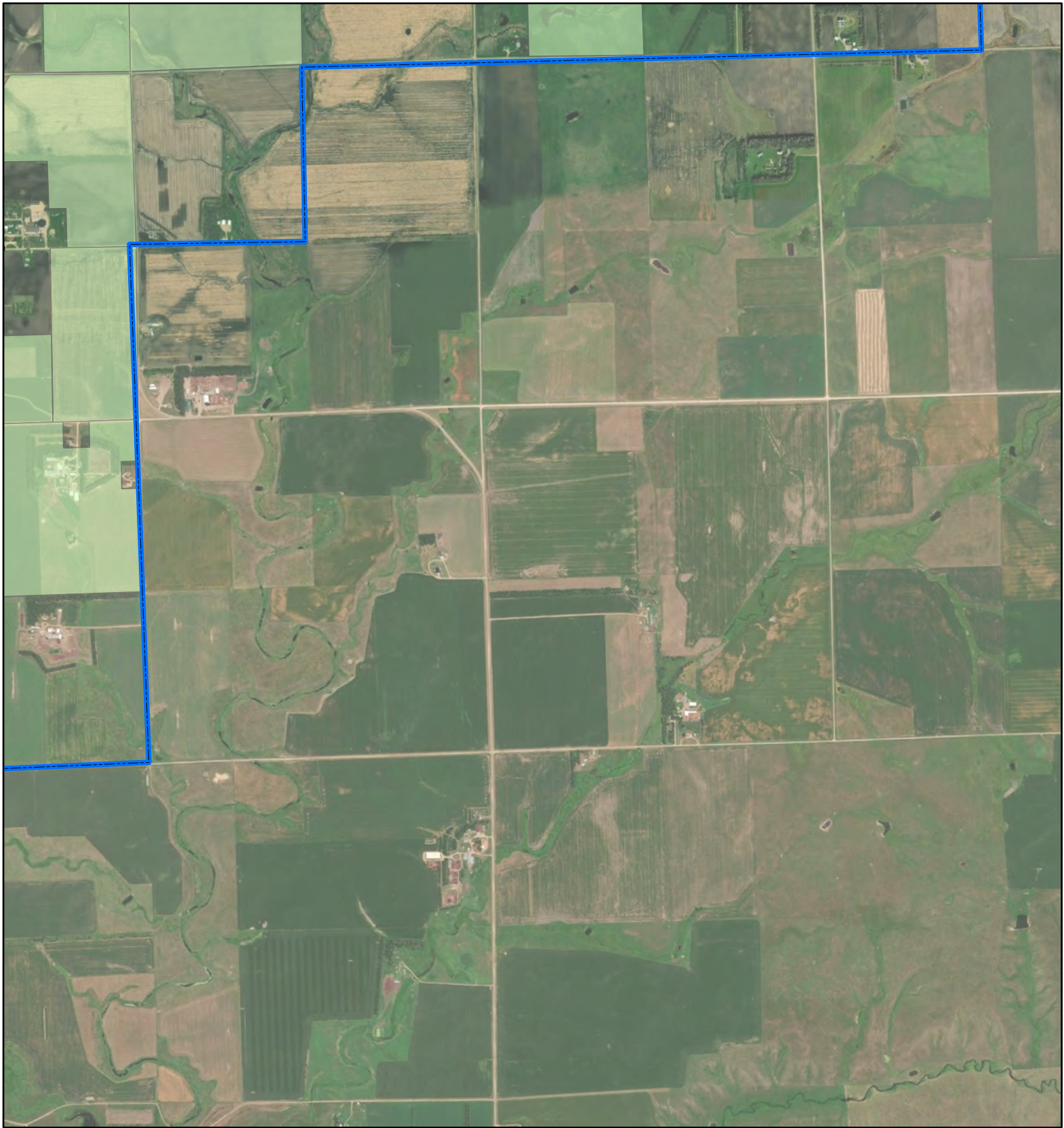
- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⊙ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/ Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: Still Lake SE (1970), Watertown East (1969),
South Shore (1973), Kranzburg (1970)
Township/Range: T118N, R52W, T118N, R51W,
T117N, R52W, T117N, R51W
Codington County, South Dakota

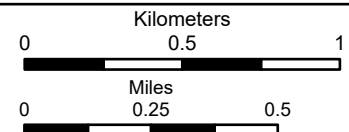
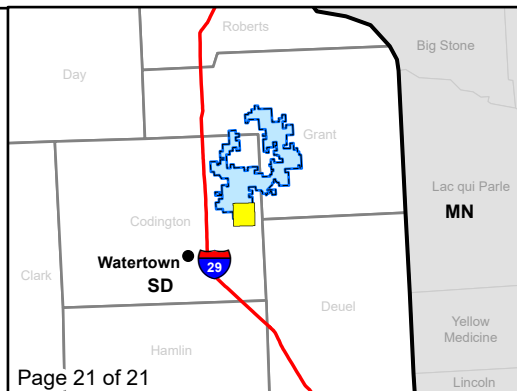
020741 **SWCA**
ENVIRONMENTAL CONSULTANTS

Projection:



CRI PUC Compliance Crowned Ridge Wind Farm

- Primary Turbine
- Alternate Turbine
- ⊕ MET Tower
- ⦿ City
- Access Road
- Alternate Access Road
- Collection Line
- Crane Path
- Railroad
- O&M Facility/
Substation
- Batch Plant
- Laydown Yard
- Project Boundary
- County Boundary
- Participating Landowner



Service Layer Credits: Esri, HERE, Garmin,
© OpenStreetMap contributors, and the GIS user
community
Quadrangle: South Shore (1973),
Kranzburg (1970)
Township/Range: T118N, R51W,
T117N, R51W
Codrington County, South Dakota

020742 **SWCA**
ENVIRONMENTAL CONSULTANTS

Projection:



Pre-Construction Compliance Report Crowned Ridge Wind Farm Sound Study Codington and Grant Counties, SD

Submitted To:

SWCA Environmental Consultants
116 North 4th Street, Suite 200
Bismarck, North Dakota 58501
Tel: 701.258.6622
E-mail: SBaer@swca.com

Submitted By:

Jay Haley, P.E., Partner
EAPC Wind Energy
3100 DeMers Ave.
Grand Forks, ND, 58201
Tel: 701-775-3000
E-mail: jhaley@eapc.net

July 28,

2019

Author:

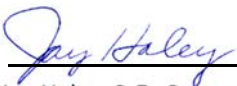

Jay Haley, P.E., Partner

TABLE OF CONTENTS

1. INTRODUCTION.....	4
2. BACKGROUND AND COUNTY REGULATIONS.....	4
3. STUDY METHODOLOGY	5
4. RESULTS OF ANALYSIS	8
5. CONCLUSIONS.....	10
APPENDIX A: CROWNED RIDGE WIND ENERGY PROJECT SITE OVERVIEW MAP.....	12
APPENDIX B: WIND TURBINE COORDINATES	14
APPENDIX C: TABLE OF SOUND RESULTS	19
APPENDIX D: STANDARD RESOLUTION SOUND MAPS.....	40

LIST OF TABLES

Table 1: Wind turbine specifications.	7
Table 2: Codington County property boundary realistic sound distribution.....	9
Table 3: Grant County occupied structure realistic sound distribution	9
Table 4: Summary of sound pressure level predictions.	10

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	7/28/2019	J. Haley

Executive Summary

EAPC was hired to provide estimates of the potential sound impacts for a proposed wind turbine layout in Codington and Grant Counties of the Crowned Ridge wind farm project in northeastern South Dakota. The scope of this report includes all proposed turbines included in the Crowned Ridge project that will be permitted separately through the South Dakota Public Utilities Commission. Locations of area occupied structures and a wind turbine layout using a mixture of 142 wind turbines manufactured by General Electric (GE) were provided to EAPC by Crowned Ridge Wind, LLC. Wind turbine models and locations of 140 turbines for the adjacent Crowned Ridge II wind farm were supplied by Crowned Ridge Wind II, LLC and were included in the model. The wind turbine models and coordinates of 97 turbines for the adjacent Dakota Range I and II wind farms were also included in the model, with information gathered from permit filings. A computer model was built combining digital elevation data with the information gathered to generate sound models for the site. The resulting models were then used to perform shadow flicker calculations for the 379 turbines. Based on the calculations, site-wide realistic sound maps were produced.

The Crowned Ridge wind farm project was modeled for all counties within the turbine layout and is described in this report as one project. However, for purposes of organization and because of the differences in compliance criteria, the modeling and results of the study are presented individually for each county. The noise ordinances of Codington and Grant Counties are not the same. For Codington County the noise limit is 50 dBA at the property boundary of occupied non-participating landowners. For Grant County the noise limit is 45 dBA at a distance of 25 feet from the perimeter of non-participating occupied structures and 50 dBA at participating occupied structures.

The scope of this study also includes sound impacts that are not regulated by county ordinances including participating and non-participating occupied structures and participating parcel boundaries in Codington County. The turbine array was arranged so that the sound pressure level at all non-participating occupied structures in both counties would be 45 dBA or less and participating occupied structures in both counties would be 50 dBA or less. For all turbines, Low Noise Trailing Edge (LNTE) blades were used to reduce the sound pressure levels in order to achieve compliance with county regulations by increasing the flexibility in turbine locations to meet setback requirements.

The model is based on a number of conservative assumptions. It assumes that the wind turbines are always emitting the maximum sound pressure level with an additional 2 dBA added to the wind turbine noise emission profiles. It is also assumed that each wind turbine is always downwind of each receptor and the atmospheric conditions are most favorable for sound transmission. Also in particular for Grant County, the sound pressure level was calculated at a distance of 50 feet from the perimeter of structures instead of 25 feet. This is also a conservative assumption because the noise levels will be higher at 50 feet than 25 feet.

Crowned Ridge Codington County Turbines

Codington County's current Ordinance #68 Zoning Ordinance Section 5.22.03.12.a notes that the applicable sound limit is 50 dBA at an occupied non-participating property line, which is what has been evaluated in this report for Codington County. Codington County does not have a specific ordinance for sound pressure levels at a participating property boundary; although not required by the county, the sound pressure levels at participating property boundaries and occupied structures within 2 kilometers of a wind turbine were also evaluated. There is also no ordinance for sound pressure levels at any participating or non-participating occupied structures.

Within the Crowned Ridge Project, for Codington County, an evaluation of the sound impacts at 67 occupied land parcel boundaries (21 participating and 46 non-participating) within Codington County was performed. The 67 land parcel boundaries with existing residences were modeled using an area-type sound sensor so that the highest sound pressure level at the property line could be calculated.

In Codington County, the maximum sound pressure level at a non-participating property boundary is 49.9 dBA, therefore, the project, 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 #68, which is 50 dBA. The maximum sound pressure level at a participating property boundary is 53.5 dBA.

There are 77 occupied structures (26 participating and 51 non-participating) in Codington County within 2 kilometers of a wind turbine, which were modeled using a point-type sound sensor so that the highest sound pressure level at the perimeter of the structures could be calculated. In Codington County, the maximum sound pressure level at the perimeter of a non-participating occupied structure was 44.8 dBA. The maximum sound pressure level at a participating occupied structure was 47.8 dBA.

Therefore, the project as modeled, is in compliance with Codington County's allowable sound pressure levels as described in the current Codington County Ordinance.

Crowned Ridge Grant County Turbines

Grant County's current Ordinance 2016-01C, Section 1211.04, paragraph 14 of the current Grant County Zoning Ordinance sets the limit at 45 dBA at a distance of 25 feet from the perimeter of non-participating occupied structures and 50 dBA for participating occupied structures.

For Grant County, an evaluation of the noise impacts at 60 (34 participating and 26 non-participating) occupied structures within 2 kilometers within Grant County was performed. The 60 occupied structures were modeled using a point-type sound sensor so that the highest sound pressure level 25 feet from the perimeter of the structures could be calculated. In Grant County, the maximum sound pressure level 25 feet from the perimeter of a non-

participating occupied structure is 43 dBA, and 45.3 dBA for a participating occupied structure.

Based upon the results presented above, the project as modeled, is in compliance with Grant County's allowable sound pressure levels as described in the current Grant County Ordinance.

1. INTRODUCTION

EAPC was hired to conduct sound studies for the regional development of the Crowned Ridge wind farm project located in Codington and Grant Counties in northeastern South Dakota. The layout consists of 129 GE 2.3 MW wind turbines with a hub height of 90 meters (including 18 alternate turbine locations) and 13 GE 2.3 MW wind turbines with a hub height of 80 meters for a total of 142 wind turbines. The array includes the six remaining Hessler turbines (CR1-16, CR1-19, CR1-23, CR1-60, CR1-67, and CR1-68) to ensure compliance in the event any of the Hessler turbines, which are now alternates, are constructed consistent with Condition No. 27. Also, to ensure compliance under all construction of turbine scenarios, CR1-49, also a Hessler turbine, has been permanently dropped. The locations of the proposed wind turbines were supplied by Crowned Ridge Wind, LLC.

From the database of existing residences and coordinates supplied by Crowned Ridge Wind, LLC, 77 occupied structures (26 participating and 51 non-participating) in Codington County and 60 occupied structures (34 participating and 26 non-participating) in Grant County were found to be within 2 kilometers of a wind turbine and were included in the sound models. Additionally, 67 occupied land parcels (21 participating and 46 non-participating) were found to be within 2 kilometers of a wind turbine in Codington County, in line with the Codington County ordinance (see below). At a distance of 2 kilometers from a turbine base, the sound pressure level will be less than 35 dBA (considerably less than ordinance limits) so there is no need to include land parcels or structures beyond that distance. Land parcels were not modeled for Grant County as they are not a part of the Grant County ordinance.

The area of interest for this study is located in Codington and Grant Counties near the town of Watertown in northeastern South Dakota. The surrounding terrain has a change in elevation across the project site ranging from 475 to 621 meters (1,558 to 2,037 feet) at the wind turbine base. The region's vegetation is comprised primarily of prairie grass and agricultural land. The project overview map can be found in Appendix A.

2. BACKGROUND AND COUNTY REGULATIONS

To determine if the layout provided would be compliant for the Crowned Ridge Project and in line with each county's regulations, detailed sound scenarios were analyzed using a computer model. The scenarios assumed that the wind turbines were operating at a wind speed that resulted in the loudest sound being emitted, which is conservative because the turbines would not actually be operating at maximum sound output levels at all times.

Codington County's current Ordinance #68 Zoning Ordinance Section 5.22.03, paragraph 12.a) prescribes sound limits for wind turbine projects as follows:

"12.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.”

Therefore, Codington County’s only applicable sound limit is 50 dBA at an occupied non-participating property line, which is what has been evaluated in this report for Codington County. Although not required by the county, the sound pressure levels at participating property boundaries and participating and non-participating occupied structures (i.e., residences, business, and buildings) within 2 kilometers of a wind turbine were also evaluated.

Grant County’s current Ordinance 2016-01C, Section 1211.04, paragraph 14 prescribes sound limits for wind turbine projects as follows:

“14.) Noise. Noise level shall not exceed 45 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of existing off-site non-participating residences, businesses, buildings owned and/or maintained by a governmental entity.”

“Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of participating residences, businesses, and buildings owned and/or maintained by a governmental entity.”

Therefore, Grant County’s current applicable sound limit is 45 dBA for all non-participating, and 50 dBA for all participating, existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity. For purposes of this report, these residences, businesses, and buildings will hereafter be referred to as occupied structures.

3. STUDY METHODOLOGY

This sound analysis was performed utilizing windPRO¹, 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 (i.e., prairie grass, weeds, brush) and crop cover. Realistic sound pressure levels were calculated at 1.5 m AGL at the participating and non-participating existing occupied structures and occupied parcel boundaries (Codington County only). 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 analysis.

The inputs and assumptions for the windPRO sound calculation include the following:

- Turbine Coordinates
- Turbine Specifications
- Turbine Sound Emission Data
- Sound Receptor Coordinates
- Participation Status
- USGS Digital Elevation Model (DEM) (height contour data)
- Uncertainty Factor
- Meteorological Conditions
- Ground Attenuation

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. Sound is also absorbed by trees and reflected by structures such as buildings or walls, although these effects (trees and buildings) are ignored in the model.

Turbine Specifications: GE Wind turbine specifications from the manufacturer were supplied to EAPC by Crowned Ridge Wind, LLC. Wind turbine specifications included in the model were the power curves, blade types (standard and low noise), hub heights and operational rotational speed of the rotor. For all turbines, Low Noise Trailing Edge (LNTE) blades were used to reduce the sound pressure levels in order to achieve compliance with county regulations by increasing the flexibility in turbine locations to meet setback requirements. The turbine specifications for the Dakota Range I and II projects were supplied by Vestas.

Turbine Sound Emission Data: 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. A safety margin of 2 dBA was added to the wind turbine noise emission profiles for the analysis in order to produce more conservative results, meaning that the model will predict higher sound pressure levels.

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 2.3-116, the loudest normal operating sound pressure level emitted is 107.5 dBA at 10 m/s and higher at hub height. Since the value is reported at hub height, it is the same value for both 80 meter and 90 meter hub-height turbines.

For the turbines used in the Dakota Range projects, the loudest normal operating sound pressure level emitted from the Vestas V136-4.2 is 105.9 dBA at 9 m/s and higher.

The specifications for the GE and Vestas wind turbine models used in this study are included in Table 1 below. The table of Crowned Ridge wind turbine coordinates is included in Appendix B.

Table 1: Wind turbine specifications.

Crowned Ridge, Crowned Ridge II and Dakota Range I & II wind energy projects 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 2.3	80	116	3	22	107.5	106
General Electric	GE 2.3	90	116	3	22	107.5	106
Vestas	V136-4.2	82	136	3	20	106.5	103.9

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 all existing residences, and occupied structures found to be located within 2 kilometer of the 142 proposed wind turbine locations by Crowned Ridge.

In Grant County, where the point of compliance is 25 feet from the perimeter of the structure, a ring of receptors was modeled 50 feet from the perimeter in order to capture sound levels that would conservatively represent the sound pressure levels 25 feet away from the perimeter.

Receptor Participation Status: A database indicating the participation status of the land parcels and the structures within the wind farm boundary were supplied to EAPC by Crowned Ridge Wind, LLC.

USGS Digital Elevation Model (DEM) (height contour data): For this study, 3-meter resolution 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.

Uncertainty Factor: No uncertainty factor was provided by the wind turbine manufacturer. In this situation, it is common practice based on experience and studies to add 2 dBA to the sound pressure levels of each wind turbine. For this analysis, the 2 dBA were added to all wind turbine noise emission profiles.

Meteorological Conditions: A temperature of 10° C (50° F) and a relative humidity of 70% were assumed for the analysis. These conditions represent an atmospheric “worst case” scenario where sound waves will travel farther with less atmospheric absorption. This will lead to more conservative (higher predicted sound levels) results.

All wind turbines are assumed to be operating simultaneously at maximum sound output levels. All turbines are assumed to be downwind of all receptors, which is another conservative (higher predicted sound pressure levels) assumption.

Ground Attenuation: A ground attenuation factor of 0.5 was assumed for this analysis. It represents “mixed ground” consisting of half hard and half soft (porous) ground cover, which is slightly conservative and will result in higher predicted sound levels since the ground cover includes native prairie and agricultural crop land.

No other sources of sound attenuation such as trees, air turbulence or wind shadow effects were assumed in the analysis.

Wind Turbines from Adjacent Projects: The Crowned Ridge II project and the Dakota Range I and II projects are adjacent to the Crowned Ridge project. Because sound impacts are cumulative, there will be impacts from these other projects that will be additive to the impacts from the Crowned Ridge project. The Crowned Ridge II wind turbine array and the Dakota Range I and II turbine arrays were included in the model to capture the full sound impacts on the receptors.

4. RESULTS OF ANALYSIS

Although modeled as one project, the noise ordinances of the two counties are not the same. For Codington County, the noise limit is 50 dBA at the property boundary of occupied non-participating landowners. Codington County does not have a specific ordinance for sound pressure levels at a participating property boundary; although not required by the county, the sound pressure levels at participating property boundaries and occupied structures within 2 kilometers of a wind turbine were also evaluated. There is also no ordinance for sound pressure levels at any participating or non-participating occupied structures. For Grant County, the noise limit is 45 dBA at a distance of 25 feet from the perimeter of non-participating occupied structures and 50 dBA at participating occupied structures. Because of the differences in compliance criteria, the results of the study are presented individually for each county.

Crowned Ridge Codington County Turbines

For the Crowned Ridge Codington County Turbines, the sound study indicates that the highest sound pressure level at a non-participating property boundary is 49.9 dBA. Therefore, the project would be in compliance with Codington County’s allowable sound pressure levels as described in Section 5.22.03 paragraph 12 of Ordinance #68. Table 2 shows the distribution of sound pressure levels for the project. The maximum sound pressure level at a participating property boundary is 53.5 dBA; however, as there is no

county ordinance for participating property boundaries. This information is provided for transparency.

Table 2: Codington County property boundary realistic sound distribution

Realistic Sound (dBA)	Non-Participating Property Boundary	Participating Property Boundary
0 to 25	0	0
25 to 30	0	0
30 to 35	0	0
35 to 40	11	0
40 to 45	12	4
45 to 50	23	7
50+	0	10

Crowned Ridge Grant County Turbines

For Grant County, the sound study indicates that the highest sound pressure level at a distance of 25 feet from the perimeter of a non-participating occupied structure is 43 dBA. The highest sound pressure level at a distance of 25 feet from the perimeter of a participating occupied structure is 45.3 dBA. Therefore the project would be in compliance with Grant County's allowable sound pressure levels as described in Section 1211.04, paragraph 14 of the current Grant County Zoning Ordinance 2016-01C. Table 3 shows the distribution of sound pressure levels for the project.

Table 3: Grant County occupied structure realistic sound distribution

Realistic Sound (dBA)	Non-Participating Occupied Structures	Participating Occupied Structures
0 to 25	0	0
25 to 30	2	0
30 to 35	4	0
35 to 40	10	14
40 to 45	10	17
45 to 50	0	3
+50	0	0

Crowned Ridge Project Summary

The summary results for the Crowned Ridge Project are shown in table 4 below. The full table of results from the sound study can be found in Appendix C. Table C-1 lists the results sorted by receptor number and Table C-2 lists the results sorted by sound impacts (dBA) from highest to lowest. Table C-3 lists the results with 6 of the turbines recommended by Hessler removed. Table C-4 lists the results with the Grant County ordinance applied 25 feet from the perimeter of all occupied structures in both Grant and Codington Counties. All of the tabular results include the cumulative impacts from Crowned Ridge and Crowned Ridge II windfarms. The maps showing the sound impact iso-lines for the Crowned Ridge wind farm are in Appendix D.

Table 4: Summary of sound pressure level predictions.

County	Feature	Noise Limit (dBA)	Maximum Predicted (dBA)
Codington	Participating Occupied Structures	N/A	47.8
	Non-Participating Occupied Structures	N/A	44.8
	Participating Occupied Parcel Boundary Lines	N/A	53.5
	Non-participating Occupied Parcel Boundary Lines	50	49.9
Grant	Participating Occupied Structures	50	45.3
	Non-Participating Occupied Structures	45	43

5. CONCLUSIONS

The conservative results of this sound study indicate that the Crowned Ridge Project is in compliance with both Codington and Grant County ordinances.

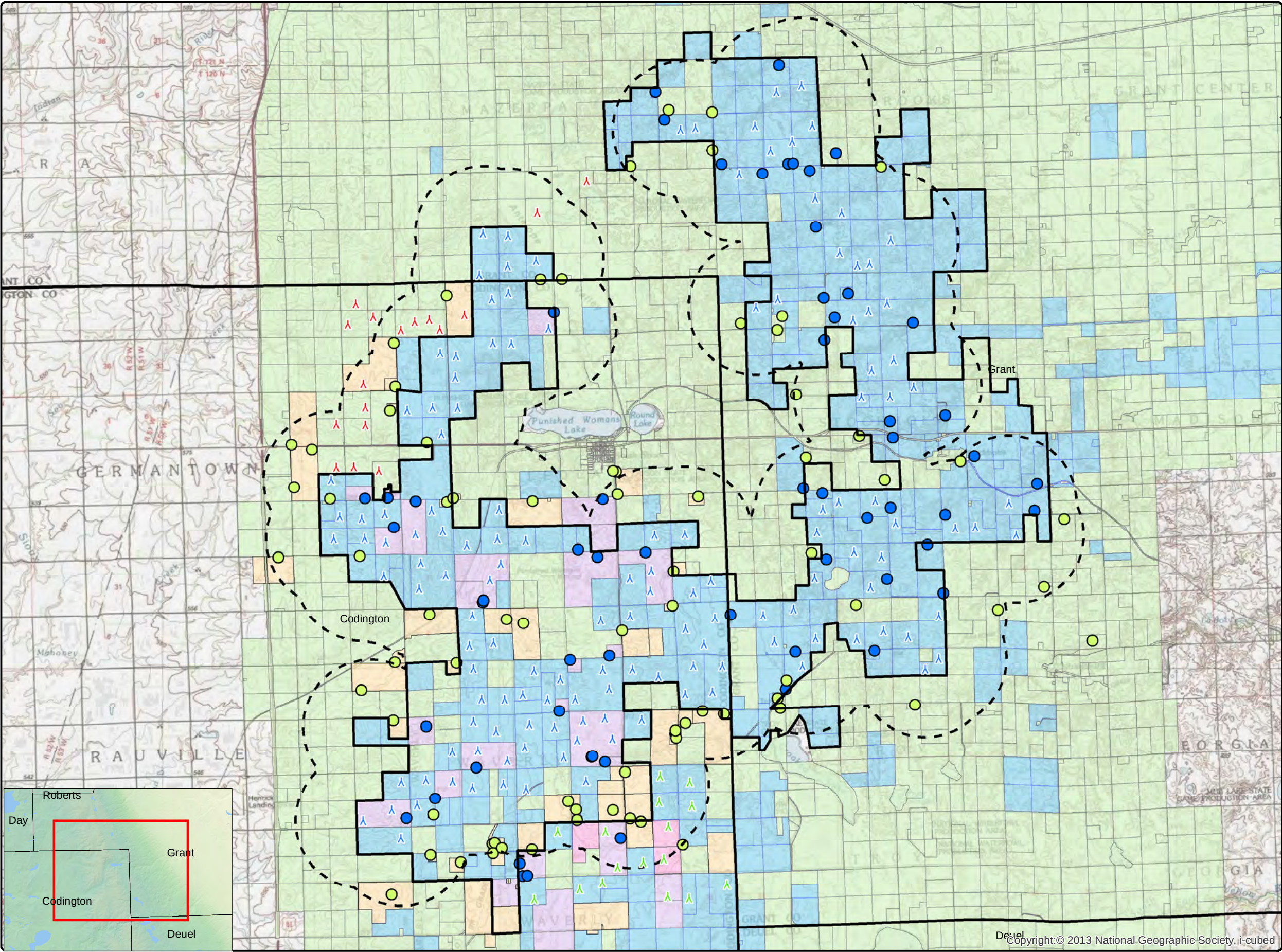
For Codington County, of the 67 property boundaries modeled, the highest sound pressure level at a non-participating property boundary is 49.9 dBA and none measured more than 50 dBA. Therefore the Crowned Ridge wind farms would be in compliance with Codington County Ordinance #68.

For Grant County, the sound study indicates that the highest sound pressure level 25 feet from the perimeter of a non-participating occupied structure is 43 dBA. The highest sound pressure level 25 feet from the perimeter of a participating occupied structure is 45.3 dBA. Therefore the project would be in compliance with the current Grant County Ordinance 2016-01C.

The results of this study are inherently conservative due to the fact that the turbines were modeled as though they were always operating at maximum sound emission levels and in all cases, an additional 2 dBA was added to the sound level being emitted by the turbine

during the modeling stage and not to the results of the sound modeling. The turbines were also modeled as though they were always downwind of each receptor, and atmospheric conditions were modeled to be most favorable for sound transmission. In addition, the receptors in Grant County were modeled 50 feet from the perimeter of the structures where the ordinance specifies 25 feet. Noise levels will be higher farther away from the perimeter.

APPENDIX A: CROWNED RIDGE WIND ENERGY PROJECT SITE OVERVIEW MAP



www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Overview Map

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with land parcels within the project footprint and existing occupied structures.

Codington County occupied land parcels within 2 km of a wind turbine.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS **Checked By:** JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.

APPENDIX B: WIND TURBINE COORDINATES

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-1	GE2.3 116RD 90HH r2.madE	659,443	5,003,083	610.2	LNTE
CRI-2	GE2.3 116RD 90HH r2.madE	660,185	5,003,010	598.1	LNTE
CRI-3	GE2.3 116RD 90HH r2.madE	661,008	5,002,288	584.1	LNTE
CRI-4	GE2.3 116RD 90HH r2.madE	660,173	5,002,120	602.5	LNTE
CRI-5	GE2.3 116RD 90HH r2.madE	659,337	5,001,862	609.9	LNTE
CRI-6	GE2.3 116RD 90HH r2.madE	660,193	5,001,329	610.5	LNTE
CRI-7	GE2.3 116RD 90HH r2.madE	659,705	5,001,146	618.0	LNTE
CRI-8	GE2.3 116RD 90HH r2.madE	661,380	5,000,282	588.3	LNTE
CRI-9	GE2.3 116RD 90HH r2.madE	659,731	4,999,855	613.4	LNTE
CRI-10	GE2.3 116RD 90HH r2.madE	660,280	4,999,837	615.0	LNTE
CRI-11	GE2.3 116RD 90HH r2.madE	658,170	4,999,546	610.9	LNTE
CRI-12	GE2.3 116RD 90HH r2.madE	658,644	4,999,460	615.0	LNTE
CRI-13	GE2.3 116RD 90HH r2.madE	658,622	4,998,843	613.3	LNTE
CRI-14	GE2.3 116RD 90HH r2.madE	657,947	4,997,935	618.3	LNTE
CRI-15	GE2.3 116RD 90HH r2.madE	658,688	4,997,924	618.0	LNTE
CRI-16	GE2.3 116RD 90HH r2.madE	657,203	4,997,856	611.9	LNTE
CRI-18	GE2.3 116RD 90HH r2.madE	658,217	4,997,154	618.0	LNTE
CRI-19	GE2.3 116RD 90HH r2.madE	654,954	4,995,804	601.1	LNTE
CRI-20	GE2.3 116RD 90HH r2.madE	659,920	4,994,924	594.0	LNTE
CRI-21	GE2.3 116RD 90HH r2.madE	657,925	4,994,896	617.1	LNTE
CRI-22	GE2.3 116RD 90HH r2.madE	656,543	4,994,796	616.5	LNTE
CRI-23	GE2.3 116RD 90HH r2.madE	655,208	4,994,717	594.7	LNTE
CRI-24	GE2.3 116RD 90HH r2.madE	655,852	4,994,652	609.0	LNTE
CRI-25	GE2.3 116RD 90HH r2.madE	658,251	4,994,286	605.5	LNTE
CRI-26	GE2.3 116RD 90HH r2.madE	665,405	4,994,191	578.5	LNTE
CRI-27	GE2.3 116RD 90HH r2.madE	657,442	4,994,187	621.0	LNTE
CRI-28	GE2.3 116RD 90HH r2.madE	664,517	4,994,168	579.0	LNTE
CRI-29	GE2.3 116RD 90HH r2.madE	655,940	4,994,069	606.9	LNTE
CRI-30	GE2.3 116RD 90HH r2.madE	659,871	4,994,052	593.7	LNTE
CRI-31	GE2.3 116RD 90HH r2.madE	655,030	4,994,051	603.0	LNTE
CRI-32	GE2.3 116RD 90HH r2.madE	660,704	4,993,998	606.0	LNTE
CRI-33	GE2.3 116RD 90HH r2.madE	656,566	4,993,941	618.0	LNTE
CRI-34	GE2.3 116RD 90HH r2.madE	658,966	4,993,856	599.7	LNTE
CRI-35	GE2.3 116RD 90HH r2.madE	657,602	4,993,347	607.4	LNTE
CRI-36	GE2.3 116RD 90HH r2.madE	659,966	4,993,319	594.0	LNTE
CRI-37	GE2.3 116RD 90HH r2.madE	664,419	4,993,110	587.3	LNTE
CRI-38	GE2.3 116RD 90HH r2.madE	658,338	4,992,981	600.5	LNTE
CRI-39	GE2.3 116RD 90HH r2.madE	656,507	4,992,958	609.0	LNTE
CRI-41	GE2.3 116RD 90HH r2.madE	663,782	4,992,883	597.7	LNTE
CRI-43	GE2.3 116RD 90HH r2.madE	666,181	4,992,815	577.9	LNTE
CRI-44	GE2.3 116RD 90HH r2.madE	665,665	4,992,460	576.0	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-46	GE2.3 116RD 90HH r2.madE	664,387	4,992,505	591.0	LNTE
CRI-48	GE2.3 116RD 90HH r2.madE	663,794	4,991,782	587.1	LNTE
CRI-50	GE2.3 116RD 90HH r2.madE	662,930	4,991,655	612.0	LNTE
CRI-51	GE2.3 116RD 90HH r2.madE	666,299	4,991,723	575.3	LNTE
CRI-52	GE2.3 116RD 90HH r2.madE	665,426	4,991,398	575.6	LNTE
CRI-53	GE2.3 116RD 90HH r2.madE	659,750	4,990,981	598.7	LNTE
CRI-54	GE2.3 116RD 90HH r2.madE	665,979	4,990,946	573.7	LNTE
CRI-55	GE2.3 116RD 90HH r2.madE	659,045	4,990,899	597.1	LNTE
CRI-58	GE2.3 116RD 90HH r2.madE	665,663	4,990,303	585.0	LNTE
CRI-59	GE2.3 116RD 90HH r2.madE	666,523	4,990,291	573.0	LNTE
CRI-60	GE2.3 116RD 90HH r2.madE	659,155	4,990,208	594.0	LNTE
CRI-61	GE2.3 116RD 90HH r2.madE	662,982	4,990,178	612.0	LNTE
CRI-62	GE2.3 116RD 90HH r2.madE	660,954	4,990,155	600.7	LNTE
CRI-63	GE2.3 116RD 90HH r2.madE	664,627	4,989,977	588.6	LNTE
CRI-64	GE2.3 116RD 90HH r2.madE	663,858	4,990,188	604.3	LNTE
CRI-65	GE2.3 116RD 90HH r2.madE	661,732	4,989,898	609.0	LNTE
CRI-66	GE2.3 116RD 90HH r2.madE	663,165	4,989,613	614.7	LNTE
CRI-67	GE2.3 116RD 90HH r2.madE	666,226	4,989,531	574.8	LNTE
CRI-68	GE2.3 116RD 90HH r2.madE	665,420	4,989,461	585.0	LNTE
CRI-69	GE2.3 116RD 80HH r2.madE	660,621	4,989,453	605.6	LNTE
CRI-70	GE2.3 116RD 90HH r2.madE	662,171	4,989,319	611.0	LNTE
CRI-71	GE2.3 116RD 80HH r2.madE	659,405	4,989,320	607.3	LNTE
CRI-72	GE2.3 116RD 80HH r2.madE	660,087	4,989,309	606.0	LNTE
CRI-73	GE2.3 116RD 90HH r2.madE	661,344	4,989,297	609.8	LNTE
CRI-74	GE2.3 116RD 90HH r2.madE	663,041	4,988,744	615.0	LNTE
CRI-75	GE2.3 116RD 90HH r2.madE	664,137	4,988,702	609.0	LNTE
CRI-76	GE2.3 116RD 90HH r2.madE	662,399	4,988,667	615.0	LNTE
CRI-77	GE2.3 116RD 80HH r2.madE	659,158	4,988,642	612.0	LNTE
CRI-78	GE2.3 116RD 80HH r2.madE	660,811	4,988,558	604.1	LNTE
CRI-80	GE2.3 116RD 90HH r2.madE	661,552	4,988,481	608.8	LNTE
CRI-81	GE2.3 116RD 90HH r2.madE	659,825	4,988,365	606.8	LNTE
CRI-82	GE2.3 116RD 90HH r2.madE	663,271	4,988,133	613.0	LNTE
CRI-83	GE2.3 116RD 90HH r2.madE	662,227	4,988,103	606.6	LNTE
CRI-84	GE2.3 116RD 80HH r2.madE	660,677	4,987,880	600.6	LNTE
CRI-85	GE2.3 116RD 90HH r2.madE	659,295	4,987,798	612.0	LNTE
CRI-86	GE2.3 116RD 90HH r2.madE	658,534	4,987,759	613.1	LNTE
CRI-87	GE2.3 116RD 90HH r2.madE	661,830	4,987,596	609.0	LNTE
CRI-88	GE2.3 116RD 90HH r2.madE	660,157	4,987,492	603.0	LNTE
CRI-89	GE2.3 116RD 80HH r2.madE	657,758	4,986,926	614.9	LNTE
CRI-90	GE2.3 116RD 80HH r2.madE	658,545	4,986,881	612.0	LNTE
CRI-91	GE2.3 116RD 80HH r2.madE	657,023	4,986,868	612.0	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
 GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
 UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-92	GE2.3 116RD 80HH r2.madE	660,039	4,986,804	607.2	LNTE
CRI-93	GE2.3 116RD 80HH r2.madE	659,133	4,986,700	607.9	LNTE
CRI-94	GE2.3 116RD 80HH r2.madE	660,716	4,986,660	600.6	LNTE
CRI-95	GE2.3 116RD 90HH r2.madE	657,488	4,986,184	612.0	LNTE
CRI-96	GE2.3 116RD 90HH r2.madE	656,744	4,986,037	609.0	LNTE
CRI-97	GE2.3 116RD 80HH r2.madE	655,899	4,985,715	592.7	LNTE
CRI-98	GE2.3 116RD 90HH r2.madE	657,015	4,985,192	608.9	LNTE
CRI-99	GE2.3 116RD 90HH r2.madE	672,521	4,990,188	556.7	LNTE
CRI-100	GE2.3 116RD 90HH r2.madE	668,885	4,990,286	585.0	LNTE
CRI-101	GE2.3 116RD 90HH r2.madE	672,921	4,990,513	544.6	LNTE
CRI-102	GE2.3 116RD 90HH r2.madE	668,059	4,991,023	581.0	LNTE
CRI-103	GE2.3 116RD 90HH r2.madE	669,279	4,991,115	582.0	LNTE
CRI-104	GE2.3 116RD 90HH r2.madE	672,009	4,991,151	555.0	LNTE
CRI-105	GE2.3 116RD 90HH r2.madE	670,488	4,991,091	571.6	LNTE
CRI-106	GE2.3 116RD 90HH r2.madE	671,278	4,991,335	566.2	LNTE
CRI-107	GE2.3 116RD 90HH r2.madE	667,723	4,991,800	582.0	LNTE
CRI-108	GE2.3 116RD 90HH r2.madE	672,917	4,991,775	541.2	LNTE
CRI-109	GE2.3 116RD 90HH r2.madE	670,897	4,992,616	557.4	LNTE
CRI-111	GE2.3 116RD 90HH r2.madE	671,220	4,993,526	550.6	LNTE
CRI-112	GE2.3 116RD 90HH r2.madE	670,419	4,993,665	561.0	LNTE
CRI-113	GE2.3 116RD 90HH r2.madE	675,201	4,994,165	497.6	LNTE
CRI-114	GE2.3 116RD 90HH r2.madE	669,318	4,994,256	561.0	LNTE
CRI-115	GE2.3 116RD 90HH r2.madE	673,402	4,994,374	516.4	LNTE
CRI-116	GE2.3 116RD 90HH r2.madE	671,642	4,994,527	531.4	LNTE
CRI-117	GE2.3 116RD 90HH r2.madE	669,488	4,994,930	544.8	LNTE
CRI-118	GE2.3 116RD 90HH r2.madE	669,961	4,995,134	540.4	LNTE
CRI-119	GE2.3 116RD 90HH r2.madE	674,992	4,995,107	492.0	LNTE
CRI-120	GE2.3 116RD 90HH r2.madE	671,034	4,995,179	536.2	LNTE
CRI-121	GE2.3 116RD 90HH r2.madE	670,629	4,998,259	531.0	LNTE
CRI-122	GE2.3 116RD 90HH r2.madE	671,475	4,998,261	517.4	LNTE
CRI-123	GE2.3 116RD 90HH r2.madE	672,180	4,998,561	505.0	LNTE
CRI-124	GE2.3 116RD 90HH r2.madE	670,926	4,999,036	522.8	LNTE
CRI-125	GE2.3 116RD 90HH r2.madE	671,580	4,999,340	509.8	LNTE
CRI-126	GE2.3 116RD 90HH r2.madE	670,382	5,000,519	516.0	LNTE
CRI-127	GE2.3 116RD 90HH r2.madE	670,845	5,000,795	507.4	LNTE
CRI-128	GE2.3 116RD 90HH r2.madE	671,388	5,001,034	498.2	LNTE
CRI-129	GE2.3 116RD 90HH r2.madE	667,516	5,000,900	553.6	LNTE
CRI-130	GE2.3 116RD 90HH r2.madE	668,158	5,001,149	546.0	LNTE
CRI-131	GE2.3 116RD 90HH r2.madE	670,512	5,002,137	504.0	LNTE
CRI-132	GE2.3 116RD 90HH r2.madE	670,875	5,002,186	499.9	LNTE
CRI-133	GE2.3 116RD 90HH r2.madE	669,990	5,002,521	502.7	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
continued

[illegible]

APPENDIX C: TABLE OF SOUND RESULTS

Table C-1: Crowned Ridge Sound Level Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Coddington County

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C1-NP	Non-P	Boundary	657,276	4,983,921	590.3	36.4	4,258
CR1-C2-NP	Non-P	Boundary	658,435	4,984,609	601.8	37.5	5,036
CR1-C3-NP	Non-P	Boundary	657,812	4,984,785	603.4	39.3	2,936
CR1-C4-NP	Non-P	Boundary	659,890	4,985,620	605.2	40.4	3,914
CR1-C6-P	Participant	Boundary	663,383	4,994,502	591.0	38.3	3,878
CR1-C7-NP	Non-P	Boundary	661,266	4,985,387	591.0	46.5	1,253
CR1-C8-P	Participant	Boundary	661,277	4,984,852	597.0	43.0	2,139
CR1-C9-NP	Non-P	Boundary	665,264	4,985,116	609.0	45.3	1,814
CR1-C10-P	Participant	Boundary	662,871	4,985,402	601.7	52.1	614
CR1-C11-NP	Non-P	Boundary	664,482	4,984,923	608.8	47.4	1,509
CR1-C12-NP	Non-P	Boundary	662,067	4,985,677	605.1	45.1	1,670
CR1-C13-NP	Non-P	Boundary	664,428	4,986,270	615.0	49.9	728
CR1-C14-NP	Non-P	Boundary	657,803	4,986,003	609.0	46.1	1,191
CR1-C15-NP	Non-P	Boundary	663,047	4,985,700	612.9	48.7	968
CR1-C16-NP	Non-P	Boundary	661,642	4,985,677	597.0	48.7	948
CR1-C17-P	Participant	Boundary	658,819	4,986,842	611.4	49.7	909
CR1-C18-NP	Non-P	Boundary	664,396	4,987,007	609.4	49.1	948
CR1-C19-P	Participant	Boundary	660,393	4,987,529	608.4	50.1	784
CR1-C20-P	Participant	Boundary	662,024	4,987,612	604.2	51.0	640
CR1-C26-P	Participant	Boundary	658,015	4,987,993	606.7	43.4	1,867
CR1-C27-NP	Non-P	Boundary	657,234	4,988,151	587.2	39.5	4,265
CR1-C28-NP	Non-P	Boundary	665,432	4,989,009	583.9	44.7	1,483
CR1-C29-NP	Non-P	Boundary	666,496	4,989,001	574.3	42.5	1,952
CR1-C30-P	Participant	Boundary	661,978	4,989,318	612.8	51.3	633
CR1-C31-NP	Non-P	Boundary	665,639	4,989,013	584.7	44.3	1,637
CR1-C32-NP	Non-P	Boundary	657,160	4,990,373	573.2	37.5	6,421
CR1-C33-NP	Non-P	Boundary	657,126	4,990,843	567.0	37.8	5,856
CR1-C34-NP	Non-P	Boundary	658,763	4,990,247	589.4	45.8	1,293
CR1-C35-P	Participant	Boundary	661,955	4,990,153	606.1	47.1	1,112
CR1-C36-P	Participant	Boundary	663,116	4,990,548	610.7	46.1	1,293
CR1-C37-NP	Non-P	Boundary	663,829	4,990,572	594.0	46.1	1,263
CR1-C38-NP	Non-P	Boundary	660,955	4,990,468	591.2	47.3	1,027
CR1-C39-NP	Non-P	Boundary	659,741	4,991,242	583.3	48.5	856
CR1-C40-NP	Non-P	Boundary	658,706	4,991,231	579.8	44.8	1,555
CR1-C41-NP	Non-P	Boundary	664,797	4,992,137	578.8	44.5	1,808
CR1-C42-P	Participant	Boundary	659,828	4,992,807	580.1	51.1	604
CR1-C44-NP	Non-P	Boundary	665,447	4,992,972	578.1	44.3	1,824
CR1-C45-NP	Non-P	Boundary	653,821	4,993,552	573.0	36.6	4,291
CR1-C46-NP	Non-P	Boundary	655,903	4,993,577	609.0	45.1	1,621

Table C-1: Crowned Ridge Sound Level Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C47-P	Participant	Boundary	663,454	4,992,888	612.0	46.7	1,076
CR1-C48-P	Participant	Boundary	664,262	4,992,514	586.6	53.5	413
CR1-C49-P	Participant	Boundary	662,224	4,993,664	609.0	38.3	5,105
CR1-C50-P	Participant	Boundary	656,239	4,994,042	618.0	49.6	984
CR1-C51-P	Participant	Boundary	657,753	4,994,889	620.0	51.5	564
CR1-C52-NP	Non-P	Boundary	654,986	4,995,398	603.0	45.8	1,335
CR1-C53-NP	Non-P	Boundary	664,171	4,995,340	580.5	37.2	4,009
CR1-C54-NP	Non-P	Boundary	663,495	4,995,329	582.9	36.5	5,075
CR1-C55-NP	Non-P	Boundary	660,139	4,994,937	607.0	49.4	722
CR1-C56-P	Participant	Boundary	655,385	4,995,606	603.0	45.6	1,555
CR1-C57-P	Participant	Boundary	656,526	4,995,198	616.1	45.8	1,319
CR1-C58-NP	Non-P	Boundary	657,839	4,997,040	615.0	45.4	1,293
CR1-C59-P	Participant	Boundary	661,380	5,000,092	591.5	50.2	623
CR1-C60-NP	Non-P	Boundary	656,539	4,998,453	609.3	42.6	2,162
CR1-C61-NP	Non-P	Boundary	656,926	4,997,851	612.0	47.8	909
CR1-C62-NP	Non-P	Boundary	658,155	4,994,994	614.5	48.7	820
CR1-C63-NP	Non-P	Boundary	658,543	4,995,211	606.8	42.4	2,277
CR1-C64-P	Participant	Boundary	659,129	4,991,995	576.6	49.9	679
CR1-C65-NP	Non-P	Boundary	665,516	4,995,045	578.0	39.1	2,825
CR1-C70-NP	Non-P	Boundary	664,953	4,987,981	596.1	42.2	3,225
CR1-C71-NP	Non-P	Boundary	664,683	4,987,355	600.0	48.2	1,047
CR1-C105-NP	Non-P	Boundary	658,351	5,000,265	609.0	49.8	604
CR1-C107-NP	Non-P	Boundary	655,923	4,998,435	595.6	48.5	673
CR1-C109-NP	Non-P	Boundary	654,533	4,997,357	592.6	40.9	1,909
CR1-C110-NP	Non-P	Boundary	654,553	4,996,633	588.7	41.3	2,365
CR1-C111-NP	Non-P	Boundary	654,576	4,995,809	599.1	45.5	1,240
CR1-C112-NP	Non-P	Boundary	660,152	4,984,994	604.0	39.2	5,075
CR2-C150-P	Participant	Boundary	657,308	4,986,173	600.0	51.3	591
CR1-C1-NP	Non-P	Structure	656,743	4,983,525	596.0	34.8	5,541
CR1-C2-NP	Non-P	Structure	658,791	4,984,483	602.0	37.2	6,273
CR1-C3-NP	Non-P	Structure	657,888	4,984,697	604.2	38.7	3,294
CR1-C4-NP	Non-P	Structure	659,744	4,984,749	606.0	38.4	5,981
CR1-C5-NP	Non-P	Structure	659,958	4,984,794	604.8	38.7	5,659
CR1-C6-P	Participant	Structure	662,989	4,995,228	599.8	36.3	6,102
CR1-C7-NP	Non-P	Structure	660,893	4,984,861	593.2	41.1	3,022
CR1-C8-P	Participant	Structure	660,532	4,984,445	599.4	40.0	3,740
CR1-C9-NP	Non-P	Structure	665,352	4,985,004	609.0	44.7	2,280
CR1-C10-P	Participant	Structure	663,510	4,985,195	609.0	46.0	1,634

Table C-1: Crowned Ridge Sound Level Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C11-NP	Non-P	Structure	664,111	4,985,679	609.0	44.0	2,615
CR1-C12-NP	Non-P	Structure	662,222	4,985,736	603.0	44.0	2,201
CR1-C12-1-NP	Non-P	Structure	662,199	4,986,047	606.0	43.2	2,818
CR1-C13-NP	Non-P	Structure	663,792	4,985,785	612.0	43.5	2,713
CR1-C14-NP	Non-P	Structure	657,982	4,985,894	609.0	43.4	1,880
CR1-C15-NP	Non-P	Structure	663,291	4,986,026	615.0	43.7	2,175
CR1-C16-NP	Non-P	Structure	661,960	4,986,288	606.0	43.0	2,648
CR1-C17-P	Participant	Structure	658,031	4,986,373	609.1	45.1	1,886
CR1-C18-NP	Non-P	Structure	663,651	4,987,157	610.4	42.6	3,409
CR1-C19-P	Participant	Structure	659,243	4,987,276	611.6	46.3	1,722
CR1-C20-P	Participant	Structure	663,054	4,987,455	606.0	44.0	2,336
CR1-C21-P	Participant	Structure	660,756	4,984,086	594.0	41.9	2,388
CR1-C22-P	Participant	Structure	660,755	4,984,082	594.0	41.9	2,375
CR1-C23-P	Participant	Structure	660,619	4,984,078	595.8	41.4	2,523
CR1-C26-P	Participant	Structure	657,767	4,988,493	597.0	40.3	3,484
CR1-C27-NP	Non-P	Structure	656,876	4,988,683	583.0	37.5	5,974
CR1-C28-NP	Non-P	Structure	665,429	4,988,598	590.9	41.7	2,831
CR1-C29-NP	Non-P	Structure	666,572	4,988,867	575.9	41.2	2,457
CR1-C30-P	Participant	Structure	661,699	4,988,957	615.0	47.8	1,614
CR1-C31-NP	Non-P	Structure	665,939	4,988,950	585.4	43.2	2,126
CR1-C32-NP	Non-P	Structure	655,843	4,989,581	568.8	35.2	9,708
CR1-C33-NP	Non-P	Structure	656,839	4,990,404	569.8	36.9	7,418
CR1-C34-NP	Non-P	Structure	658,661	4,990,389	588.2	44.5	1,726
CR1-C35-P	Participant	Structure	662,025	4,990,475	609.0	43.7	2,123
CR1-C36-P	Participant	Structure	663,181	4,990,600	615.0	45.3	1,532
CR1-C37-NP	Non-P	Structure	663,563	4,991,342	605.1	44.8	1,631
CR1-C38-NP	Non-P	Structure	660,639	4,991,557	597.0	40.9	3,474
CR1-C39-NP	Non-P	Structure	660,144	4,991,670	588.0	42.2	2,605
CR1-C40-NP	Non-P	Structure	657,865	4,991,818	583.7	41.4	2,690
CR1-C41-NP	Non-P	Structure	665,053	4,992,084	576.1	44.1	2,356
CR1-C42-P	Participant	Structure	659,458	4,992,229	580.0	44.6	1,801
CR1-C44-NP	Non-P	Structure	665,076	4,993,095	578.2	43.8	2,155
CR1-C45-NP	Non-P	Structure	653,390	4,993,503	573.2	35.0	5,673
CR1-C46-NP	Non-P	Structure	655,802	4,993,540	609.1	44.4	1,795
CR1-C47-P	Participant	Structure	662,825	4,993,508	613.9	39.2	3,750
CR1-C48-P	Participant	Structure	664,247	4,993,646	588.0	44.6	1,847
CR1-C49-P	Participant	Structure	662,250	4,993,731	609.0	38.2	5,148
CR1-C50-P	Participant	Structure	656,806	4,994,388	621.0	46.8	1,591

continued

[illegible]

Table C-1: Crowned Ridge Sound Level Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case sound results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Grant County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-G12-NP	Non-P	Structure	668,229	4,989,039	575.0	37.8	4,623
CR1-G13-NP	Non-P	Structure	672,216	4,989,142	558.0	37.2	3,576
CR1-G14-NP	Non-P	Structure	668,156	4,989,332	574.1	38.6	3,940
CR1-G15-P	Participant	Structure	668,396	4,989,607	576.0	39.9	2,746
CR1-G16-NP	Non-P	Structure	668,419	4,989,861	576.0	41.7	2,070
CR1-G18-P	Participant	Structure	668,678	4,990,722	585.0	45.1	1,585
CR1-G19-P	Participant	Structure	671,018	4,990,744	570.0	43.4	2,077
CR1-G21-P	Participant	Structure	666,766	4,991,807	577.1	44.8	1,555
CR1-G22-NP	Non-P	Structure	674,670	4,991,955	527.6	34.8	5,781
CR1-G23-NP	Non-P	Structure	670,471	4,992,104	560.0	42.5	2,185
CR1-G24-P	Participant	Structure	673,058	4,992,440	539.4	35.0	2,231
CR1-G25-P	Participant	Structure	671,391	4,992,858	549.0	43.8	1,804
CR1-G26-P	Participant	Structure	672,589	4,993,869	531.0	39.9	3,140
CR1-G27-NP	Non-P	Structure	676,630	4,994,642	480.8	34.0	4,944
CR1-G28-P	Participant	Structure	673,113	4,994,772	513.9	43.2	1,614
CR1-G32-P	Participant	Structure	669,477	4,995,401	546.0	45.1	1,545
CR1-G33-P	Participant	Structure	668,911	4,995,550	548.7	39.9	2,779
CR1-G34-NP	Non-P	Structure	671,320	4,995,798	531.0	40.8	2,238
CR1-G36-NP	Non-P	Structure	673,559	4,996,344	498.0	35.4	6,211
CR1-G37-NP	Non-P	Structure	668,998	4,996,452	549.0	36.6	5,246
CR1-G38-P	Participant	Structure	673,972	4,996,493	494.5	35.0	5,646
CR1-G41-P	Participant	Structure	671,563	4,997,050	497.6	37.9	3,983
CR1-G42-NP	Non-P	Structure	670,566	4,997,097	518.9	38.0	3,819
CR1-G43-NP	Non-P	Structure	661,141	5,001,721	583.6	42.9	1,909
CR1-G44-NP	Non-P	Structure	661,781	5,001,732	583.7	39.2	3,123
CR1-G59-P	Participant	Structure	675,755	4,994,888	487.7	39.6	2,605
CR1-G60-P	Participant	Structure	675,830	4,995,687	477.0	36.4	3,343
CR1-G65-P	Participant	Structure	671,496	4,994,973	537.0	45.3	1,539
CR1-G66-P	Participant	Structure	670,802	4,994,681	539.7	43.9	1,801
CR1-G67-P	Participant	Structure	669,597	4,993,440	556.1	43.2	2,106
CR1-G68-NP	Non-P	Structure	669,159	4,993,632	565.6	43.0	2,113
CR1-G70-NP	Non-P	Structure	677,465	4,991,043	492.0	29.3	12,651
CR1-G77-NP	Non-P	Structure	676,031	4,992,629	502.7	33.2	5,728
CR1-G81-P	Participant	Structure	671,478	4,997,523	508.8	40.7	2,421
CR1-G105-NP	Non-P	Structure	668,696	4,998,325	549.0	35.2	6,345
CR1-G108-P	Participant	Structure	669,516	5,001,186	522.2	39.7	3,586
CR1-G109-NP	Non-P	Structure	667,064	5,000,425	566.2	40.1	2,152
CR1-G110-NP	Non-P	Structure	671,218	5,005,064	456.2	34.8	5,889

continued

[illegible]

Table C-2: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C13-NP	Non-P	Boundary	664,428	4,986,270	615.0	49.9	728
CR1-C105-NP	Non-P	Boundary	658,351	5,000,265	609.0	49.8	604
CR1-C55-NP	Non-P	Boundary	660,139	4,994,937	607.0	49.4	722
CR1-C18-NP	Non-P	Boundary	664,396	4,987,007	609.4	49.1	948
CR1-C15-NP	Non-P	Boundary	663,047	4,985,700	612.9	48.7	968
CR1-C62-NP	Non-P	Boundary	658,155	4,994,994	614.5	48.7	820
CR1-C16-NP	Non-P	Boundary	661,642	4,985,677	597.0	48.7	948
CR1-C39-NP	Non-P	Boundary	659,741	4,991,242	583.3	48.5	856
CR1-C107-NP	Non-P	Boundary	655,923	4,998,435	595.6	48.5	673
CR1-C71-NP	Non-P	Boundary	664,683	4,987,355	600.0	48.2	1,047
CR1-C61-NP	Non-P	Boundary	656,926	4,997,851	612.0	47.8	909
CR1-C11-NP	Non-P	Boundary	664,482	4,984,923	608.8	47.4	1,509
CR1-C38-NP	Non-P	Boundary	660,955	4,990,468	591.2	47.3	1,027
CR1-C7-NP	Non-P	Boundary	661,266	4,985,387	591.0	46.5	1,253
CR1-C14-NP	Non-P	Boundary	657,803	4,986,003	609.0	46.1	1,191
CR1-C37-NP	Non-P	Boundary	663,829	4,990,572	594.0	46.1	1,263
CR1-C34-NP	Non-P	Boundary	658,763	4,990,247	589.4	45.8	1,293
CR1-C52-NP	Non-P	Boundary	654,986	4,995,398	603.0	45.8	1,335
CR1-C111-NP	Non-P	Boundary	654,576	4,995,809	599.1	45.5	1,240
CR1-C58-NP	Non-P	Boundary	657,839	4,997,040	615.0	45.4	1,293
CR1-C9-NP	Non-P	Boundary	665,264	4,985,116	609.0	45.3	1,814
CR1-C46-NP	Non-P	Boundary	655,903	4,993,577	609.0	45.1	1,621
CR1-C12-NP	Non-P	Boundary	662,067	4,985,677	605.1	45.1	1,670
CR1-C40-NP	Non-P	Boundary	658,706	4,991,231	579.8	44.8	1,555
CR1-C28-NP	Non-P	Boundary	665,432	4,989,009	583.9	44.7	1,483
CR1-C41-NP	Non-P	Boundary	664,797	4,992,137	578.8	44.5	1,808
CR1-C31-NP	Non-P	Boundary	665,639	4,989,013	584.7	44.3	1,637
CR1-C44-NP	Non-P	Boundary	665,447	4,992,972	578.1	44.3	1,824
CR1-C60-NP	Non-P	Boundary	656,539	4,998,453	609.3	42.6	2,162
CR1-C29-NP	Non-P	Boundary	666,496	4,989,001	574.3	42.5	1,952
CR1-C63-NP	Non-P	Boundary	658,543	4,995,211	606.8	42.4	2,277
CR1-C70-NP	Non-P	Boundary	664,953	4,987,981	596.1	42.2	3,225
CR1-C110-NP	Non-P	Boundary	654,553	4,996,633	588.7	41.3	2,910
CR1-C109-NP	Non-P	Boundary	654,533	4,997,357	592.6	40.9	1,909
CR1-C4-NP	Non-P	Boundary	659,890	4,985,620	605.2	40.4	3,914
CR1-C27-NP	Non-P	Boundary	657,234	4,988,151	587.2	39.5	4,265
CR1-C3-NP	Non-P	Boundary	657,812	4,984,785	603.4	39.3	2,936
CR1-C112-NP	Non-P	Boundary	660,152	4,984,994	604.0	39.2	5,075
CR1-C65-NP	Non-P	Boundary	665,516	4,995,045	578.0	39.1	2,825

Table C-2: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C33-NP	Non-P	Boundary	657,126	4,990,843	567.0	37.8	5,856
CR1-C32-NP	Non-P	Boundary	657,160	4,990,373	573.2	37.5	6,421
CR1-C2-NP	Non-P	Boundary	658,435	4,984,609	601.8	37.5	5,036
CR1-C53-NP	Non-P	Boundary	664,171	4,995,340	580.5	37.2	4,009
CR1-C45-NP	Non-P	Boundary	653,821	4,993,552	573.0	36.6	4,291
CR1-C54-NP	Non-P	Boundary	663,495	4,995,329	582.9	36.5	5,075
CR1-C1-NP	Non-P	Boundary	657,276	4,983,921	590.3	36.4	4,258
CR1-C48-P	Participant	Boundary	664,262	4,992,514	586.6	53.5	413
CR1-C10-P	Participant	Boundary	662,871	4,985,402	601.7	52.1	614
CR1-C51-P	Participant	Boundary	657,753	4,994,889	620.0	51.5	564
CR1-C30-P	Participant	Boundary	661,978	4,989,318	612.8	51.3	633
CR2-C150-P	Participant	Boundary	657,308	4,986,173	600.0	51.3	591
CR1-C42-P	Participant	Boundary	659,828	4,992,807	580.1	51.1	604
CR1-C20-P	Participant	Boundary	662,024	4,987,612	604.2	51.0	640
CR1-C59-P	Participant	Boundary	661,380	5,000,092	591.5	50.2	623
CR1-C19-P	Participant	Boundary	660,393	4,987,529	608.4	50.1	784
CR1-C64-P	Participant	Boundary	659,129	4,991,995	576.6	49.9	679
CR1-C17-P	Participant	Boundary	658,819	4,986,842	611.4	49.7	909
CR1-C50-P	Participant	Boundary	656,239	4,994,042	618.0	49.6	984
CR1-C35-P	Participant	Boundary	661,955	4,990,153	606.1	47.1	1,112
CR1-C47-P	Participant	Boundary	663,454	4,992,888	612.0	46.7	1,076
CR1-C36-P	Participant	Boundary	663,116	4,990,548	610.7	46.1	1,293
CR1-C57-P	Participant	Boundary	656,526	4,995,198	616.1	45.8	1,319
CR1-C56-P	Participant	Boundary	655,385	4,995,606	603.0	45.6	1,555
CR1-C26-P	Participant	Boundary	658,015	4,987,993	606.7	43.4	1,867
CR1-C8-P	Participant	Boundary	661,277	4,984,852	597.0	43.0	2,139
CR1-C49-P	Participant	Boundary	662,224	4,993,664	609.0	38.3	5,105
CR1-C6-P	Participant	Boundary	663,383	4,994,502	591.0	38.3	3,878
CR1-C37-NP	Non-P	Structure	663,563	4,991,342	605.1	44.8	1,631
CR1-C9-NP	Non-P	Structure	665,352	4,985,004	609.0	44.7	2,280
CR1-C52-NP	Non-P	Structure	654,924	4,995,231	603.0	44.6	1,883
CR1-C34-NP	Non-P	Structure	658,661	4,990,389	588.2	44.5	1,726
CR1-C46-NP	Non-P	Structure	655,802	4,993,540	609.1	44.4	1,795
CR1-C61-NP	Non-P	Structure	656,690	4,997,831	612.0	44.2	1,686
CR1-C41-NP	Non-P	Structure	665,053	4,992,084	576.1	44.1	2,356
CR1-C12-NP	Non-P	Structure	662,222	4,985,736	603.0	44.0	2,201
CR1-C11-NP	Non-P	Structure	664,111	4,985,679	609.0	44.0	2,615
CR1-C62-NP	Non-P	Structure	658,375	4,995,138	615.0	43.9	1,676

Table C-2: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19

Realistic case sound results at land parcel boundaries and occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C107-NP	Non-P	Structure	656,811	4,999,855	598.8	43.9	1,401
CR1-C44-NP	Non-P	Structure	665,076	4,993,095	578.2	43.8	2,155
CR1-C15-NP	Non-P	Structure	663,291	4,986,026	615.0	43.7	2,175
CR1-C58-NP	Non-P	Structure	657,781	4,996,906	615.0	43.7	1,647
CR1-C13-NP	Non-P	Structure	663,792	4,985,785	612.0	43.5	2,713
CR1-C14-NP	Non-P	Structure	657,982	4,985,894	609.0	43.4	1,880
CR1-C12-1-NP	Non-P	Structure	662,199	4,986,047	606.0	43.2	2,818
CR1-C31-NP	Non-P	Structure	665,939	4,988,950	585.4	43.2	2,126
CR1-C16-NP	Non-P	Structure	661,960	4,986,288	606.0	43.0	2,648
CR1-C18-NP	Non-P	Structure	663,651	4,987,157	610.4	42.6	3,409
CR1-C39-NP	Non-P	Structure	660,144	4,991,670	588.0	42.2	2,605
CR1-C60-NP	Non-P	Structure	656,855	4,998,565	613.5	42.1	2,592
CR1-C63-NP	Non-P	Structure	658,566	4,995,254	612.4	42.1	2,408
CR1-C105-NP	Non-P	Structure	658,372	5,001,257	600.3	42.1	2,549
CR1-C28-NP	Non-P	Structure	665,429	4,988,598	590.9	41.7	2,831
CR1-C70-NP	Non-P	Structure	665,135	4,988,293	595.9	41.6	3,540
CR1-C71-NP	Non-P	Structure	665,137	4,988,378	595.6	41.6	3,448
CR1-C72-NP	Non-P	Structure	665,158	4,988,170	594.6	41.6	3,776
CR1-C40-NP	Non-P	Structure	657,865	4,991,818	583.7	41.4	2,690
CR1-C29-NP	Non-P	Structure	666,572	4,988,867	575.9	41.2	2,457
CR1-C7-NP	Non-P	Structure	660,893	4,984,861	593.2	41.1	3,022
CR1-C38-NP	Non-P	Structure	660,639	4,991,557	597.0	40.9	3,474
CR1-C110-NP	Non-P	Structure	654,385	4,996,686	593.9	40.1	2,910
CR1-C55-NP	Non-P	Structure	660,914	4,995,169	607.5	39.4	3,360
CR1-C67-NP	Non-P	Structure	659,789	4,985,057	606.0	38.9	5,791
CR1-C112-NP	Non-P	Structure	660,002	4,984,908	604.6	38.9	5,627
CR1-C3-NP	Non-P	Structure	657,888	4,984,697	604.2	38.7	3,294
CR1-C5-NP	Non-P	Structure	659,958	4,984,794	604.8	38.7	5,659
CR1-C66-NP	Non-P	Structure	659,718	4,985,032	606.0	38.7	5,800
CR1-C4-NP	Non-P	Structure	659,744	4,984,749	606.0	38.4	5,981
CR1-C111-NP	Non-P	Structure	653,857	4,995,573	591.0	38.3	3,678
CR1-C27-NP	Non-P	Structure	656,876	4,988,683	583.0	37.5	5,974
CR1-C2-NP	Non-P	Structure	658,791	4,984,483	602.0	37.2	6,273
CR1-C65-NP	Non-P	Structure	665,805	4,995,305	579.0	37.2	3,884
CR1-C109-NP	Non-P	Structure	653,780	4,996,828	588.0	37.1	4,797
CR1-C33-NP	Non-P	Structure	656,839	4,990,404	569.8	36.9	7,418
CR1-C54-NP	Non-P	Structure	663,421	4,995,376	583.4	36.3	5,351
CR1-C32-NP	Non-P	Structure	655,843	4,989,581	568.8	35.2	9,708

continued

[illegible]

Table C-2: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19

Realistic case sound results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Grant County

continued

Receptor ID	Participation Status	Type	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-G68-NP	Non-P	Structure	669,159	4,993,632	565.6	43.0	2,113
CR1-G43-NP	Non-P	Structure	661,141	5,001,721	583.6	42.9	1,909
CR1-G125-NP	Non-P	Structure	668,289	5,000,643	543.0	42.8	1,716
CR1-G23-NP	Non-P	Structure	670,471	4,992,104	560.0	42.5	2,185
CR1-G16-NP	Non-P	Structure	668,419	4,989,861	576.0	41.7	2,070
CR1-G114-NP	Non-P	Structure	666,214	5,006,667	521.1	40.8	2,205
CR1-G34-NP	Non-P	Structure	671,320	4,995,798	531.0	40.8	2,238
CR1-G115-NP	Non-P	Structure	664,933	5,006,731	544.6	40.5	2,188
CR1-G113-NP	Non-P	Structure	666,228	5,005,549	537.0	40.3	2,746
CR1-G109-NP	Non-P	Structure	667,064	5,000,425	566.2	40.1	2,152
CR1-G130-NP	Non-P	Structure	668,147	5,000,233	549.0	39.3	3,005
CR1-G44-NP	Non-P	Structure	661,781	5,001,732	583.7	39.2	3,123
CR1-G14-NP	Non-P	Structure	668,156	4,989,332	574.1	38.6	3,940
CR1-G42-NP	Non-P	Structure	670,566	4,997,097	518.9	38.0	3,819
CR1-G12-NP	Non-P	Structure	668,229	4,989,039	575.0	37.8	4,623
CR1-G13-NP	Non-P	Structure	672,216	4,989,142	558.0	37.2	3,576
CR1-G37-NP	Non-P	Structure	668,998	4,996,452	549.0	36.6	5,246
CR1-G36-NP	Non-P	Structure	673,559	4,996,344	498.0	35.4	6,211
CR1-G117-NP	Non-P	Structure	663,801	5,005,084	581.3	35.3	4,501
CR1-G105-NP	Non-P	Structure	668,696	4,998,325	549.0	35.2	6,345
CR1-G22-NP	Non-P	Structure	674,670	4,991,955	527.6	34.8	5,781
CR1-G110-NP	Non-P	Structure	671,218	5,005,064	456.2	34.8	5,889
CR1-G27-NP	Non-P	Structure	676,630	4,994,642	480.8	34.0	4,944
CR1-G77-NP	Non-P	Structure	676,031	4,992,629	502.7	33.2	5,728
CR1-G70-NP	Non-P	Structure	677,465	4,991,043	492.0	29.3	12,651
CR1-G600-NP	Non-P	Structure	674,301	5,005,773	393.0	28.8	13,186
CR1-G65-P	Participant	Structure	671,496	4,994,973	537.0	45.3	1,539
CR1-G18-P	Participant	Structure	668,678	4,990,722	585.0	45.1	1,585
CR1-G32-P	Participant	Structure	669,477	4,995,401	546.0	45.1	1,545
CR1-G21-P	Participant	Structure	666,766	4,991,807	577.1	44.8	1,555
CR1-G66-P	Participant	Structure	670,802	4,994,681	539.7	43.9	1,801
CR1-G25-P	Participant	Structure	671,391	4,992,858	549.0	43.8	1,804
CR1-G19-P	Participant	Structure	671,018	4,990,744	570.0	43.4	2,077
CR1-G67-P	Participant	Structure	669,597	4,993,440	556.1	43.2	2,106
CR1-G28-P	Participant	Structure	673,113	4,994,772	513.9	43.2	1,614
CR1-G128-P	Participant	Structure	670,242	5,001,314	513.0	42.9	2,612
CR1-G131-P	Participant	Structure	668,466	5,005,145	505.2	42.9	2,133
CR1-G124-P	Participant	Structure	669,843	5,000,605	525.0	42.7	1,791

continued

[illegible]

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/27/19

6 turbines removed as suggested by Mr. Hessler

Realistic case sound results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codington County

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Hessler Case Sound (dB(A))	Real Case Sound (dB(A))	Reduction (DB(A))	Distance to Nearest Turbine (ft)
CR1-C37-NP	Non-P	663,563	4,991,342	605.1	44.8	44.8	0.0	1,631
CR1-C9-NP	Non-P	665,352	4,985,004	609.0	44.7	44.7	0.0	2,280
CR1-C46-NP	Non-P	655,802	4,993,540	609.1	44.2	44.4	0.2	1,795
CR1-C61-NP	Non-P	656,690	4,997,831	612.0	44.2	44.2	0.0	1,686
CR1-C41-NP	Non-P	665,053	4,992,084	576.1	44.1	44.1	0.0	2,356
CR1-C11-NP	Non-P	664,111	4,985,679	609.0	43.9	44.0	0.1	2,615
CR1-C12-NP	Non-P	662,222	4,985,736	603.0	43.9	44.0	0.1	2,201
CR1-C62-NP	Non-P	658,375	4,995,138	615.0	43.9	43.9	0.0	1,676
CR1-C107-NP	Non-P	656,811	4,999,855	598.8	43.9	43.9	0.0	1,401
CR1-C15-NP	Non-P	663,291	4,986,026	615.0	43.7	43.7	0.0	2,175
CR1-C44-NP	Non-P	665,076	4,993,095	578.2	43.7	43.8	0.1	2,155
CR1-C58-NP	Non-P	657,781	4,996,906	615.0	43.7	43.7	0.0	1,647
CR1-C13-NP	Non-P	663,792	4,985,785	612.0	43.5	43.5	0.0	2,713
CR1-C14-NP	Non-P	657,982	4,985,894	609.0	43.3	43.4	0.1	1,880
CR1-C12-1-NP	Non-P	662,199	4,986,047	606.0	43.1	43.2	0.1	2,818
CR1-C16-NP	Non-P	661,960	4,986,288	606.0	43.0	43.0	0.0	2,648
CR1-C18-NP	Non-P	663,651	4,987,157	610.4	42.5	42.6	0.1	3,409
CR1-C34-NP	Non-P	658,661	4,990,389	588.2	42.3	44.5	2.2	1,726
CR1-C105-NP	Non-P	658,372	5,001,257	600.3	42.1	42.1	0.0	2,549
CR1-C39-NP	Non-P	660,144	4,991,670	588.0	42.0	42.2	0.2	2,605
CR1-C60-NP	Non-P	656,855	4,998,565	613.5	42.0	42.1	0.1	2,592
CR1-C63-NP	Non-P	658,566	4,995,254	612.4	42.0	42.1	0.1	2,408
CR1-C40-NP	Non-P	657,865	4,991,818	583.7	41.3	41.4	0.1	2,690
CR1-C7-NP	Non-P	660,893	4,984,861	593.2	41.1	41.1	0.0	3,022
CR1-C72-NP	Non-P	665,158	4,988,170	594.6	41.0	41.6	0.6	3,776
CR1-C70-NP	Non-P	665,135	4,988,293	595.9	40.9	41.6	0.7	3,540
CR1-C71-NP	Non-P	665,137	4,988,378	595.6	40.8	41.6	0.8	3,448
CR1-C38-NP	Non-P	660,639	4,991,557	597.0	40.7	40.9	0.2	3,474
CR1-C52-NP	Non-P	654,924	4,995,231	603.0	40.4	44.6	4.2	3,586
CR1-C28-NP	Non-P	665,429	4,988,598	590.9	40.1	41.7	1.6	2,831
CR1-C31-NP	Non-P	665,939	4,988,950	585.4	39.5	43.2	3.7	2,126
CR1-C55-NP	Non-P	660,914	4,995,169	607.5	39.3	39.4	0.1	3,360
CR1-C110-NP	Non-P	654,385	4,996,686	593.9	39.0	40.1	1.1	2,910
CR1-C112-NP	Non-P	660,002	4,984,908	604.6	38.9	38.9	0.0	5,627
CR1-C67-NP	Non-P	659,789	4,985,057	606.0	38.8	38.9	0.1	5,791
CR1-C3-NP	Non-P	657,888	4,984,697	604.2	38.7	38.7	0.0	3,294
CR1-C5-NP	Non-P	659,958	4,984,794	604.8	38.7	38.7	0.0	5,659
CR1-C66-NP	Non-P	659,718	4,985,032	606.0	38.7	38.7	0.0	5,800
CR1-C29-NP	Non-P	666,572	4,988,867	575.9	38.6	41.2	2.6	2,457

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/27/19

6 turbines removed as suggested by Mr. Hessler

Realistic case sound results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codrigton County

continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Hessler Case Sound (dB(A))	Real Case Sound (dB(A))	Reduction (DB(A))	Distance to Nearest Turbine (ft)
CR1-C4-NP	Non-P	659,744	4,984,749	606.0	38.3	38.4	0.1	5,981
CR1-C27-NP	Non-P	656,876	4,988,683	583.0	37.4	37.5	0.1	5,974
CR1-C2-NP	Non-P	658,791	4,984,483	602.0	37.2	37.2	0.0	6,273
CR1-C65-NP	Non-P	665,805	4,995,305	579.0	37.2	37.2	0.0	3,884
CR1-C33-NP	Non-P	656,839	4,990,404	569.8	36.6	36.9	0.3	7,418
CR1-C109-NP	Non-P	653,780	4,996,828	588.0	36.3	37.1	0.8	4,797
CR1-C111-NP	Non-P	653,857	4,995,573	591.0	36.3	38.3	2.0	6,289
CR1-C54-NP	Non-P	663,421	4,995,376	583.4	36.2	36.3	0.1	5,351
CR1-C53-NP	Non-P	663,376	4,996,043	578.8	35.1	35.2	0.1	7,201
CR1-C32-NP	Non-P	655,843	4,989,581	568.8	34.9	35.2	0.3	9,708
CR1-C1-NP	Non-P	656,743	4,983,525	596.0	34.8	34.8	0.0	5,541
CR1-C45-NP	Non-P	653,390	4,993,503	573.2	34.4	35.0	0.6	5,673
CR1-C30-P	Participant	661,699	4,988,957	615.0	47.8	47.8	0.0	1,614
CR1-C50-P	Participant	656,806	4,994,388	621.0	46.7	46.8	0.1	1,591
CR1-C19-P	Participant	659,243	4,987,276	611.6	46.3	46.3	0.0	1,722
CR2-C150-P	Participant	657,178	4,985,788	612.0	46.1	46.1	0.0	1,640
CR1-C10-P	Participant	663,510	4,985,195	609.0	46.0	46.0	0.0	1,634
CR1-C36-P	Participant	663,181	4,990,600	615.0	45.3	45.3	0.0	1,532
CR1-C68-P	Participant	662,652	4,987,606	609.0	45.2	45.2	0.0	2,146
CR1-C17-P	Participant	658,031	4,986,373	609.1	45.1	45.1	0.0	1,886
CR1-C69-P	Participant	662,685	4,987,619	609.0	45.1	45.1	0.0	2,185
CR1-C64-P	Participant	659,436	4,992,174	581.0	44.8	44.8	0.0	1,614
CR1-C48-P	Participant	664,247	4,993,646	588.0	44.6	44.6	0.0	1,847
CR1-C57-P	Participant	656,628	4,995,266	615.0	44.6	44.8	0.2	1,568
CR1-C42-P	Participant	659,458	4,992,229	580.0	44.5	44.6	0.1	1,801
CR1-C51-P	Participant	657,455	4,995,160	621.0	44.0	44.0	0.0	1,768
CR1-C56-P	Participant	655,953	4,995,244	606.5	44.0	44.7	0.7	1,972
CR1-C20-P	Participant	663,054	4,987,455	606.0	43.9	44.0	0.1	2,336
CR1-C35-P	Participant	662,025	4,990,475	609.0	43.7	43.7	0.0	2,123
CR1-C59-P	Participant	661,548	5,000,754	584.2	42.7	42.7	0.0	1,644
CR1-C21-P	Participant	660,756	4,984,086	594.0	41.9	41.9	0.0	2,388
CR1-C22-P	Participant	660,755	4,984,082	594.0	41.9	41.9	0.0	2,375
CR1-C23-P	Participant	660,619	4,984,078	595.8	41.4	41.4	0.0	2,523
CR1-C26-P	Participant	657,767	4,988,493	597.0	40.2	40.3	0.1	3,484
CR1-C8-P	Participant	660,532	4,984,445	599.4	39.9	40.0	0.1	3,740
CR1-C47-P	Participant	662,825	4,993,508	613.9	39.1	39.2	0.1	3,750
CR1-C49-P	Participant	662,250	4,993,731	609.0	38.1	38.2	0.1	5,148
CR1-C6-P	Participant	662,989	4,995,228	599.8	36.2	36.3	0.1	6,102

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/27/19

6 turbines removed as suggested by Mr. Hessler

Realistic case sound results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Grant County

continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Hessler Case Sound (dB(A))	Real Case Sound (dB(A))	Reduction (DB(A))	Distance to Nearest Turbine (ft)
CR1-G68-NP	Non-P	669,159	4,993,632	565.6	43.0	43.0	0.0	2,113
CR1-G43-NP	Non-P	661,141	5,001,721	583.6	42.9	42.9	0.0	1,909
CR1-G125-NP	Non-P	668,289	5,000,643	543.0	42.8	42.8	0.0	1,716
CR1-G23-NP	Non-P	670,471	4,992,104	560.0	42.5	42.5	0.0	2,185
CR1-G16-NP	Non-P	668,419	4,989,861	576.0	41.6	41.7	0.1	2,070
CR1-G114-NP	Non-P	666,214	5,006,667	521.1	40.8	40.8	0.0	2,205
CR1-G34-NP	Non-P	671,320	4,995,798	531.0	40.8	40.8	0.0	2,238
CR1-G115-NP	Non-P	664,933	5,006,731	544.6	40.5	40.5	0.0	2,188
CR1-G113-NP	Non-P	666,228	5,005,549	537.0	40.3	40.3	0.0	2,746
CR1-G109-NP	Non-P	667,064	5,000,425	566.2	40.1	40.1	0.0	2,152
CR1-G130-NP	Non-P	668,147	5,000,233	549.0	39.3	39.3	0.0	3,005
CR1-G44-NP	Non-P	661,781	5,001,732	583.7	39.2	39.2	0.0	3,123
CR1-G14-NP	Non-P	668,156	4,989,332	574.1	38.2	38.6	0.4	3,940
CR1-G42-NP	Non-P	670,566	4,997,097	518.9	38.0	38.0	0.0	3,819
CR1-G12-NP	Non-P	668,229	4,989,039	575.0	37.4	37.8	0.4	4,623
CR1-G13-NP	Non-P	672,216	4,989,142	558.0	37.2	37.2	0.0	3,576
CR1-G37-NP	Non-P	668,998	4,996,452	549.0	36.5	36.6	0.1	5,246
CR1-G36-NP	Non-P	673,559	4,996,344	498.0	35.4	35.4	0.0	6,211
CR1-G117-NP	Non-P	663,801	5,005,084	581.3	35.3	35.3	0.0	4,501
CR1-G105-NP	Non-P	668,696	4,998,325	549.0	35.2	35.2	0.0	6,345
CR1-G110-NP	Non-P	671,218	5,005,064	456.2	34.8	34.8	0.0	5,889
CR1-G22-NP	Non-P	674,670	4,991,955	527.6	34.8	34.8	0.0	5,781
CR1-G27-NP	Non-P	676,630	4,994,642	480.8	33.9	34.0	0.1	4,944
CR1-G77-NP	Non-P	676,031	4,992,629	502.7	33.1	33.2	0.1	5,728
CR1-G70-NP	Non-P	677,465	4,991,043	492.0	29.3	29.3	0.0	12,651
CR1-G600-NP	Non-P	674,301	5,005,773	393.0	28.8	28.8	0.0	13,186
CR1-G65-P	Participant	671,496	4,994,973	537.0	45.3	45.3	0.0	1,539
CR1-G18-P	Participant	668,678	4,990,722	585.0	45.1	45.1	0.0	1,585
CR1-G32-P	Participant	669,477	4,995,401	546.0	45.1	45.1	0.0	1,545
CR1-G21-P	Participant	666,766	4,991,807	577.1	44.7	44.8	0.1	1,555
CR1-G66-P	Participant	670,802	4,994,681	539.7	43.9	43.9	0.0	1,801
CR1-G25-P	Participant	671,391	4,992,858	549.0	43.8	43.8	0.0	1,804
CR1-G19-P	Participant	671,018	4,990,744	570.0	43.4	43.4	0.0	2,077
CR1-G67-P	Participant	669,597	4,993,440	556.1	43.2	43.2	0.0	2,106
CR1-G28-P	Participant	673,113	4,994,772	513.9	43.2	43.2	0.0	1,614
CR1-G128-P	Participant	670,242	5,001,314	513.0	42.9	42.9	0.0	2,612
CR1-G131-P	Participant	668,466	5,005,145	505.2	42.9	42.9	0.0	2,133
CR1-G124-P	Participant	669,843	5,000,605	525.0	42.7	42.7	0.0	1,791

continued

[illegible]

Table C-4: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19
Realistic case sound results 25 ft from occupied structures perimeter
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C37-NP	Non-P	663,563	4,991,342	605.1	45.0	1,631
CR1-C9-NP	Non-P	665,352	4,985,004	609.0	44.8	2,280
CR1-C52-NP	Non-P	654,924	4,995,231	603.0	44.7	1,883
CR1-C34-NP	Non-P	658,661	4,990,389	588.2	44.7	1,726
CR1-C46-NP	Non-P	655,802	4,993,540	609.1	44.6	1,795
CR1-C61-NP	Non-P	656,690	4,997,831	612.0	44.3	1,686
CR1-C41-NP	Non-P	665,053	4,992,084	576.1	44.2	2,356
CR1-C12-NP	Non-P	662,222	4,985,736	603.0	44.9	2,201
CR1-C11-NP	Non-P	664,111	4,985,679	609.0	44.0	2,615
CR1-C62-NP	Non-P	658,375	4,995,138	615.0	44.1	1,676
CR1-C107-NP	Non-P	656,811	4,999,855	598.8	44.1	1,401
CR1-C44-NP	Non-P	665,076	4,993,095	578.2	43.8	2,155
CR1-C15-NP	Non-P	663,291	4,986,026	615.0	43.8	2,175
CR1-C58-NP	Non-P	657,781	4,996,906	615.0	43.9	1,647
CR1-C13-NP	Non-P	663,792	4,985,785	612.0	43.5	2,713
CR1-C14-NP	Non-P	657,982	4,985,894	609.0	43.5	1,880
CR1-C12-1-NP	Non-P	662,199	4,986,047	606.0	43.2	2,818
CR1-C31-NP	Non-P	665,939	4,988,950	585.4	43.3	2,126
CR1-C16-NP	Non-P	661,960	4,986,288	606.0	43.0	2,648
CR1-C18-NP	Non-P	663,651	4,987,157	610.4	42.6	3,409
CR1-C39-NP	Non-P	660,144	4,991,670	588.0	42.2	2,605
CR1-C60-NP	Non-P	656,855	4,998,565	613.5	42.1	2,592
CR1-C63-NP	Non-P	658,566	4,995,254	612.4	42.1	2,408
CR1-C105-NP	Non-P	658,372	5,001,257	600.3	42.2	2,549
CR1-C28-NP	Non-P	665,429	4,988,598	590.9	41.8	2,831
CR1-C70-NP	Non-P	665,135	4,988,293	595.9	41.6	3,540
CR1-C71-NP	Non-P	665,137	4,988,378	595.6	41.7	3,448
CR1-C72-NP	Non-P	665,158	4,988,170	594.6	41.6	3,776
CR1-C40-NP	Non-P	657,865	4,991,818	583.7	41.5	2,690
CR1-C29-NP	Non-P	666,572	4,988,867	575.9	41.3	2,457
CR1-C7-NP	Non-P	660,893	4,984,861	593.2	41.2	3,022
CR1-C38-NP	Non-P	660,639	4,991,557	597.0	40.9	3,474
CR1-C110-NP	Non-P	654,385	4,996,686	593.9	40.2	2,910
CR1-C55-NP	Non-P	660,914	4,995,169	607.5	39.4	3,360
CR1-C67-NP	Non-P	659,789	4,985,057	606.0	38.9	5,791
CR1-C112-NP	Non-P	660,002	4,984,908	604.6	38.9	5,627
CR1-C3-NP	Non-P	657,888	4,984,697	604.2	38.8	3,294
CR1-C5-NP	Non-P	659,958	4,984,794	604.8	38.7	5,659
CR1-C66-NP	Non-P	659,718	4,985,032	606.0	38.8	5,800

Table C-4: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19
Realistic case sound results 25 ft from occupied structures perimeter
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-C4-NP	Non-P	659,744	4,984,749	606.0	38.4	5,981
CR1-C111-NP	Non-P	653,857	4,995,573	591.0	38.3	3,678
CR1-C27-NP	Non-P	656,876	4,988,683	583.0	37.6	5,974
CR1-C2-NP	Non-P	658,791	4,984,483	602.0	37.3	6,273
CR1-C65-NP	Non-P	665,805	4,995,305	579.0	37.3	3,884
CR1-C109-NP	Non-P	653,780	4,996,828	588.0	37.2	4,797
CR1-C33-NP	Non-P	656,839	4,990,404	569.8	36.9	7,418
CR1-C54-NP	Non-P	663,421	4,995,376	583.4	36.3	5,351
CR1-C32-NP	Non-P	655,843	4,989,581	568.8	35.2	9,708
CR1-C53-NP	Non-P	663,376	4,996,043	578.8	35.2	7,201
CR1-C45-NP	Non-P	653,390	4,993,503	573.2	35.1	5,673
CR1-C1-NP	Non-P	656,743	4,983,525	596.0	34.9	5,541
CR1-C30-P	Participant	661,699	4,988,957	615.0	47.8	1,614
CR1-C50-P	Participant	656,806	4,994,388	621.0	46.8	1,591
CR1-C19-P	Participant	659,243	4,987,276	611.6	39.5	1,722
CR2-C150-P	Participant	657,178	4,985,788	612.0	46.2	1,640
CR1-C10-P	Participant	663,510	4,985,195	609.0	46.1	1,634
CR1-C36-P	Participant	663,181	4,990,600	615.0	45.5	1,532
CR1-C68-P	Participant	662,652	4,987,606	609.0	45.2	2,146
CR1-C17-P	Participant	658,031	4,986,373	609.1	45.2	1,886
CR1-C69-P	Participant	662,685	4,987,619	609.0	45.2	2,185
CR1-C57-P	Participant	656,628	4,995,266	615.0	45.0	1,568
CR1-C64-P	Participant	659,436	4,992,174	581.0	44.9	1,614
CR1-C56-P	Participant	655,953	4,995,244	606.5	44.8	1,972
CR1-C42-P	Participant	659,458	4,992,229	580.0	44.7	1,801
CR1-C48-P	Participant	664,247	4,993,646	588.0	44.7	1,847
CR1-C20-P	Participant	663,054	4,987,455	606.0	44.0	2,336
CR1-C51-P	Participant	657,455	4,995,160	621.0	44.2	1,768
CR1-C35-P	Participant	662,025	4,990,475	609.0	43.8	2,123
CR1-C59-P	Participant	661,548	5,000,754	584.2	42.9	1,644
CR1-C21-P	Participant	660,756	4,984,086	594.0	42.0	2,388
CR1-C22-P	Participant	660,755	4,984,082	594.0	42.0	2,375
CR1-C23-P	Participant	660,619	4,984,078	595.8	41.5	2,523
CR1-C26-P	Participant	657,767	4,988,493	597.0	40.4	3,484
CR1-C8-P	Participant	660,532	4,984,445	599.4	40.0	3,740
CR1-C47-P	Participant	662,825	4,993,508	613.9	39.3	3,750
CR1-C49-P	Participant	662,250	4,993,731	609.0	38.2	5,148
CR1-C6-P	Participant	662,989	4,995,228	599.8	36.3	6,102

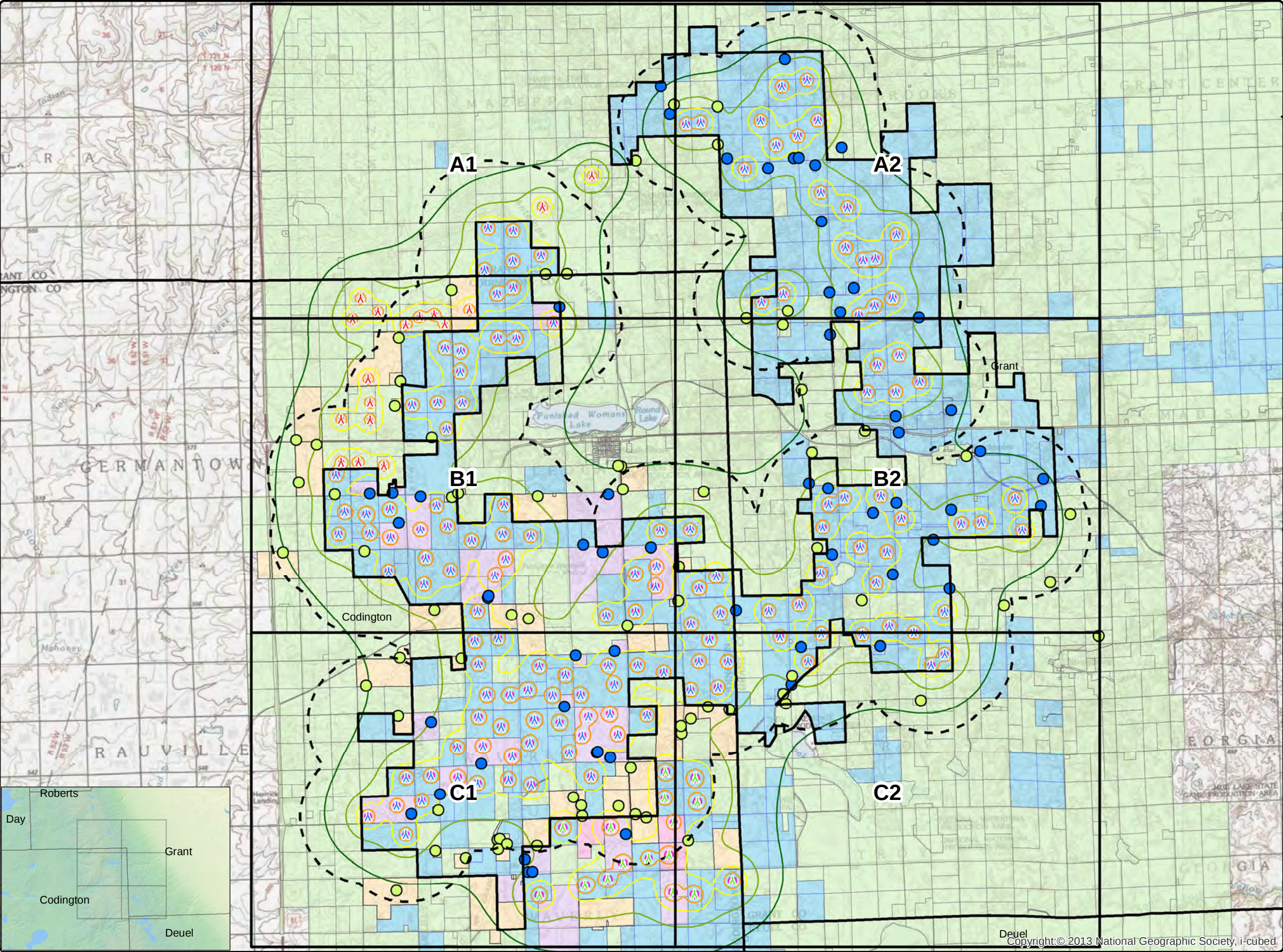
Table C-4: Crowned Ridge Sound Level Tabular Results Sorted by Sound Level - Updated 7/26/19
Realistic case sound results 25 ft from occupied structures perimeter
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Grant County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Sound (dB(A))	Distance to Nearest Turbine (ft)
CR1-G68-NP	Non-P	669,159	4,993,632	565.6	43.0	2,113
CR1-G43-NP	Non-P	661,141	5,001,721	583.6	42.9	1,909
CR1-G125-NP	Non-P	668,289	5,000,643	543.0	42.8	1,716
CR1-G23-NP	Non-P	670,471	4,992,104	560.0	42.5	2,185
CR1-G16-NP	Non-P	668,419	4,989,861	576.0	41.7	2,070
CR1-G114-NP	Non-P	666,214	5,006,667	521.1	40.8	2,205
CR1-G34-NP	Non-P	671,320	4,995,798	531.0	40.8	2,238
CR1-G115-NP	Non-P	664,933	5,006,731	544.6	40.5	2,188
CR1-G113-NP	Non-P	666,228	5,005,549	537.0	40.3	2,746
CR1-G109-NP	Non-P	667,064	5,000,425	566.2	40.1	2,152
CR1-G130-NP	Non-P	668,147	5,000,233	549.0	39.3	3,005
CR1-G44-NP	Non-P	661,781	5,001,732	583.7	39.2	3,123
CR1-G14-NP	Non-P	668,156	4,989,332	574.1	38.6	3,940
CR1-G42-NP	Non-P	670,566	4,997,097	518.9	38.0	3,819
CR1-G12-NP	Non-P	668,229	4,989,039	575.0	37.8	4,623
CR1-G13-NP	Non-P	672,216	4,989,142	558.0	37.2	3,576
CR1-G37-NP	Non-P	668,998	4,996,452	549.0	36.6	5,246
CR1-G36-NP	Non-P	673,559	4,996,344	498.0	35.4	6,211
CR1-G117-NP	Non-P	663,801	5,005,084	581.3	35.3	4,501
CR1-G105-NP	Non-P	668,696	4,998,325	549.0	35.2	6,345
CR1-G22-NP	Non-P	674,670	4,991,955	527.6	34.8	5,781
CR1-G110-NP	Non-P	671,218	5,005,064	456.2	34.8	5,889
CR1-G27-NP	Non-P	676,630	4,994,642	480.8	34.0	4,944
CR1-G77-NP	Non-P	676,031	4,992,629	502.7	33.2	5,728
CR1-G70-NP	Non-P	677,465	4,991,043	492.0	29.3	12,651
CR1-G600-NP	Non-P	674,301	5,005,773	393.0	28.8	13,186
CR1-G65-P	Participant	671,496	4,994,973	537.0	45.3	1,539
CR1-G18-P	Participant	668,678	4,990,722	585.0	45.1	1,585
CR1-G32-P	Participant	669,477	4,995,401	546.0	45.1	1,545
CR1-G21-P	Participant	666,766	4,991,807	577.1	44.8	1,555
CR1-G66-P	Participant	670,802	4,994,681	539.7	43.9	1,801
CR1-G25-P	Participant	671,391	4,992,858	549.0	43.8	1,804
CR1-G19-P	Participant	671,018	4,990,744	570.0	43.4	2,077
CR1-G67-P	Participant	669,597	4,993,440	556.1	43.2	2,106
CR1-G28-P	Participant	673,113	4,994,772	513.9	43.2	1,614
CR1-G128-P	Participant	670,242	5,001,314	513.0	42.9	2,612
CR1-G131-P	Participant	668,466	5,005,145	505.2	42.9	2,133
CR1-G124-P	Participant	669,843	5,000,605	525.0	42.7	1,791

continued

[illegible]

APPENDIX D: STANDARD RESOLUTION SOUND MAPS





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

**Crowned Ridge Wind Farm
Sound Pressure Iso-Lines
Overview Map**

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

Sound Pressure (dBA)

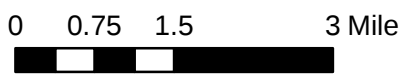
- 35
- 40
- 45
- 50
- 55

- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.

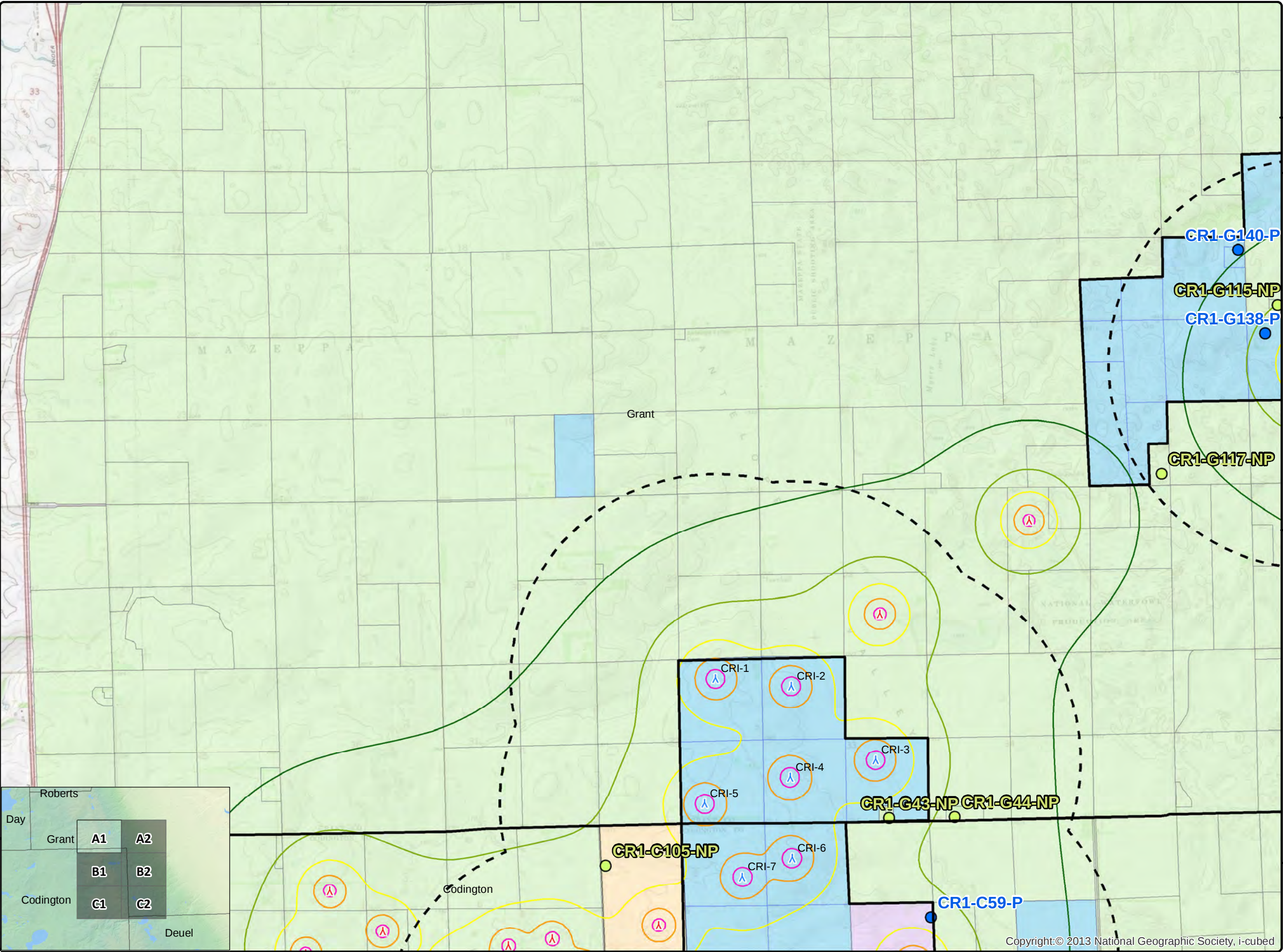


N
W E
S



Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.

020786





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.
Predicted sound pressure levels at existing residences and land parcel boundaries.
Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS **Checked By:** JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

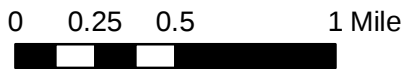
Sound Pressure (dBA)

- 35
- 40
- 45
- 50
- 55

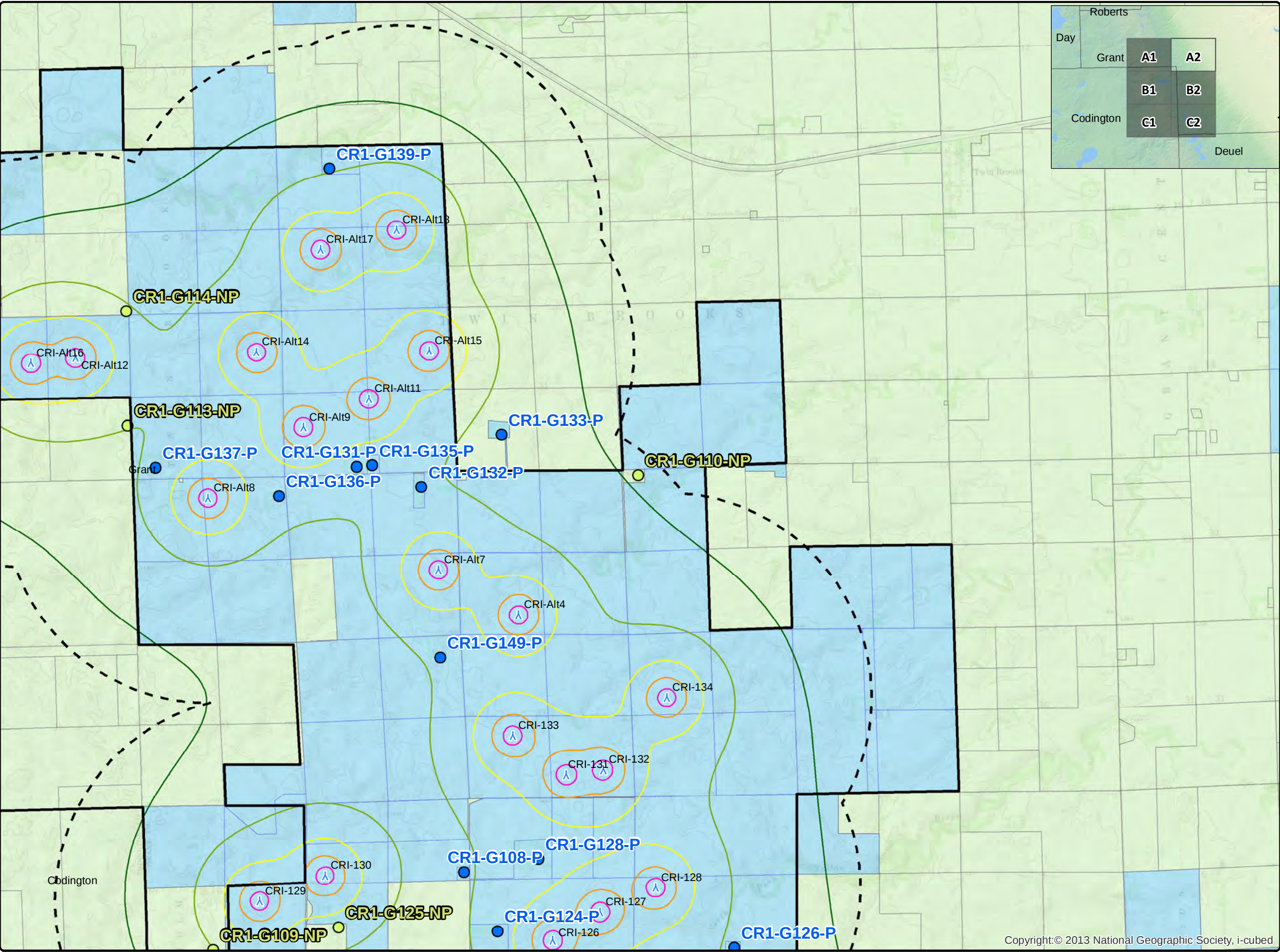
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.





www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

1	Original	2019.07.27
#	Description	Date

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

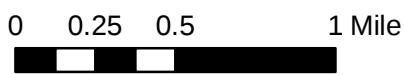
Sound Pressure (dBA)

- 35
- 40
- 45
- 50
- 55

- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

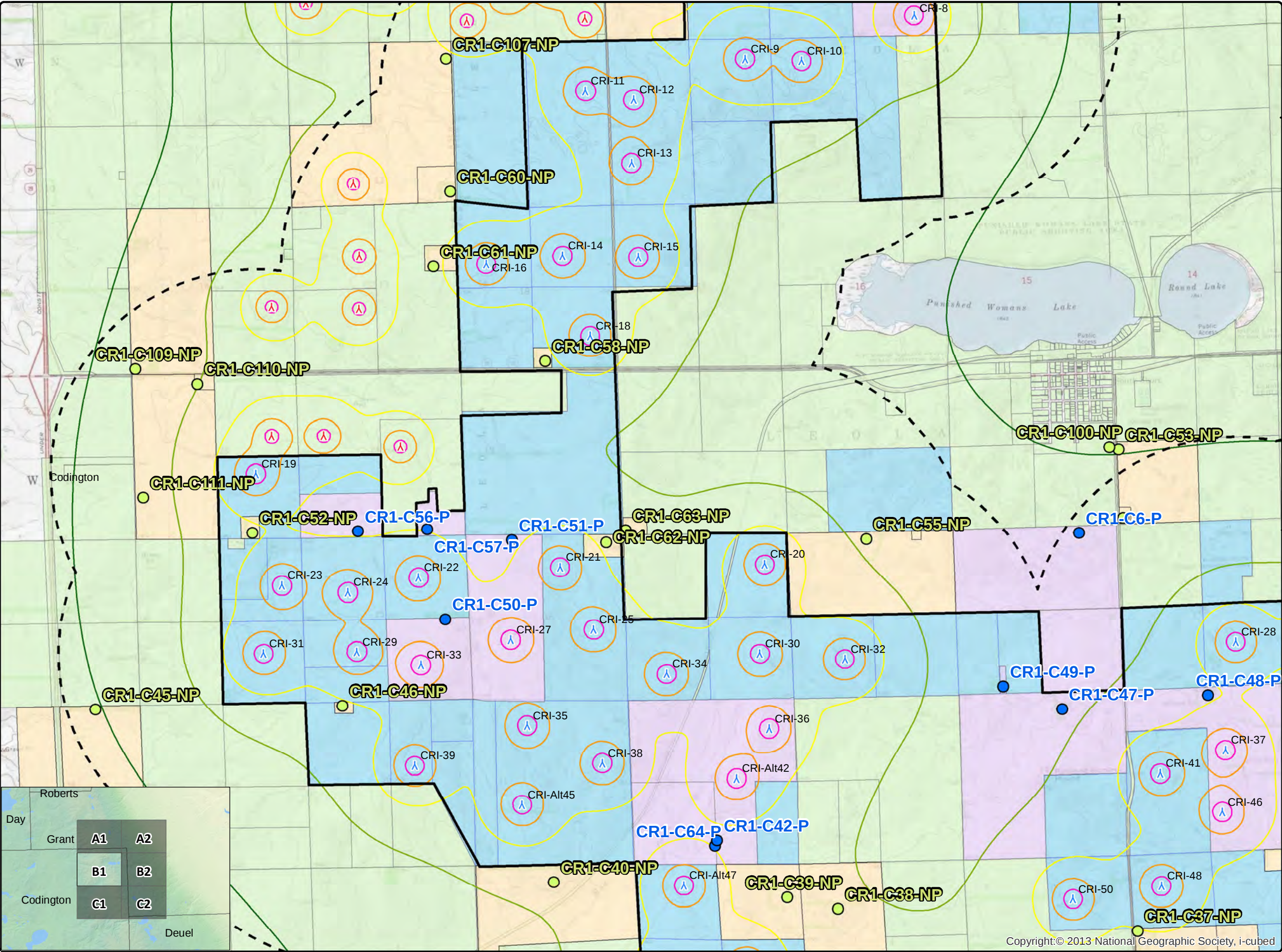
COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.

020788





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Legend

-  Crowned Ridge Turbines
-  Crowned Ridge II Turbines
-  Dakota Range Turbines
-  2 km Turbine Buffer
-  County Lines
-  CR1 Project Boundary
-  Non Participants
-  Participants

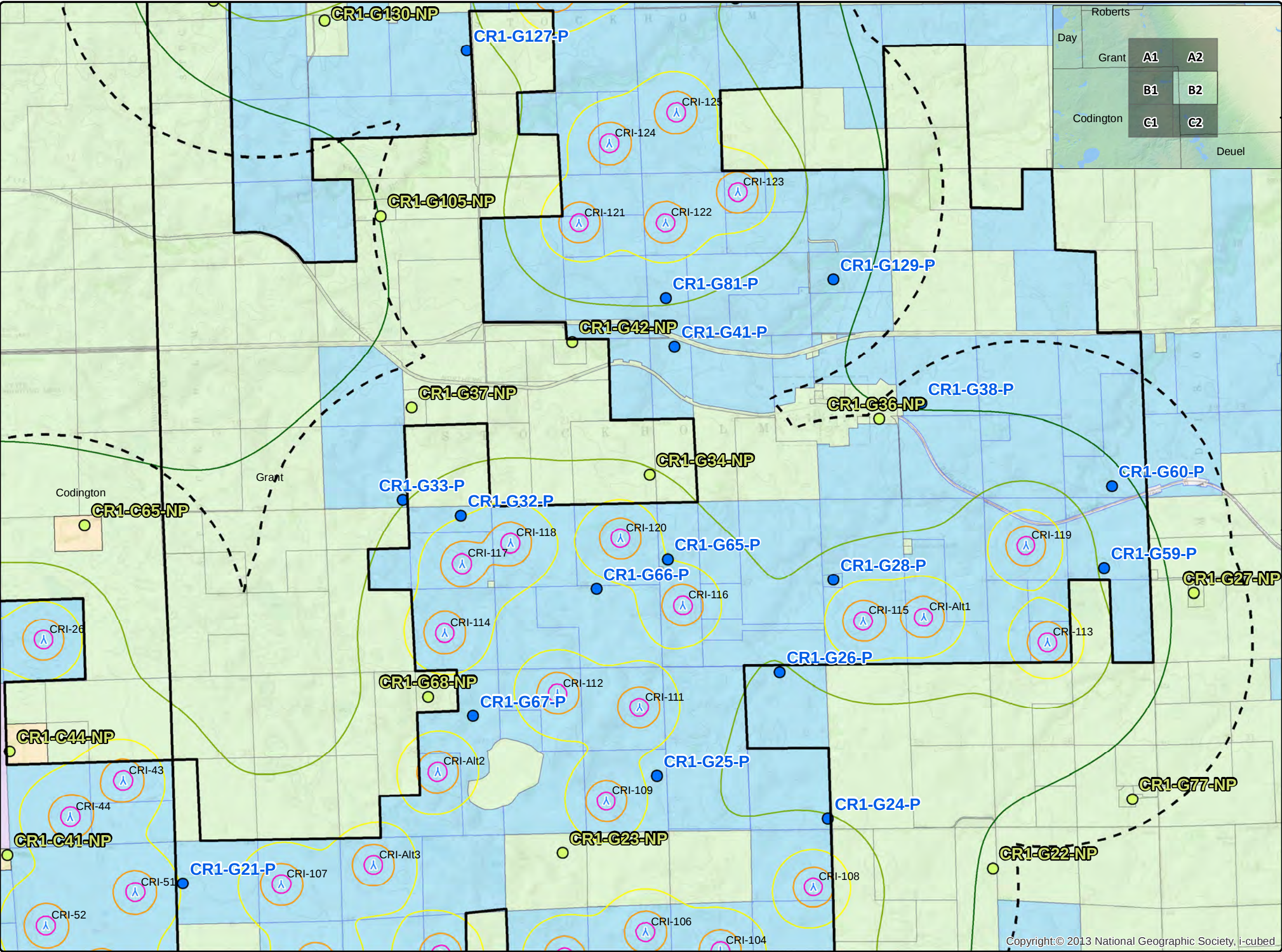
Sound Pressure (dBA)

-  35
-  40
-  45
-  50
-  55

-  Non-Part. Occupied Codington Parcels
-  Participating Occupied Codington Parcels
-  Non-Participating Parcels
-  Participating Parcels
-  Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.







EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm
Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

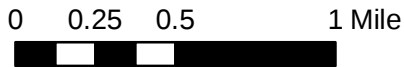
Sound Pressure (dBA)

- 35
- 40
- 45
- 50
- 55

- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

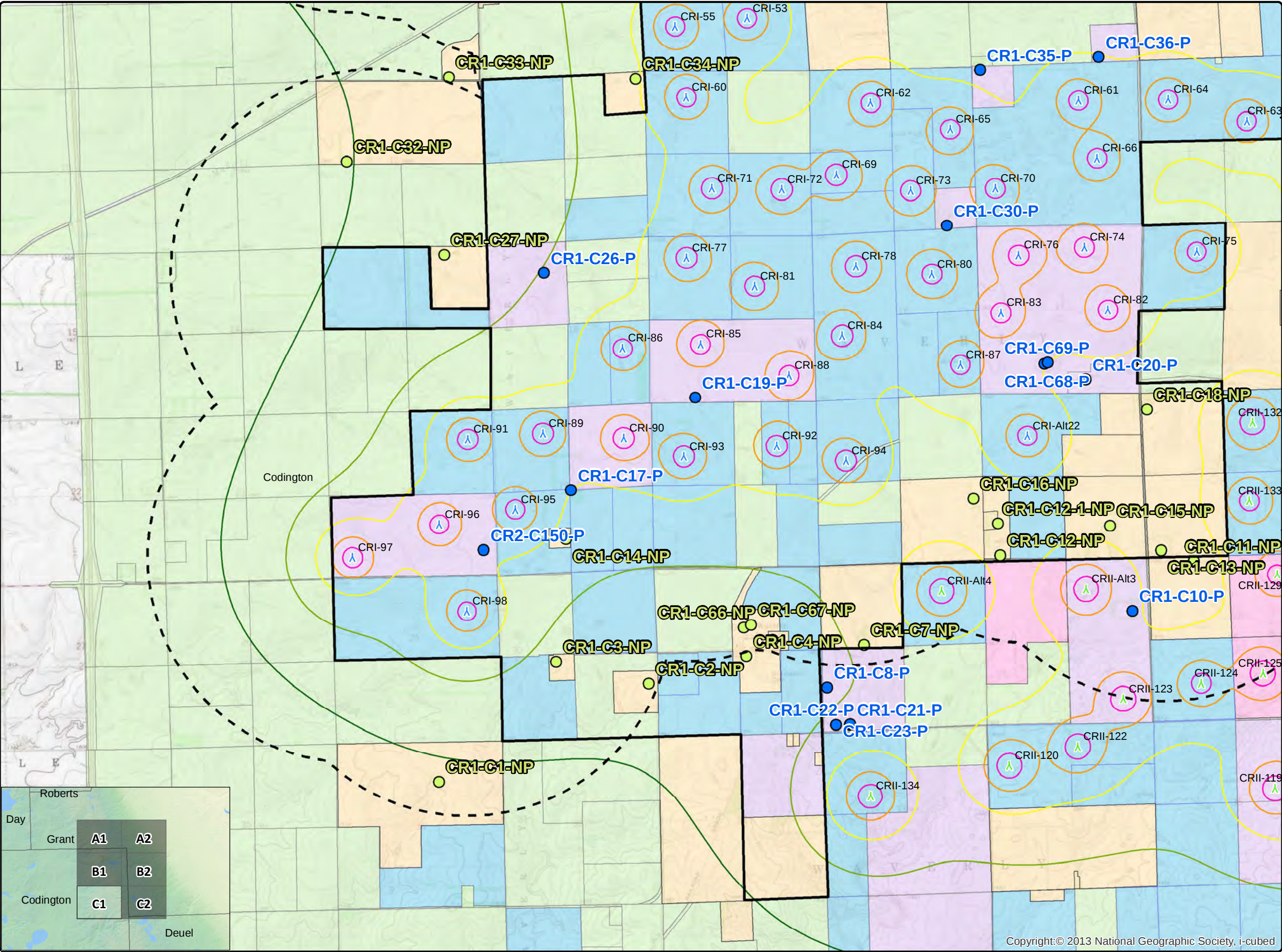
COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.

020790





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

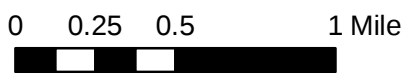
Sound Pressure (dBA)

- 35
- 40
- 45
- 50
- 55

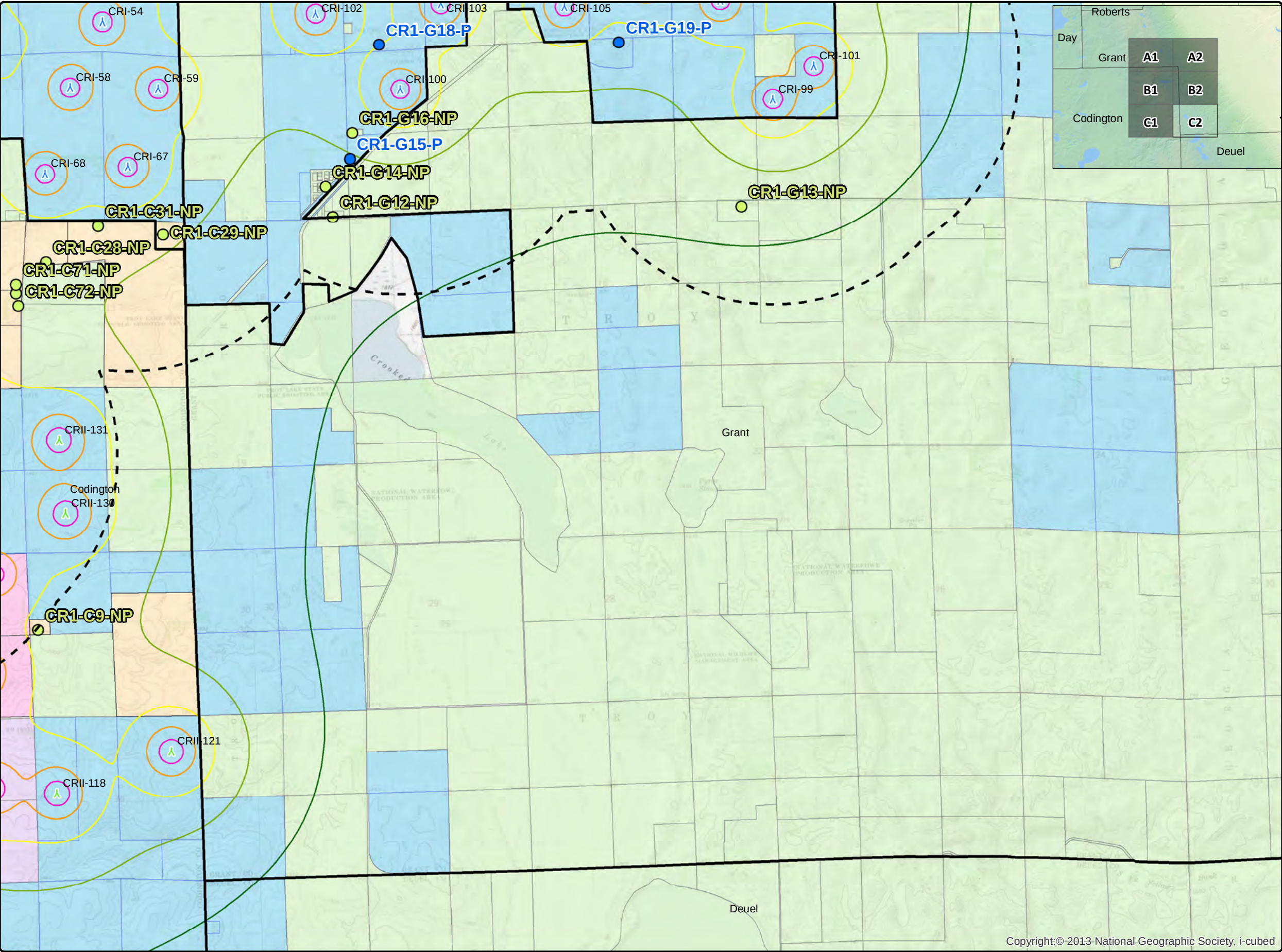
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Sound Pressure Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures and parcel boundaries within 2 km.

Predicted sound pressure levels at existing residences and land parcel boundaries.

Additional 2 dBA added.

Location: Watertown, SD
Project #: 20174430

Issue Dates		
#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

Sound Pressure (dBA)

- 35
- 40
- 45
- 50
- 55

- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Pre-Construction Compliance Report Crowned Ridge Wind, LLC Shadow Flicker Study Codington and Grant Counties, SD

Submitted To:

SWCA Environmental Consultants
116 North 4th Street, Suite 200
Bismarck, North Dakota 58501
Tel: 701.258.6622
E-mail: SBaer@swca.com

Submitted By:

Jay Haley, P.E., Partner
EAPC Wind Energy
3100 DeMers Ave.
Grand Forks, ND, 58201
Tel: 701-775-3000
E-mail: jhaley@eapc.net

July 28,

2019

Author:

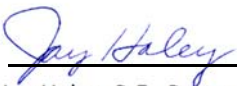

Jay Haley, P.E., Partner

TABLE OF CONTENTS

1. INTRODUCTION.....	3
2. BACKGROUND.....	3
3. STUDY METHODOLOGY	4
4. RESULTS OF ANALYSIS	7
5. CONCLUSIONS.....	10
APPENDIX A: CROWNED RIDGE WIND ENERGY PROJECT SITE OVERVIEW MAP.....	11
APPENDIX B: WIND TURBINE COORDINATES	13
APPENDIX C: TABLE OF SHADOW FLICKER RESULTS	18
APPENDIX D: STANDARD RESOLUTION SHADOW FLICKER MAPS.....	31

LIST OF TABLES

Table 1: Huron, SD monthly sunshine probabilities	6
Table 2: Codington County occupied structures realistic shadow flicker distribution.....	8
Table 3: Grant County occupied structures realistic shadow flicker distribution.	9
Table 4: Summary of shadow flicker predictions.	10

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	7/28/2019	J. Haley

Executive Summary

EAPC was hired to provide estimates of the potential shadow flicker impacts for a proposed wind turbine layout in Codington and Grant Counties of the Crowned Ridge wind farm project in northeastern South Dakota. The scope of this report includes all proposed turbines included in the Crowned Ridge project that will be permitted separately through the South Dakota Public Utilities Commission. Locations of area occupied structures and a wind turbine layout using a mixture of 142 wind turbines manufactured by General Electric (GE) were provided to EAPC by Crowned Ridge Wind, LLC. Wind turbine models and locations of 140 turbines for the adjacent Crowned Ridge II wind farm were supplied by Crowned Ridge Wind II, LLC and were included in the model. The wind turbine models and coordinates of 97 turbines for the adjacent Dakota Range I and II wind farms were also included in the model, with information gathered from permit filings. A computer model was built combining digital elevation data with the information gathered to generate shadow flicker models for the site. The resulting models were then used to perform shadow flicker calculations for the 379 turbines. Based on the calculations, site-wide realistic shadow flicker maps were produced to predict the shadow flicker at nearby residences within the Crowned Ridge Project area.

The model is based on a number of conservative assumptions. No credit was taken for the blocking effects of trees or buildings. The receptors were omni-directional rather than modeling specific facades of buildings, and the study assumes 100% turbine availability.

The scope of this study includes the shadow flicker impacts of the Crowned Ridge wind farm on the two counties it is located within, Codington and Grant. The shadow flicker ordinances of both counties limit the maximum number of shadow flicker to 30 hours per year at occupied structures.

For the shadow study in Codington County, the 73 occupied structures (22 participating and 51 non-participating) 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.

For the shadow study in Grant County, 60 occupied structures (34 participating and 26 non-participating) 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.

For the Crowned Ridge turbine array provided, no occupied structures experienced more than 30 hours of shadow flickering per year based on realistic assumptions regarding operational time and sunshine probability, with the exception of one non-participating structure. For the non-participating structure, the contributing turbine (which is an alternate turbine subject to terms in Condition No. 27), can only be activated per the terms in Condition No. 27. If activated under the terms of Condition No. 27, the turbine will be curtailed to less than 30 hours per year of shadow flicker. With this commitment, the Crowned Ridge wind farm is in compliance with the shadow flicker limitations set forth in both Codington County's Section

5.22.03 paragraph 13 of Ordinance #68, and Section 1211.04 paragraph 14 of Grant County's Ordinance 2016-01C, which is 30 hours per year.

1. INTRODUCTION

EAPC was hired to conduct shadow flicker studies for the regional development of the Crowned Ridge wind farm project located in Codington and Grant Counties in northeastern South Dakota. The layout consists of 129 GE 2.3 MW wind turbines with a hub height of 90 meters (including 18 alternate turbine locations) and 13 GE 2.3 MW wind turbines with a hub height of 80 meters for a total of 142 wind turbines. The array includes the six remaining Hessler turbines (CR1-16, CR1-19, CR1-23, CR1-60, CR1-67, and CR1-68) to ensure compliance in the event any of the Hessler turbines, which are now alternates, are constructed consistent with Condition No. 27. Also, to ensure compliance under all construction of turbine scenarios, CR1-49, also a Hessler turbine, has been permanently dropped. The locations of the proposed wind turbines were supplied by Crowned Ridge Wind, LLC.

From the database of occupied structures and coordinates supplied by Crowned Ridge Wind, LLC, 73 occupied structures (22 participating and 51 non-participating) in Codington County and 60 occupied structures (34 participating and 26 non-participating) in Grant County were found to be within 2 kilometers of a wind turbine and were included in the shadow models. Shadow flicker does not extend beyond a distance of approximately 1,700 meters from the wind turbine base.

The area of interest for this report is located in Codington and Grant Counties near the town of Watertown in northeastern South Dakota. The surrounding terrain has a change in elevation across the project site ranging from 475 to 621 meters (1,558 to 2,037 feet) at the wind turbine base. The region's vegetation is comprised primarily of prairie grass and agricultural land. The project overview map can be found in Appendix A.

2. BACKGROUND

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 0.4 to 0.78 Hz, hence the term "flicker." In this case, with a maximum rotational speed of 15.6 rpm for the GE 2.3-116, the frequency would be 0.78 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.

This flickering effect is most noticeable within approximately 1,000 meters of the turbine, and becomes more and more diffused as the distance increases. Beyond 1,700 meters, the shadow flicker effects are indistinguishable. 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. For this study, in the interest of being conservative, any occupied structure within 2,000 meters of a wind turbine was included in the analysis.

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 which will make the shadow flicker prediction more conservative (higher than in reality).

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.

3. STUDY METHODOLOGY

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 available 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-sight 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. The table of wind turbine coordinates can be found in Appendix B.

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 all participating and non-participating occupied structures found to be located within 2 kilometers of the 142 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 1.

Table 1: 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://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-meter resolution 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.

Wind Turbines from Adjacent Projects: The Crowned Ridge II project and the Dakota Range I and II projects are adjacent to the Crowned Ridge project. Because shadow flicker impacts are cumulative, there will be impacts from these other projects that will be additive to the impacts from the Crowned Ridge project. The Crowned Ridge II wind turbine array and the Dakota Range I and II turbine arrays were included in the model to capture the full shadow flicker impacts on the receptors.

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.

4. RESULTS OF ANALYSIS

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.

Crowned Ridge Codington County Turbines

For Codington County, a total of 73 (22 participating and 51 non-participating) occupied structures within 2 kilometers of a wind turbine were analyzed and standard resolution realistic shadow flicker maps were generated for the turbine array.

The 73 shadow receptors were then modeled as greenhouse-mode receptors and the estimated shadow flicker was calculated for the array. No occupied structures experienced more than 30 hours of shadow flickering per year based on realistic assumptions regarding operational time and sunshine probability, with the exception of one non-participating structure. For the non-participating structure, the contributing turbine (which is an alternate turbine subject to terms in Condition No. 27), can only be activated per the terms in Condition No. 27. If activated under the terms of Condition No. 27, the turbine will be curtailed to less than 30 hours per year of shadow flicker. With this commitment, the Crowned Ridge wind farm is in compliance with the shadow flicker limitations set forth in Codington County's Section 5.22.03 paragraph 13 of Ordinance #68, which is 30 hours per year. Of the 73 receptors, the number that registered no shadow flicker hours was 14 (19.2%).

With the exception of the one receptor mentioned, which will be brought into compliance through curtailment of the contributing turbine, the maximum modeled expected shadow flicker at a participating receptor is 29 hours and 29 minutes and the maximum modeled expected shadow flicker at a non-participating receptor is 28 hours and 25 minutes. Table 2 contains the realistic shadow flicker distribution of the 73 occupied residences.

Table 2: Codington County occupied structures realistic shadow flicker distribution.

Realistic Shadow Flicker (hrs/year)	Number of Non-Participating Occupied Structures	Number of Participating Occupied Structures
0	13	1
0 to 5	7	2
5 to 10	10	5
10 to 15	8	7
15 to 20	7	0
20 to 25	2	3
25 to 30	3	3
30+	1*	0

* Will be brought into compliance through curtailment.

Crowned Ridge Grant County Turbines

For Grant County, 60 (34 participating and 26 non-participating) occupied structures within 2 kilometers of a wind turbine were found and analyzed. Standard resolution realistic shadow flicker maps were generated for the turbine array.

The 60 shadow receptors were then modeled as greenhouse-mode receptors and the estimated shadow flicker was calculated for the array. No occupied structures are

expected to experience more than 29 hours and 59 minutes of shadow flicker per year. Therefore, the Crowned Ridge wind farm would be in compliance with Section 1211.04 paragraph 14 of Grant County's Ordinance 2016-01C. Of the 60 occupied structures, the number that registered no shadow flicker hours was 20 (33.3%).

The maximum modeled expected shadow flicker at a participating receptor is 29 hours and 59 minutes and the maximum modeled expected shadow flicker at a non-participating receptor is 23 hours and 23 minutes. Table 3 contains the realistic shadow flicker distribution of the 60 occupied structures.

Table 3: Grant County occupied structures realistic shadow flicker distribution.

Realistic Shadow Flicker (hrs/year)	Number of Non-Participating Occupied Structures	Number of Participating Occupied Structures
0	14	6
0 to 5	6	6
5 to 10	3	6
10 to 15	0	6
15 to 20	2	4
20 to 25	1	3
25 to 30	0	3
30+	0	0

Crowned Ridge Turbines Summary

For the Crowned Ridge Project, with the one exception noted above, which will be brought into compliance through curtailment of the contributing turbine, no occupied structures are expected to experience more than 30 hours of shadow flicker per year, for both counties. The summary of results is shown in table 4 below. The full table of results from the realistic shadow flicker study can be found in Appendix C. Table C-1 lists the results sorted by receptor number. Table C-2 lists the results sorted by shadow flicker hours from highest to lowest. Table C-3 lists the results with 6 of the turbines recommended by Hessler removed. The Crowned Ridge II and the Dakota Range I and II turbine arrays were included in the model to capture the full shadow flicker impacts on the receptors. The maps showing the shadow flicker impact iso-lines for the Crowned Ridge wind farm are in Appendix D.

Table 4: Summary of shadow flicker predictions.

County	Feature	Shadow Limit (hr/yr)	Maximum Predicted (hr/yr)
Codington	Participating Occupied Structures	30	30:00 *
	Non-Participating Occupied Structures	30	30:00 *
Grant	Participating Occupied Structures	30	29:59
	Non-Participating Occupied Structures	30	23:23

* Will be brought into compliance through curtailment.

5. CONCLUSIONS

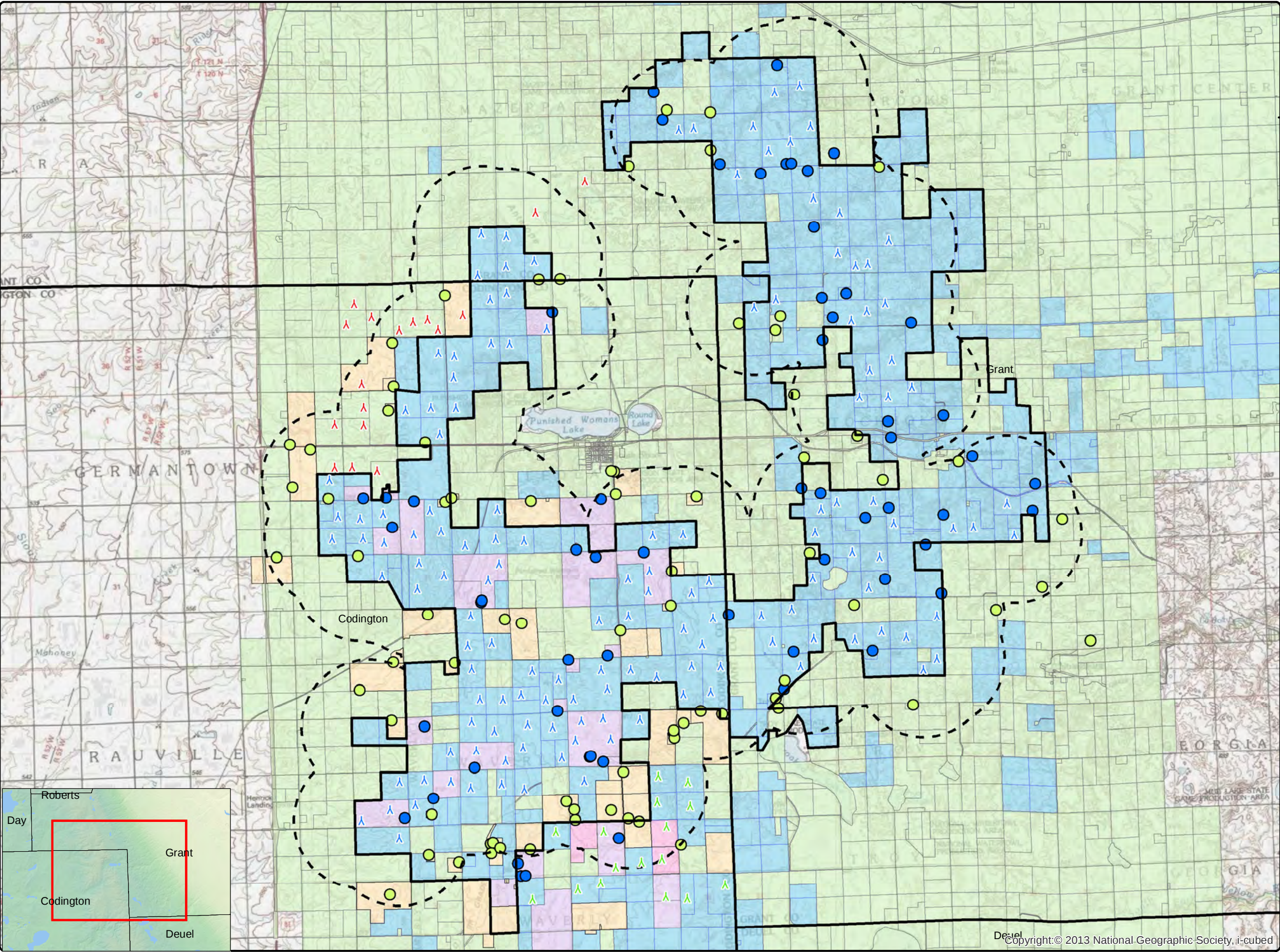
The shadow flicker impact on the receptors was calculated with reductions due to turbine operational direction and sunshine probabilities included. For both counties, with the one exception noted above, no occupied structures are expected to experience more than 30 hours of shadow flicker per year.

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, including alternates, 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: CROWNED RIDGE WIND ENERGY PROJECT SITE OVERVIEW MAP



www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Overview Map

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with land parcels within the project footprint and existing occupied structures.

Codington County occupied land parcels within 2 km of a wind turbine.

Location: Watertown, SD
Project #: 20174430

Issue Dates

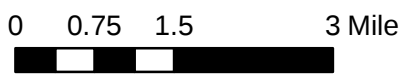
1	Original	2019.07.27
#	Description	Date

Drawn By: AS Checked By: JH

Legend

- ▲ Crowned Ridge Turbines
- ▲ Crowned Ridge II Turbines
- ▲ Dakota Range Turbines
- - - 2 km Turbine Buffer
- ▬ County Lines
- ▬ CR1 Project Boundary
- Non Participants
- Participants
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.



APPENDIX B: WIND TURBINE COORDINATES

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-1	GE2.3 116RD 90HH r2.madE	659,443	5,003,083	610.2	LNTE
CRI-2	GE2.3 116RD 90HH r2.madE	660,185	5,003,010	598.1	LNTE
CRI-3	GE2.3 116RD 90HH r2.madE	661,008	5,002,288	584.1	LNTE
CRI-4	GE2.3 116RD 90HH r2.madE	660,173	5,002,120	602.5	LNTE
CRI-5	GE2.3 116RD 90HH r2.madE	659,337	5,001,862	609.9	LNTE
CRI-6	GE2.3 116RD 90HH r2.madE	660,193	5,001,329	610.5	LNTE
CRI-7	GE2.3 116RD 90HH r2.madE	659,705	5,001,146	618.0	LNTE
CRI-8	GE2.3 116RD 90HH r2.madE	661,380	5,000,282	588.3	LNTE
CRI-9	GE2.3 116RD 90HH r2.madE	659,731	4,999,855	613.4	LNTE
CRI-10	GE2.3 116RD 90HH r2.madE	660,280	4,999,837	615.0	LNTE
CRI-11	GE2.3 116RD 90HH r2.madE	658,170	4,999,546	610.9	LNTE
CRI-12	GE2.3 116RD 90HH r2.madE	658,644	4,999,460	615.0	LNTE
CRI-13	GE2.3 116RD 90HH r2.madE	658,622	4,998,843	613.3	LNTE
CRI-14	GE2.3 116RD 90HH r2.madE	657,947	4,997,935	618.3	LNTE
CRI-15	GE2.3 116RD 90HH r2.madE	658,688	4,997,924	618.0	LNTE
CRI-16	GE2.3 116RD 90HH r2.madE	657,203	4,997,856	611.9	LNTE
CRI-18	GE2.3 116RD 90HH r2.madE	658,217	4,997,154	618.0	LNTE
CRI-19	GE2.3 116RD 90HH r2.madE	654,954	4,995,804	601.1	LNTE
CRI-20	GE2.3 116RD 90HH r2.madE	659,920	4,994,924	594.0	LNTE
CRI-21	GE2.3 116RD 90HH r2.madE	657,925	4,994,896	617.1	LNTE
CRI-22	GE2.3 116RD 90HH r2.madE	656,543	4,994,796	616.5	LNTE
CRI-23	GE2.3 116RD 90HH r2.madE	655,208	4,994,717	594.7	LNTE
CRI-24	GE2.3 116RD 90HH r2.madE	655,852	4,994,652	609.0	LNTE
CRI-25	GE2.3 116RD 90HH r2.madE	658,251	4,994,286	605.5	LNTE
CRI-26	GE2.3 116RD 90HH r2.madE	665,405	4,994,191	578.5	LNTE
CRI-27	GE2.3 116RD 90HH r2.madE	657,442	4,994,187	621.0	LNTE
CRI-28	GE2.3 116RD 90HH r2.madE	664,517	4,994,168	579.0	LNTE
CRI-29	GE2.3 116RD 90HH r2.madE	655,940	4,994,069	606.9	LNTE
CRI-30	GE2.3 116RD 90HH r2.madE	659,871	4,994,052	593.7	LNTE
CRI-31	GE2.3 116RD 90HH r2.madE	655,030	4,994,051	603.0	LNTE
CRI-32	GE2.3 116RD 90HH r2.madE	660,704	4,993,998	606.0	LNTE
CRI-33	GE2.3 116RD 90HH r2.madE	656,566	4,993,941	618.0	LNTE
CRI-34	GE2.3 116RD 90HH r2.madE	658,966	4,993,856	599.7	LNTE
CRI-35	GE2.3 116RD 90HH r2.madE	657,602	4,993,347	607.4	LNTE
CRI-36	GE2.3 116RD 90HH r2.madE	659,966	4,993,319	594.0	LNTE
CRI-37	GE2.3 116RD 90HH r2.madE	664,419	4,993,110	587.3	LNTE
CRI-38	GE2.3 116RD 90HH r2.madE	658,338	4,992,981	600.5	LNTE
CRI-39	GE2.3 116RD 90HH r2.madE	656,507	4,992,958	609.0	LNTE
CRI-41	GE2.3 116RD 90HH r2.madE	663,782	4,992,883	597.7	LNTE
CRI-43	GE2.3 116RD 90HH r2.madE	666,181	4,992,815	577.9	LNTE
CRI-44	GE2.3 116RD 90HH r2.madE	665,665	4,992,460	576.0	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-46	GE2.3 116RD 90HH r2.madE	664,387	4,992,505	591.0	LNTE
CRI-48	GE2.3 116RD 90HH r2.madE	663,794	4,991,782	587.1	LNTE
CRI-50	GE2.3 116RD 90HH r2.madE	662,930	4,991,655	612.0	LNTE
CRI-51	GE2.3 116RD 90HH r2.madE	666,299	4,991,723	575.3	LNTE
CRI-52	GE2.3 116RD 90HH r2.madE	665,426	4,991,398	575.6	LNTE
CRI-53	GE2.3 116RD 90HH r2.madE	659,750	4,990,981	598.7	LNTE
CRI-54	GE2.3 116RD 90HH r2.madE	665,979	4,990,946	573.7	LNTE
CRI-55	GE2.3 116RD 90HH r2.madE	659,045	4,990,899	597.1	LNTE
CRI-58	GE2.3 116RD 90HH r2.madE	665,663	4,990,303	585.0	LNTE
CRI-59	GE2.3 116RD 90HH r2.madE	666,523	4,990,291	573.0	LNTE
CRI-60	GE2.3 116RD 90HH r2.madE	659,155	4,990,208	594.0	LNTE
CRI-61	GE2.3 116RD 90HH r2.madE	662,982	4,990,178	612.0	LNTE
CRI-62	GE2.3 116RD 90HH r2.madE	660,954	4,990,155	600.7	LNTE
CRI-63	GE2.3 116RD 90HH r2.madE	664,627	4,989,977	588.6	LNTE
CRI-64	GE2.3 116RD 90HH r2.madE	663,858	4,990,188	604.3	LNTE
CRI-65	GE2.3 116RD 90HH r2.madE	661,732	4,989,898	609.0	LNTE
CRI-66	GE2.3 116RD 90HH r2.madE	663,165	4,989,613	614.7	LNTE
CRI-67	GE2.3 116RD 90HH r2.madE	666,226	4,989,531	574.8	LNTE
CRI-68	GE2.3 116RD 90HH r2.madE	665,420	4,989,461	585.0	LNTE
CRI-69	GE2.3 116RD 80HH r2.madE	660,621	4,989,453	605.6	LNTE
CRI-70	GE2.3 116RD 90HH r2.madE	662,171	4,989,319	611.0	LNTE
CRI-71	GE2.3 116RD 80HH r2.madE	659,405	4,989,320	607.3	LNTE
CRI-72	GE2.3 116RD 80HH r2.madE	660,087	4,989,309	606.0	LNTE
CRI-73	GE2.3 116RD 90HH r2.madE	661,344	4,989,297	609.8	LNTE
CRI-74	GE2.3 116RD 90HH r2.madE	663,041	4,988,744	615.0	LNTE
CRI-75	GE2.3 116RD 90HH r2.madE	664,137	4,988,702	609.0	LNTE
CRI-76	GE2.3 116RD 90HH r2.madE	662,399	4,988,667	615.0	LNTE
CRI-77	GE2.3 116RD 80HH r2.madE	659,158	4,988,642	612.0	LNTE
CRI-78	GE2.3 116RD 80HH r2.madE	660,811	4,988,558	604.1	LNTE
CRI-80	GE2.3 116RD 90HH r2.madE	661,552	4,988,481	608.8	LNTE
CRI-81	GE2.3 116RD 90HH r2.madE	659,825	4,988,365	606.8	LNTE
CRI-82	GE2.3 116RD 90HH r2.madE	663,271	4,988,133	613.0	LNTE
CRI-83	GE2.3 116RD 90HH r2.madE	662,227	4,988,103	606.6	LNTE
CRI-84	GE2.3 116RD 80HH r2.madE	660,677	4,987,880	600.6	LNTE
CRI-85	GE2.3 116RD 90HH r2.madE	659,295	4,987,798	612.0	LNTE
CRI-86	GE2.3 116RD 90HH r2.madE	658,534	4,987,759	613.1	LNTE
CRI-87	GE2.3 116RD 90HH r2.madE	661,830	4,987,596	609.0	LNTE
CRI-88	GE2.3 116RD 90HH r2.madE	660,157	4,987,492	603.0	LNTE
CRI-89	GE2.3 116RD 80HH r2.madE	657,758	4,986,926	614.9	LNTE
CRI-90	GE2.3 116RD 80HH r2.madE	658,545	4,986,881	612.0	LNTE
CRI-91	GE2.3 116RD 80HH r2.madE	657,023	4,986,868	612.0	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
continued

WTG	Turbine Type	Easting (m)	Northing (m)	Base Elev. AMSL (m)	Sound Profile
CRI-92	GE2.3 116RD 80HH r2.madE	660,039	4,986,804	607.2	LNTE
CRI-93	GE2.3 116RD 80HH r2.madE	659,133	4,986,700	607.9	LNTE
CRI-94	GE2.3 116RD 80HH r2.madE	660,716	4,986,660	600.6	LNTE
CRI-95	GE2.3 116RD 90HH r2.madE	657,488	4,986,184	612.0	LNTE
CRI-96	GE2.3 116RD 90HH r2.madE	656,744	4,986,037	609.0	LNTE
CRI-97	GE2.3 116RD 80HH r2.madE	655,899	4,985,715	592.7	LNTE
CRI-98	GE2.3 116RD 90HH r2.madE	657,015	4,985,192	608.9	LNTE
CRI-99	GE2.3 116RD 90HH r2.madE	672,521	4,990,188	556.7	LNTE
CRI-100	GE2.3 116RD 90HH r2.madE	668,885	4,990,286	585.0	LNTE
CRI-101	GE2.3 116RD 90HH r2.madE	672,921	4,990,513	544.6	LNTE
CRI-102	GE2.3 116RD 90HH r2.madE	668,059	4,991,023	581.0	LNTE
CRI-103	GE2.3 116RD 90HH r2.madE	669,279	4,991,115	582.0	LNTE
CRI-104	GE2.3 116RD 90HH r2.madE	672,009	4,991,151	555.0	LNTE
CRI-105	GE2.3 116RD 90HH r2.madE	670,488	4,991,091	571.6	LNTE
CRI-106	GE2.3 116RD 90HH r2.madE	671,278	4,991,335	566.2	LNTE
CRI-107	GE2.3 116RD 90HH r2.madE	667,723	4,991,800	582.0	LNTE
CRI-108	GE2.3 116RD 90HH r2.madE	672,917	4,991,775	541.2	LNTE
CRI-109	GE2.3 116RD 90HH r2.madE	670,897	4,992,616	557.4	LNTE
CRI-111	GE2.3 116RD 90HH r2.madE	671,220	4,993,526	550.6	LNTE
CRI-112	GE2.3 116RD 90HH r2.madE	670,419	4,993,665	561.0	LNTE
CRI-113	GE2.3 116RD 90HH r2.madE	675,201	4,994,165	497.6	LNTE
CRI-114	GE2.3 116RD 90HH r2.madE	669,318	4,994,256	561.0	LNTE
CRI-115	GE2.3 116RD 90HH r2.madE	673,402	4,994,374	516.4	LNTE
CRI-116	GE2.3 116RD 90HH r2.madE	671,642	4,994,527	531.4	LNTE
CRI-117	GE2.3 116RD 90HH r2.madE	669,488	4,994,930	544.8	LNTE
CRI-118	GE2.3 116RD 90HH r2.madE	669,961	4,995,134	540.4	LNTE
CRI-119	GE2.3 116RD 90HH r2.madE	674,992	4,995,107	492.0	LNTE
CRI-120	GE2.3 116RD 90HH r2.madE	671,034	4,995,179	536.2	LNTE
CRI-121	GE2.3 116RD 90HH r2.madE	670,629	4,998,259	531.0	LNTE
CRI-122	GE2.3 116RD 90HH r2.madE	671,475	4,998,261	517.4	LNTE
CRI-123	GE2.3 116RD 90HH r2.madE	672,180	4,998,561	505.0	LNTE
CRI-124	GE2.3 116RD 90HH r2.madE	670,926	4,999,036	522.8	LNTE
CRI-125	GE2.3 116RD 90HH r2.madE	671,580	4,999,340	509.8	LNTE
CRI-126	GE2.3 116RD 90HH r2.madE	670,382	5,000,519	516.0	LNTE
CRI-127	GE2.3 116RD 90HH r2.madE	670,845	5,000,795	507.4	LNTE
CRI-128	GE2.3 116RD 90HH r2.madE	671,388	5,001,034	498.2	LNTE
CRI-129	GE2.3 116RD 90HH r2.madE	667,516	5,000,900	553.6	LNTE
CRI-130	GE2.3 116RD 90HH r2.madE	668,158	5,001,149	546.0	LNTE
CRI-131	GE2.3 116RD 90HH r2.madE	670,512	5,002,137	504.0	LNTE
CRI-132	GE2.3 116RD 90HH r2.madE	670,875	5,002,186	499.9	LNTE
CRI-133	GE2.3 116RD 90HH r2.madE	669,990	5,002,521	502.7	LNTE

Crowned Ridge Wind Farm - Updated 7/27/19
GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
continued

[illegible]

APPENDIX C: TABLE OF SHADOW FLICKER RESULTS

Table C-1: Crowned Ridge Shadow Flicker Tabular Results Sorted by Receptor ID - Updated 7/27/19**Realistic case shadow results at occupied structures****Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's****UTM NAD83 Zone 14****Codington County**

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C1-NP	Non-P	656,743.00	4,983,525.00	596.0	0:00	5,541
CR1-C2-NP	Non-P	658,791.00	4,984,483.00	602.0	0:00	6,273
CR1-C3-NP	Non-P	657,888.00	4,984,697.00	604.2	4:12	3,294
CR1-C4-NP	Non-P	659,744.00	4,984,749.00	606.0	0:00	5,981
CR1-C5-NP	Non-P	659,958.00	4,984,794.00	604.8	0:00	5,659
CR1-C6-P	Participant	662,989.00	4,995,228.00	599.8	0:00	6,102
CR1-C7-NP	Non-P	660,893.00	4,984,861.00	593.2	0:00	3,022
CR1-C9-NP	Non-P	665,352.00	4,985,004.00	609.0	15:07	2,280
CR1-C10-P	Participant	663,510.00	4,985,195.00	609.0	29:29	1,634
CR1-C11-NP	Non-P	664,111.00	4,985,679.00	609.0	10:30	2,615
CR1-C12-NP	Non-P	662,222.00	4,985,736.00	603.0	17:13	2,201
CR1-C12-1-NP	Non-P	662,199.00	4,986,047.00	606.0	10:38	2,818
CR1-C13-NP	Non-P	663,792.00	4,985,785.00	612.0	19:04	2,713
CR1-C14-NP	Non-P	657,982.00	4,985,894.00	609.0	10:02	1,880
CR1-C15-NP	Non-P	663,291.00	4,986,026.00	615.0	2:17	2,175
CR1-C16-NP	Non-P	661,960.00	4,986,288.00	606.0	6:18	2,648
CR1-C17-P	Participant	658,031.00	4,986,373.00	609.1	26:48	1,886
CR1-C18-NP	Non-P	663,651.00	4,987,157.00	610.4	6:00	3,409
CR1-C19-P	Participant	659,243.00	4,987,276.00	611.6	21:25	1,722
CR1-C20-P	Participant	663,054.00	4,987,455.00	606.0	14:42	2,336
CR1-C26-P	Participant	657,767.00	4,988,493.00	597.0	6:39	3,484
CR1-C27-NP	Non-P	656,876.00	4,988,683.00	583.0	0:00	5,974
CR1-C28-NP	Non-P	665,429.00	4,988,598.00	590.9	2:44	2,831
CR1-C29-NP	Non-P	666,572.00	4,988,867.00	575.9	6:56	2,457
CR1-C30-P	Participant	661,699.00	4,988,957.00	615.0	23:33	1,614
CR1-C31-NP	Non-P	665,939.00	4,988,950.00	585.4	0:00	2,126
CR1-C32-NP	Non-P	655,843.00	4,989,581.00	568.8	0:00	9,708
CR1-C33-NP	Non-P	656,839.00	4,990,404.00	569.8	0:00	7,418
CR1-C34-NP	Non-P	658,661.00	4,990,389.00	588.2	26:12	1,726
CR1-C35-P	Participant	662,025.00	4,990,475.00	609.0	11:49	2,123
CR1-C36-P	Participant	663,181.00	4,990,600.00	615.0	14:36	1,532
CR1-C37-NP	Non-P	663,563.00	4,991,342.00	605.1	15:55	1,631
CR1-C38-NP	Non-P	660,639.00	4,991,557.00	597.0	6:06	3,474
CR1-C39-NP	Non-P	660,144.00	4,991,670.00	588.0	6:57	2,605
CR1-C40-NP	Non-P	657,865.00	4,991,818.00	583.7	6:46	2,690
CR1-C41-NP	Non-P	665,053.00	4,992,084.00	576.1	12:30	2,356
CR1-C42-P	Participant	659,458.00	4,992,229.00	580.0	11:58	1,801
CR1-C44-NP	Non-P	665,076.00	4,993,095.00	578.2	28:25	2,155
CR1-C45-NP	Non-P	653,390.00	4,993,503.00	573.2	1:42	5,673

Table C-1: Crowned Ridge Shadow Flicker Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case shadow results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Codrington County

continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C46-NP	Non-P	655,802.00	4,993,540.00	609.1	25:44	1,795
CR1-C47-P	Participant	662,825.00	4,993,508.00	613.9	5:03	3,750
CR1-C48-P	Participant	664,247.00	4,993,646.00	588.0	3:48	1,847
CR1-C49-P	Participant	662,250.00	4,993,731.00	609.0	1:12	5,148
CR1-C50-P	Participant	656,806.00	4,994,388.00	621.0	28:38	1,591
CR1-C51-P	Participant	657,455.00	4,995,160.00	621.0	24:47	1,768
CR1-C52-NP	Non-P	654,924.00	4,995,231.00	603.0	11:16	1,883
CR1-C53-NP	Non-P	663,376.00	4,996,043.00	578.8	0:00	7,201
CR1-C54-NP	Non-P	663,421.00	4,995,376.00	583.4	0:00	5,351
CR1-C55-NP	Non-P	660,914.00	4,995,169.00	607.5	2:52	3,360
CR1-C56-P	Participant	655,953.00	4,995,244.00	606.5	28:54	1,972
CR1-C57-P	Participant	656,628.00	4,995,266.00	615.0	10:38	1,568
CR1-C58-NP	Non-P	657,781.00	4,996,906.00	615.0	17:05	1,647
CR1-C59-P	Participant	661,548.00	5,000,754.00	584.2	7:39	1,644
CR1-C60-NP	Non-P	656,855.00	4,998,565.00	613.5	14:18	2,592
CR1-C61-NP	Non-P	656,690.00	4,997,831.00	612.0	42:10	1,686
CR1-C62-NP	Non-P	658,375.00	4,995,138.00	615.0	18:10	1,676
CR1-C63-NP	Non-P	658,566.00	4,995,254.00	612.4	10:46	2,408
CR1-C64-P	Participant	659,436.00	4,992,174.00	581.0	19:54	1,614
CR1-C65-NP	Non-P	665,805.00	4,995,305.00	579.0	1:30	3,884
CR1-C66-NP	Non-P	659,718.00	4,985,032.00	606.0	0:00	5,800
CR1-C67-NP	Non-P	659,789.00	4,985,057.00	606.0	0:00	5,791
CR1-C68-P	Participant	662,652.00	4,987,606.00	609.0	6:46	2,146
CR1-C69-P	Participant	662,685.00	4,987,619.00	609.0	6:07	2,185
CR1-C70-NP	Non-P	665,135.00	4,988,293.00	595.9	12:05	3,540
CR1-C71-NP	Non-P	665,137.00	4,988,378.00	595.6	7:25	3,448
CR1-C72-NP	Non-P	665,158.00	4,988,170.00	594.6	7:41	3,776
CR1-C105-NP	Non-P	658,372.48	5,001,256.80	600.3	20:05	2,549
CR1-C107-NP	Non-P	656,810.99	4,999,855.15	598.8	9:58	1,401
CR1-C109-NP	Non-P	653,780.18	4,996,828.35	588.0	7:03	4,797
CR1-C110-NP	Non-P	654,384.54	4,996,685.57	593.9	20:47	2,910
CR1-C111-NP	Non-P	653,857.19	4,995,573.17	591.0	11:42	3,678
CR1-C112-NP	Non-P	660,001.53	4,984,907.81	604.6	0:44	5,627
CR2-C150-P	Participant	657,178.00	4,985,788.00	612.0	10:01	1,640

Table C-1: Crowned Ridge Shadow Flicker Tabular Results Sorted by Receptor ID - Updated 7/27/19

Realistic case shadow results at occupied structures

Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's

UTM NAD83 Zone 14

Grant County

continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-G12-NP	Non-P	668,229.00	4,989,039.00	575.0	0:00	4,623
CR1-G13-NP	Non-P	672,216.00	4,989,142.00	558.0	0:00	3,576
CR1-G14-NP	Non-P	668,156.00	4,989,332.00	574.1	0:00	3,940
CR1-G15-P	Participant	668,396.00	4,989,607.00	576.0	0:00	2,746
CR1-G16-NP	Non-P	668,419.00	4,989,861.00	576.0	0:00	2,070
CR1-G18-P	Participant	668,678.00	4,990,722.00	585.0	22:34	1,585
CR1-G19-P	Participant	671,018.00	4,990,744.00	570.0	5:44	2,077
CR1-G21-P	Participant	666,766.00	4,991,807.00	577.1	29:12	1,555
CR1-G22-NP	Non-P	674,670.00	4,991,955.00	527.6	0:00	5,781
CR1-G23-NP	Non-P	670,471.00	4,992,104.00	560.0	5:11	2,185
CR1-G24-P	Participant	673,058.00	4,992,440.00	539.4	0:00	2,231
CR1-G25-P	Participant	671,391.00	4,992,858.00	549.0	14:41	1,804
CR1-G26-P	Participant	672,589.00	4,993,869.00	531.0	8:17	3,140
CR1-G27-NP	Non-P	676,630.00	4,994,642.00	480.8	2:55	4,944
CR1-G28-P	Participant	673,113.00	4,994,772.00	513.9	23:01	1,614
CR1-G32-P	Participant	669,477.00	4,995,401.00	546.0	20:01	1,545
CR1-G33-P	Participant	668,911.00	4,995,550.00	548.7	3:53	2,779
CR1-G34-NP	Non-P	671,320.00	4,995,798.00	531.0	1:28	2,238
CR1-G36-NP	Non-P	673,559.00	4,996,344.00	498.0	0:00	6,211
CR1-G37-NP	Non-P	668,998.00	4,996,452.00	549.0	0:00	5,246
CR1-G38-P	Participant	673,972.00	4,996,493.00	494.5	0:00	5,646
CR1-G41-P	Participant	671,563.00	4,997,050.00	497.6	0:00	3,983
CR1-G42-NP	Non-P	670,566.00	4,997,097.00	518.9	0:00	3,819
CR1-G43-NP	Non-P	661,141.00	5,001,721.00	583.6	18:26	1,909
CR1-G44-NP	Non-P	661,781.00	5,001,732.00	583.7	2:50	3,123
CR1-G59-P	Participant	675,755.00	4,994,888.00	487.7	12:50	2,605
CR1-G60-P	Participant	675,830.00	4,995,687.00	477.0	5:44	3,343
CR1-G65-P	Participant	671,496.00	4,994,973.00	537.0	29:59	1,539
CR1-G66-P	Participant	670,802.00	4,994,681.00	539.7	16:44	1,801
CR1-G67-P	Participant	669,597.00	4,993,440.00	556.1	11:58	2,106
CR1-G68-NP	Non-P	669,159.00	4,993,632.00	565.6	2:07	2,113
CR1-G70-NP	Non-P	677,464.53	4,991,043.11	492.0	0:00	12,651
CR1-G77-NP	Non-P	676,031.00	4,992,629.00	502.7	0:00	5,728
CR1-G81-P	Participant	671,478.00	4,997,523.00	508.8	0:00	2,421
CR1-G105-NP	Non-P	668,696.00	4,998,325.00	549.0	0:00	6,345
CR1-G108-P	Participant	669,516.00	5,001,186.00	522.2	11:40	3,586
CR1-G109-NP	Non-P	667,064.00	5,000,425.00	566.2	0:59	2,152
CR1-G110-NP	Non-P	671,218.00	5,005,064.00	456.2	0:00	5,889

continued

[illegible]

Table C-2: Crowned Ridge Shadow Flicker Tabular Results Sorted by Real Case Shadow Flicker Hours/Year
Realistic case shadow results at occupied structures - Updated 7/27/19
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C61-NP	Non-P	656,690.00	4,997,831.00	612.0	42:10	1,686
CR1-C44-NP	Non-P	665,076.00	4,993,095.00	578.2	28:25	2,155
CR1-C34-NP	Non-P	658,661.00	4,990,389.00	588.2	26:12	1,726
CR1-C46-NP	Non-P	655,802.00	4,993,540.00	609.1	25:44	1,795
CR1-C110-NP	Non-P	654,384.54	4,996,685.57	593.9	20:47	2,910
CR1-C105-NP	Non-P	658,372.48	5,001,256.80	600.3	20:05	2,549
CR1-C13-NP	Non-P	663,792.00	4,985,785.00	612.0	19:04	2,713
CR1-C62-NP	Non-P	658,375.00	4,995,138.00	615.0	18:10	1,676
CR1-C12-NP	Non-P	662,222.00	4,985,736.00	603.0	17:13	2,201
CR1-C58-NP	Non-P	657,781.00	4,996,906.00	615.0	17:05	1,647
CR1-C37-NP	Non-P	663,563.00	4,991,342.00	605.1	15:55	1,631
CR1-C9-NP	Non-P	665,352.00	4,985,004.00	609.0	15:07	2,280
CR1-C60-NP	Non-P	656,855.00	4,998,565.00	613.5	14:18	2,592
CR1-C41-NP	Non-P	665,053.00	4,992,084.00	576.1	12:30	2,356
CR1-C70-NP	Non-P	665,135.00	4,988,293.00	595.9	12:05	3,540
CR1-C111-NP	Non-P	653,857.19	4,995,573.17	591.0	11:42	3,678
CR1-C52-NP	Non-P	654,924.00	4,995,231.00	603.0	11:16	1,883
CR1-C63-NP	Non-P	658,566.00	4,995,254.00	612.4	10:46	2,408
CR1-C12-1-NP	Non-P	662,199.00	4,986,047.00	606.0	10:38	2,818
CR1-C11-NP	Non-P	664,111.00	4,985,679.00	609.0	10:30	2,615
CR1-C14-NP	Non-P	657,982.00	4,985,894.00	609.0	10:02	1,880
CR1-C107-NP	Non-P	656,810.99	4,999,855.15	598.8	9:58	1,401
CR1-C72-NP	Non-P	665,158.00	4,988,170.00	594.6	7:41	3,776
CR1-C71-NP	Non-P	665,137.00	4,988,378.00	595.6	7:25	3,448
CR1-C109-NP	Non-P	653,780.18	4,996,828.35	588.0	7:03	4,797
CR1-C39-NP	Non-P	660,144.00	4,991,670.00	588.0	6:57	2,605
CR1-C29-NP	Non-P	666,572.00	4,988,867.00	575.9	6:56	2,457
CR1-C40-NP	Non-P	657,865.00	4,991,818.00	583.7	6:46	2,690
CR1-C16-NP	Non-P	661,960.00	4,986,288.00	606.0	6:18	2,648
CR1-C38-NP	Non-P	660,639.00	4,991,557.00	597.0	6:06	3,474
CR1-C18-NP	Non-P	663,651.00	4,987,157.00	610.4	6:00	3,409
CR1-C3-NP	Non-P	657,888.00	4,984,697.00	604.2	4:12	3,294
CR1-C55-NP	Non-P	660,914.00	4,995,169.00	607.5	2:52	3,360
CR1-C28-NP	Non-P	665,429.00	4,988,598.00	590.9	2:44	2,831
CR1-C15-NP	Non-P	663,291.00	4,986,026.00	615.0	2:17	2,175
CR1-C45-NP	Non-P	653,390.00	4,993,503.00	573.2	1:42	5,673
CR1-C65-NP	Non-P	665,805.00	4,995,305.00	579.0	1:30	3,884
CR1-C112-NP	Non-P	660,001.53	4,984,907.81	604.6	0:44	5,627
CR1-C1-NP	Non-P	656,743.00	4,983,525.00	596.0	0:00	5,541

Table C-2: Crowned Ridge Shadow Flicker Tabular Results Sorted by Real Case Shadow Flicker Hours/Year
Realistic case shadow results at occupied structures - Updated 7/27/19
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C27-NP	Non-P	656,876.00	4,988,683.00	583.0	0:00	5,974
CR1-C2-NP	Non-P	658,791.00	4,984,483.00	602.0	0:00	6,273
CR1-C31-NP	Non-P	665,939.00	4,988,950.00	585.4	0:00	2,126
CR1-C32-NP	Non-P	655,843.00	4,989,581.00	568.8	0:00	9,708
CR1-C33-NP	Non-P	656,839.00	4,990,404.00	569.8	0:00	7,418
CR1-C4-NP	Non-P	659,744.00	4,984,749.00	606.0	0:00	5,981
CR1-C54-NP	Non-P	663,421.00	4,995,376.00	583.4	0:00	5,351
CR1-C5-NP	Non-P	659,958.00	4,984,794.00	604.8	0:00	5,659
CR1-C66-NP	Non-P	659,718.00	4,985,032.00	606.0	0:00	5,800
CR1-C67-NP	Non-P	659,789.00	4,985,057.00	606.0	0:00	5,791
CR1-C7-NP	Non-P	660,893.00	4,984,861.00	593.2	0:00	3,022
CR1-C53-NP	Non-P	663,376.00	4,996,043.00	578.8	0:00	7,201
CR1-C10-P	Participant	663,510.00	4,985,195.00	609.0	29:29	1,634
CR1-C56-P	Participant	655,953.00	4,995,244.00	606.5	28:54	1,972
CR1-C50-P	Participant	656,806.00	4,994,388.00	621.0	28:38	1,591
CR1-C17-P	Participant	658,031.00	4,986,373.00	609.1	26:48	1,886
CR1-C51-P	Participant	657,455.00	4,995,160.00	621.0	24:47	1,768
CR1-C30-P	Participant	661,699.00	4,988,957.00	615.0	23:33	1,614
CR1-C19-P	Participant	659,243.00	4,987,276.00	611.6	21:25	1,722
CR1-C64-P	Participant	659,436.00	4,992,174.00	581.0	19:54	1,614
CR1-C20-P	Participant	663,054.00	4,987,455.00	606.0	14:42	2,336
CR1-C36-P	Participant	663,181.00	4,990,600.00	615.0	14:36	1,532
CR1-C42-P	Participant	659,458.00	4,992,229.00	580.0	11:58	1,801
CR1-C35-P	Participant	662,025.00	4,990,475.00	609.0	11:49	2,123
CR1-C57-P	Participant	656,628.00	4,995,266.00	615.0	10:38	1,568
CR2-C150-P	Participant	657,178.00	4,985,788.00	612.0	10:01	1,640
CR1-C59-P	Participant	661,548.00	5,000,754.00	584.2	7:39	1,644
CR1-C68-P	Participant	662,652.00	4,987,606.00	609.0	6:46	2,146
CR1-C26-P	Participant	657,767.00	4,988,493.00	597.0	6:39	3,484
CR1-C69-P	Participant	662,685.00	4,987,619.00	609.0	6:07	2,185
CR1-C47-P	Participant	662,825.00	4,993,508.00	613.9	5:03	3,750
CR1-C48-P	Participant	664,247.00	4,993,646.00	588.0	3:48	1,847
CR1-C49-P	Participant	662,250.00	4,993,731.00	609.0	1:12	5,148
CR1-C6-P	Participant	662,989.00	4,995,228.00	599.8	0:00	6,102

Table C-2: Crowned Ridge Shadow Flicker Tabular Results Sorted by Real Case Shadow Flicker Hours/Year
Realistic case shadow results at occupied structures - Updated 7/27/19
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Grant County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-G114-NP	Non-P	666,214.00	5,006,667.00	521.1	23:23	2,205
CR1-G43-NP	Non-P	661,141.00	5,001,721.00	583.6	18:26	1,909
CR1-G125-NP	Non-P	668,289.00	5,000,643.00	543.0	15:49	1,716
CR1-G115-NP	Non-P	664,933.00	5,006,731.00	544.6	8:01	2,188
CR1-G113-NP	Non-P	666,228.00	5,005,549.00	537.0	7:09	2,746
CR1-G23-NP	Non-P	670,471.00	4,992,104.00	560.0	5:11	2,185
CR1-G27-NP	Non-P	676,630.00	4,994,642.00	480.8	2:55	4,944
CR1-G44-NP	Non-P	661,781.00	5,001,732.00	583.7	2:50	3,123
CR1-G68-NP	Non-P	669,159.00	4,993,632.00	565.6	2:07	2,113
CR1-G117-NP	Non-P	663,801.00	5,005,084.00	581.3	1:54	4,501
CR1-G34-NP	Non-P	671,320.00	4,995,798.00	531.0	1:28	2,238
CR1-G109-NP	Non-P	667,064.00	5,000,425.00	566.2	0:59	2,152
CR1-G12-NP	Non-P	668,229.00	4,989,039.00	575.0	0:00	4,623
CR1-G16-NP	Non-P	668,419.00	4,989,861.00	576.0	0:00	2,070
CR1-G14-NP	Non-P	668,156.00	4,989,332.00	574.1	0:00	3,940
CR1-G22-NP	Non-P	674,670.00	4,991,955.00	527.6	0:00	5,781
CR1-G13-NP	Non-P	672,216.00	4,989,142.00	558.0	0:00	3,576
CR1-G77-NP	Non-P	676,031.00	4,992,629.00	502.7	0:00	5,728
CR1-G37-NP	Non-P	668,998.00	4,996,452.00	549.0	0:00	5,246
CR1-G42-NP	Non-P	670,566.00	4,997,097.00	518.9	0:00	3,819
CR1-G36-NP	Non-P	673,559.00	4,996,344.00	498.0	0:00	6,211
CR1-G105-NP	Non-P	668,696.00	4,998,325.00	549.0	0:00	6,345
CR1-G110-NP	Non-P	671,218.00	5,005,064.00	456.2	0:00	5,889
CR1-G130-NP	Non-P	668,147.00	5,000,233.00	549.0	0:00	3,005
CR1-G70-NP	Non-P	677,464.53	4,991,043.11	492.0	0:00	12,651
CR1-G600-NP	Non-P	674,300.70	5,005,772.78	393.0	0:00	13,186
CR1-G65-P	Participant	671,496.00	4,994,973.00	537.0	29:59	1,539
CR1-G21-P	Participant	666,766.00	4,991,807.00	577.1	29:12	1,555
CR1-G138-P	Participant	664,809.00	5,006,456.00	549.0	25:26	1,824
CR1-G28-P	Participant	673,113.00	4,994,772.00	513.9	23:01	1,614
CR1-G18-P	Participant	668,678.00	4,990,722.00	585.0	22:34	1,585
CR1-G32-P	Participant	669,477.00	4,995,401.00	546.0	20:01	1,545
CR1-G124-P	Participant	669,843.00	5,000,605.00	525.0	19:27	1,791
CR1-G137-P	Participant	666,501.00	5,005,136.00	529.3	18:42	1,939
CR1-G66-P	Participant	670,802.00	4,994,681.00	539.7	16:44	1,801
CR1-G128-P	Participant	670,242.00	5,001,314.00	513.0	15:02	2,612
CR1-G25-P	Participant	671,391.00	4,992,858.00	549.0	14:41	1,804
CR1-G59-P	Participant	675,755.00	4,994,888.00	487.7	12:50	2,605

Table C-2: Crowned Ridge Shadow Flicker Tabular Results Sorted by Real Case Shadow Flicker Hours/Year
Realistic case shadow results at occupied structures
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Grant County
continued

[illegible]

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Real Case Shadow Flicker Hours/Year Updated 7/27/19
6 turbines removed as suggested by Mr. Hessler
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C61-NP	Non-P	656,690.00	4,997,831.00	612.0	42:10	1,686
CR1-C44-NP	Non-P	665,076.00	4,993,095.00	578.2	28:25	2,155
CR1-C46-NP	Non-P	655,802.00	4,993,540.00	609.1	25:44	1,795
CR1-C110-NP	Non-P	654,384.54	4,996,685.57	593.9	20:47	2,910
CR1-C105-NP	Non-P	658,372.48	5,001,256.80	600.3	20:05	2,549
CR1-C13-NP	Non-P	663,792.00	4,985,785.00	612.0	19:04	2,713
CR1-C62-NP	Non-P	658,375.00	4,995,138.00	615.0	18:10	1,676
CR1-C12-NP	Non-P	662,222.00	4,985,736.00	603.0	17:13	2,201
CR1-C58-NP	Non-P	657,781.00	4,996,906.00	615.0	17:05	1,647
CR1-C37-NP	Non-P	663,563.00	4,991,342.00	605.1	15:55	1,631
CR1-C9-NP	Non-P	665,352.00	4,985,004.00	609.0	15:07	2,280
CR1-C60-NP	Non-P	656,855.00	4,998,565.00	613.5	14:18	2,592
CR1-C41-NP	Non-P	665,053.00	4,992,084.00	576.1	12:31	2,356
CR1-C70-NP	Non-P	665,135.00	4,988,293.00	595.9	12:05	3,540
CR1-C52-NP	Non-P	654,924.00	4,995,231.00	603.0	11:16	3,586
CR1-C63-NP	Non-P	658,566.00	4,995,254.00	612.4	10:46	2,408
CR1-C12-1-NP	Non-P	662,199.00	4,986,047.00	606.0	10:38	2,818
CR1-C11-NP	Non-P	664,111.00	4,985,679.00	609.0	10:30	2,615
CR1-C14-NP	Non-P	657,982.00	4,985,894.00	609.0	10:02	1,880
CR1-C107-NP	Non-P	656,810.99	4,999,855.15	598.8	9:58	1,401
CR1-C34-NP	Non-P	658,661.00	4,990,389.00	588.2	8:38	1,726
CR1-C72-NP	Non-P	665,158.00	4,988,170.00	594.6	7:41	3,776
CR1-C71-NP	Non-P	665,137.00	4,988,378.00	595.6	7:25	3,448
CR1-C39-NP	Non-P	660,144.00	4,991,670.00	588.0	6:57	2,605
CR1-C40-NP	Non-P	657,865.00	4,991,818.00	583.7	6:46	2,690
CR1-C109-NP	Non-P	653,780.18	4,996,828.35	588.0	6:39	4,797
CR1-C16-NP	Non-P	661,960.00	4,986,288.00	606.0	6:18	2,648
CR1-C38-NP	Non-P	660,639.00	4,991,557.00	597.0	6:06	3,474
CR1-C18-NP	Non-P	663,651.00	4,987,157.00	610.4	6:00	3,409
CR1-C111-NP	Non-P	653,857.19	4,995,573.17	591.0	5:43	6,289
CR1-C3-NP	Non-P	657,888.00	4,984,697.00	604.2	4:12	3,294
CR1-C55-NP	Non-P	660,914.00	4,995,169.00	607.5	2:52	3,360
CR1-C28-NP	Non-P	665,429.00	4,988,598.00	590.9	2:44	2,831
CR1-C15-NP	Non-P	663,291.00	4,986,026.00	615.0	2:17	2,175
CR1-C45-NP	Non-P	653,390.00	4,993,503.00	573.2	1:42	5,673
CR1-C65-NP	Non-P	665,805.00	4,995,305.00	579.0	1:30	3,884
CR1-C112-NP	Non-P	660,001.53	4,984,907.81	604.6	0:44	5,627
CR1-C1-NP	Non-P	656,743.00	4,983,525.00	596.0	0:00	5,541
CR1-C27-NP	Non-P	656,876.00	4,988,683.00	583.0	0:00	5,974

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Real Case Shadow Flicker Hours/Year Updated 7/27/19
6 turbines removed as suggested by Mr. Hessler
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Codington County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-C29-NP	Non-P	666,572.00	4,988,867.00	575.9	0:00	2,457
CR1-C2-NP	Non-P	658,791.00	4,984,483.00	602.0	0:00	6,273
CR1-C31-NP	Non-P	665,939.00	4,988,950.00	585.4	0:00	2,126
CR1-C32-NP	Non-P	655,843.00	4,989,581.00	568.8	0:00	9,708
CR1-C33-NP	Non-P	656,839.00	4,990,404.00	569.8	0:00	7,418
CR1-C4-NP	Non-P	659,744.00	4,984,749.00	606.0	0:00	5,981
CR1-C54-NP	Non-P	663,421.00	4,995,376.00	583.4	0:00	5,351
CR1-C5-NP	Non-P	659,958.00	4,984,794.00	604.8	0:00	5,659
CR1-C66-NP	Non-P	659,718.00	4,985,032.00	606.0	0:00	5,800
CR1-C67-NP	Non-P	659,789.00	4,985,057.00	606.0	0:00	5,791
CR1-C7-NP	Non-P	660,893.00	4,984,861.00	593.2	0:00	3,022
CR1-C53-NP	Non-P	663,376.00	4,996,043.00	578.8	0:00	7,201
CR1-C10-P	Participant	663,510.00	4,985,195.00	609.0	29:30	1,634
CR1-C50-P	Participant	656,806.00	4,994,388.00	621.0	28:17	1,591
CR1-C17-P	Participant	658,031.00	4,986,373.00	609.1	26:48	1,886
CR1-C51-P	Participant	657,455.00	4,995,160.00	621.0	24:47	1,768
CR1-C30-P	Participant	661,699.00	4,988,957.00	615.0	23:33	1,614
CR1-C19-P	Participant	659,243.00	4,987,276.00	611.6	21:25	1,722
CR1-C64-P	Participant	659,436.00	4,992,174.00	581.0	19:54	1,614
CR1-C56-P	Participant	655,953.00	4,995,244.00	606.5	18:18	1,972
CR1-C20-P	Participant	663,054.00	4,987,455.00	606.0	14:42	2,336
CR1-C36-P	Participant	663,181.00	4,990,600.00	615.0	14:36	1,532
CR1-C42-P	Participant	659,458.00	4,992,229.00	580.0	11:58	1,801
CR1-C35-P	Participant	662,025.00	4,990,475.00	609.0	11:49	2,123
CR2-C150-P	Participant	657,178.00	4,985,788.00	612.0	10:01	1,640
CR1-C57-P	Participant	656,628.00	4,995,266.00	615.0	9:55	1,568
CR1-C59-P	Participant	661,548.00	5,000,754.00	584.2	7:39	1,644
CR1-C68-P	Participant	662,652.00	4,987,606.00	609.0	6:46	2,146
CR1-C26-P	Participant	657,767.00	4,988,493.00	597.0	6:39	3,484
CR1-C69-P	Participant	662,685.00	4,987,619.00	609.0	6:07	2,185
CR1-C47-P	Participant	662,825.00	4,993,508.00	613.9	5:03	3,750
CR1-C48-P	Participant	664,247.00	4,993,646.00	588.0	3:48	1,847
CR1-C49-P	Participant	662,250.00	4,993,731.00	609.0	1:12	5,148
CR1-C6-P	Participant	662,989.00	4,995,228.00	599.8	0:00	6,102

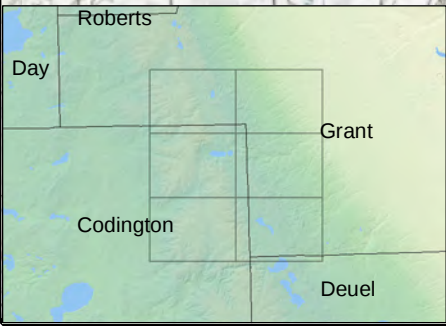
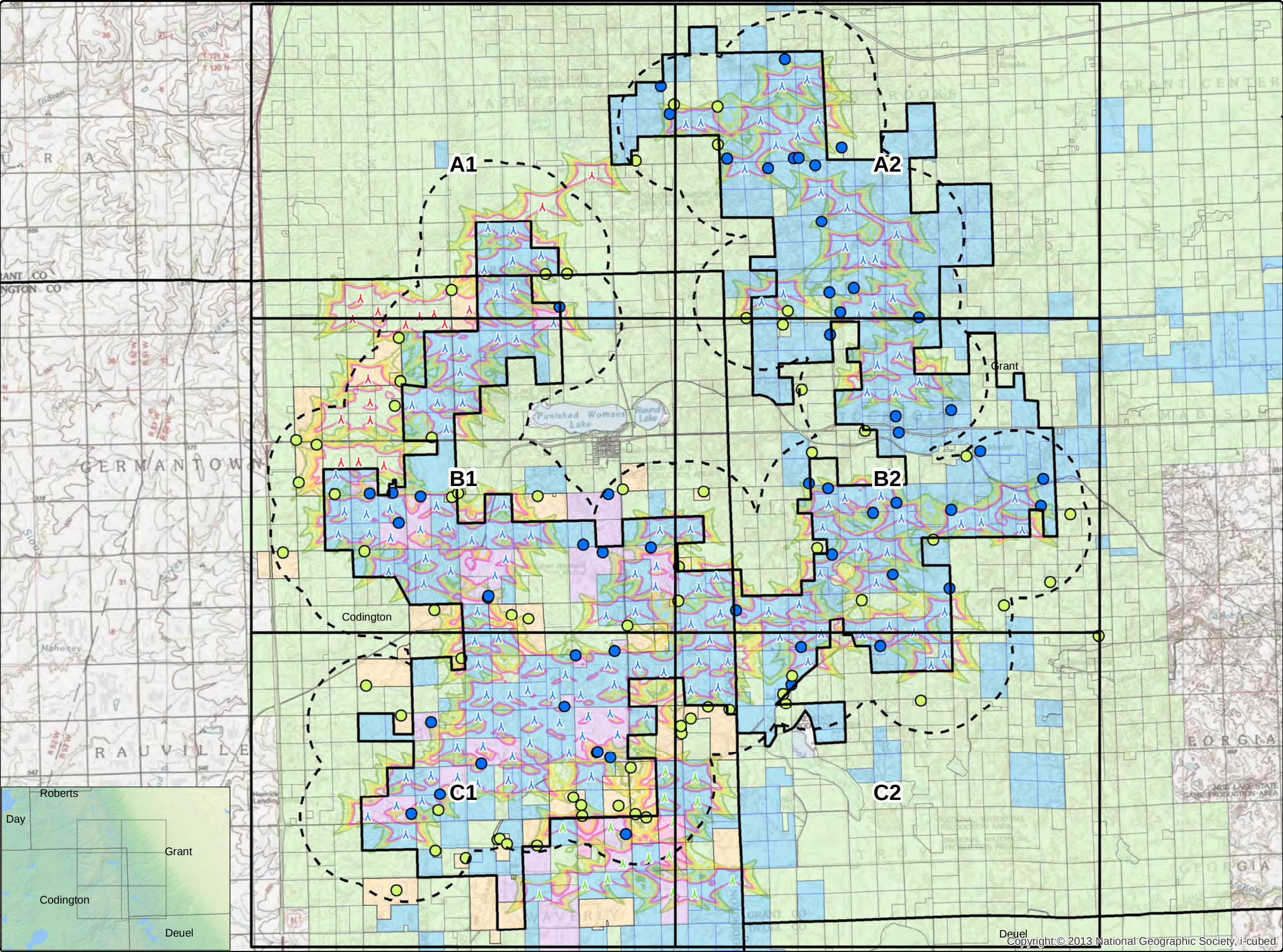
Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Real Case Shadow Flicker Hours/Year Updated 7/27/19
6 turbines removed as suggested by Mr. Hessler
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Grant County
continued

Receptor ID	Participation Status	Easting (m)	Northing (m)	Elevation AMSL (m)	Real Case Shadow (hrs/year)	Distance to Nearest Turbine (ft)
CR1-G114-NP	Non-P	666,214.00	5,006,667.00	521.1	23:23	2,205
CR1-G43-NP	Non-P	661,141.00	5,001,721.00	583.6	18:26	1,909
CR1-G125-NP	Non-P	668,289.00	5,000,643.00	543.0	15:49	1,716
CR1-G115-NP	Non-P	664,933.00	5,006,731.00	544.6	8:01	2,188
CR1-G113-NP	Non-P	666,228.00	5,005,549.00	537.0	7:09	2,746
CR1-G23-NP	Non-P	670,471.00	4,992,104.00	560.0	5:11	2,185
CR1-G27-NP	Non-P	676,630.00	4,994,642.00	480.8	2:55	4,944
CR1-G44-NP	Non-P	661,781.00	5,001,732.00	583.7	2:50	3,123
CR1-G68-NP	Non-P	669,159.00	4,993,632.00	565.6	2:07	2,113
CR1-G117-NP	Non-P	663,801.00	5,005,084.00	581.3	1:54	4,501
CR1-G34-NP	Non-P	671,320.00	4,995,798.00	531.0	1:28	2,238
CR1-G109-NP	Non-P	667,064.00	5,000,425.00	566.2	0:59	2,152
CR1-G12-NP	Non-P	668,229.00	4,989,039.00	575.0	0:00	4,623
CR1-G16-NP	Non-P	668,419.00	4,989,861.00	576.0	0:00	2,070
CR1-G14-NP	Non-P	668,156.00	4,989,332.00	574.1	0:00	3,940
CR1-G22-NP	Non-P	674,670.00	4,991,955.00	527.6	0:00	5,781
CR1-G13-NP	Non-P	672,216.00	4,989,142.00	558.0	0:00	3,576
CR1-G77-NP	Non-P	676,031.00	4,992,629.00	502.7	0:00	5,728
CR1-G37-NP	Non-P	668,998.00	4,996,452.00	549.0	0:00	5,246
CR1-G42-NP	Non-P	670,566.00	4,997,097.00	518.9	0:00	3,819
CR1-G36-NP	Non-P	673,559.00	4,996,344.00	498.0	0:00	6,211
CR1-G105-NP	Non-P	668,696.00	4,998,325.00	549.0	0:00	6,345
CR1-G110-NP	Non-P	671,218.00	5,005,064.00	456.2	0:00	5,889
CR1-G130-NP	Non-P	668,147.00	5,000,233.00	549.0	0:00	3,005
CR1-G70-NP	Non-P	677,464.53	4,991,043.11	492.0	0:00	12,651
CR1-G600-NP	Non-P	674,300.70	5,005,772.78	393.0	0:00	13,186
CR1-G65-P	Participant	671,496.00	4,994,973.00	537.0	29:59	1,539
CR1-G21-P	Participant	666,766.00	4,991,807.00	577.1	29:12	1,555
CR1-G138-P	Participant	664,809.00	5,006,456.00	549.0	25:26	1,824
CR1-G28-P	Participant	673,113.00	4,994,772.00	513.9	23:01	1,614
CR1-G18-P	Participant	668,678.00	4,990,722.00	585.0	22:35	1,585
CR1-G32-P	Participant	669,477.00	4,995,401.00	546.0	20:01	1,545
CR1-G124-P	Participant	669,843.00	5,000,605.00	525.0	19:27	1,791
CR1-G137-P	Participant	666,501.00	5,005,136.00	529.3	18:42	1,939
CR1-G66-P	Participant	670,802.00	4,994,681.00	539.7	16:45	1,801
CR1-G128-P	Participant	670,242.00	5,001,314.00	513.0	15:02	2,612
CR1-G25-P	Participant	671,391.00	4,992,858.00	549.0	14:41	1,804
CR1-G59-P	Participant	675,755.00	4,994,888.00	487.7	12:50	2,605

Table C-3: Crowned Ridge Sound Level Tabular Results Sorted by Real Case Shadow Flicker Hours/Year Updated 7/27/19
Realistic case shadow results at occupied structures
Results using GE 2.3-116-90 m HH, GE 2.3-116-80 m HH WTG's
UTM NAD83 Zone 14
Grant County
continued

[illegible]

APPENDIX D: STANDARD RESOLUTION SHADOW FLICKER MAPS





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

**Crowned Ridge Wind Farm
Shadow Flicker Iso-Lines
Overview Map**

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

Shadow Flicker (hr/yr)

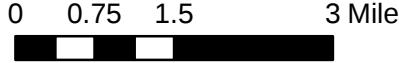
- 10
- 15
- 20
- 25
- 30

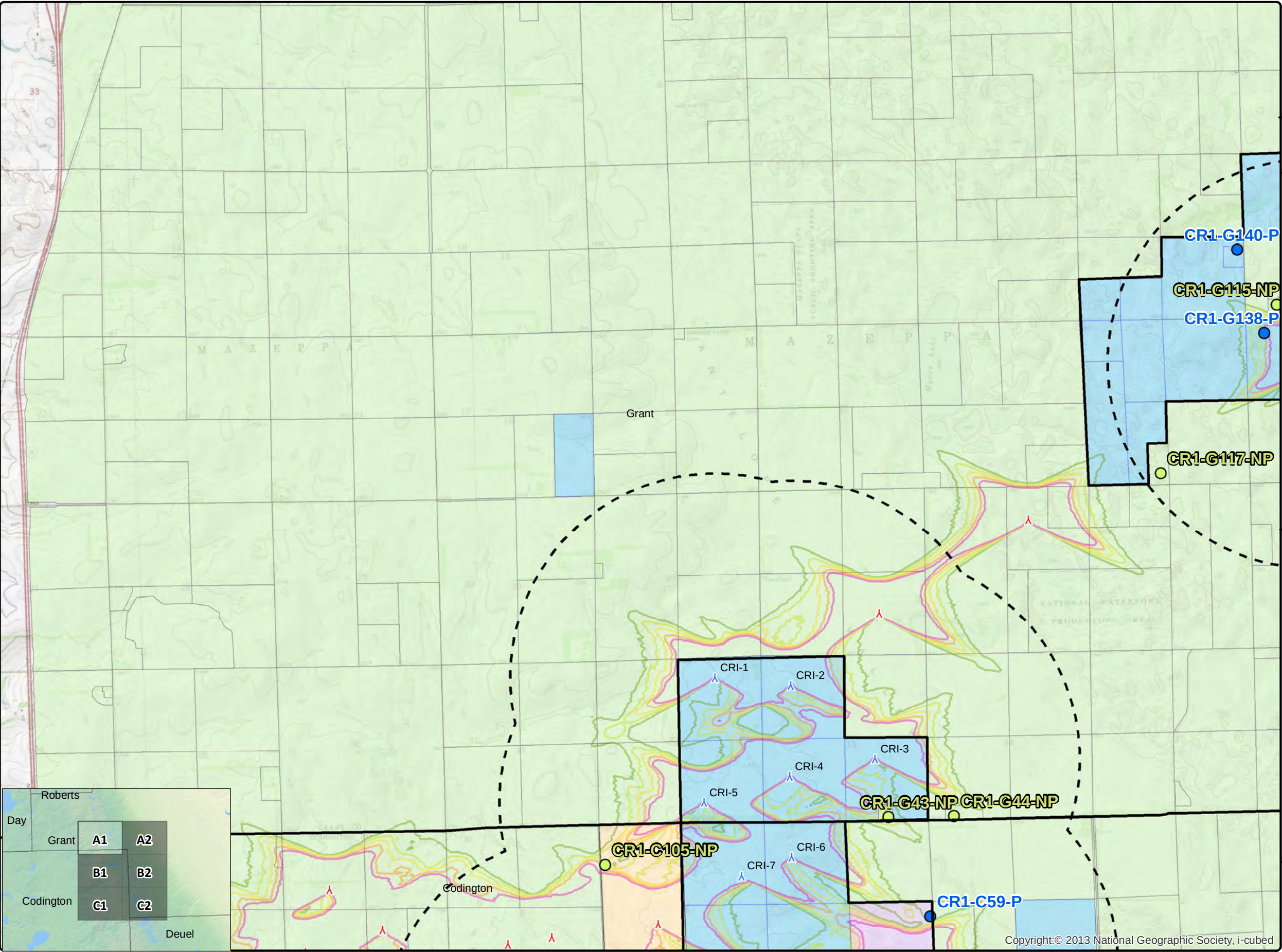
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.



N
W E
S







EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Shadow Flicker Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

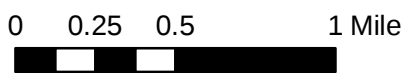
Shadow Flicker (hr/yr)

- 10
- 15
- 20
- 25
- 30

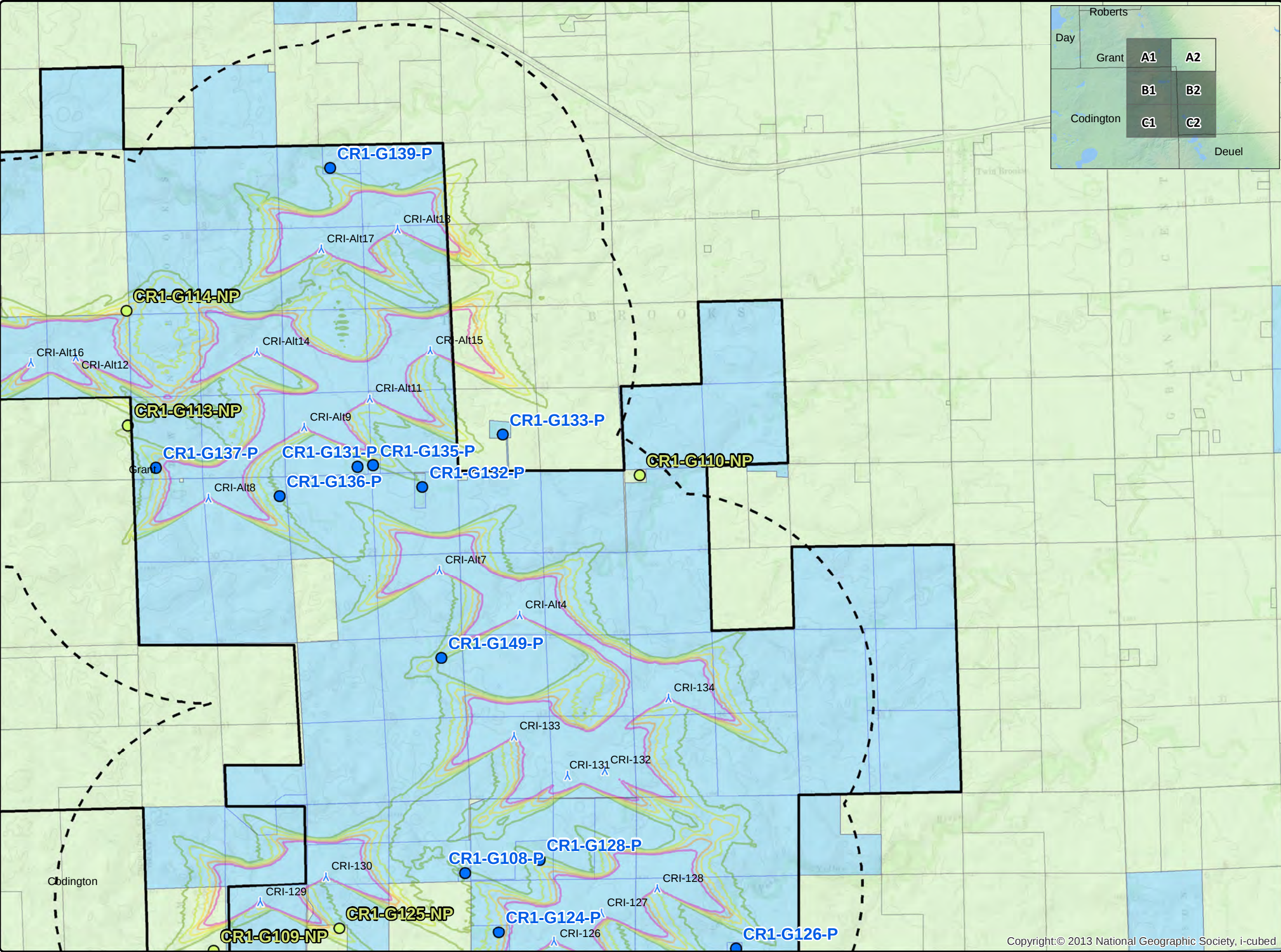
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.





www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Shadow Flicker Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

-  Crowned Ridge Turbines
-  Crowned Ridge II Turbines
-  Dakota Range Turbines
-  2 km Turbine Buffer
-  County Lines
-  CR1 Project Boundary
-  Non Participants
-  Participants

Shadow Flicker (hr/yr)

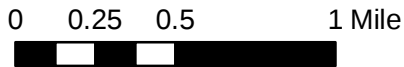
-  10
-  15
-  20
-  25
-  30

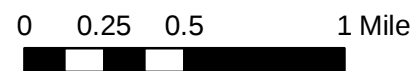
-  Non-Part. Occupied Codington Parcels
-  Participating Occupied Codington Parcels
-  Non-Participating Parcels
-  Participating Parcels
-  Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.



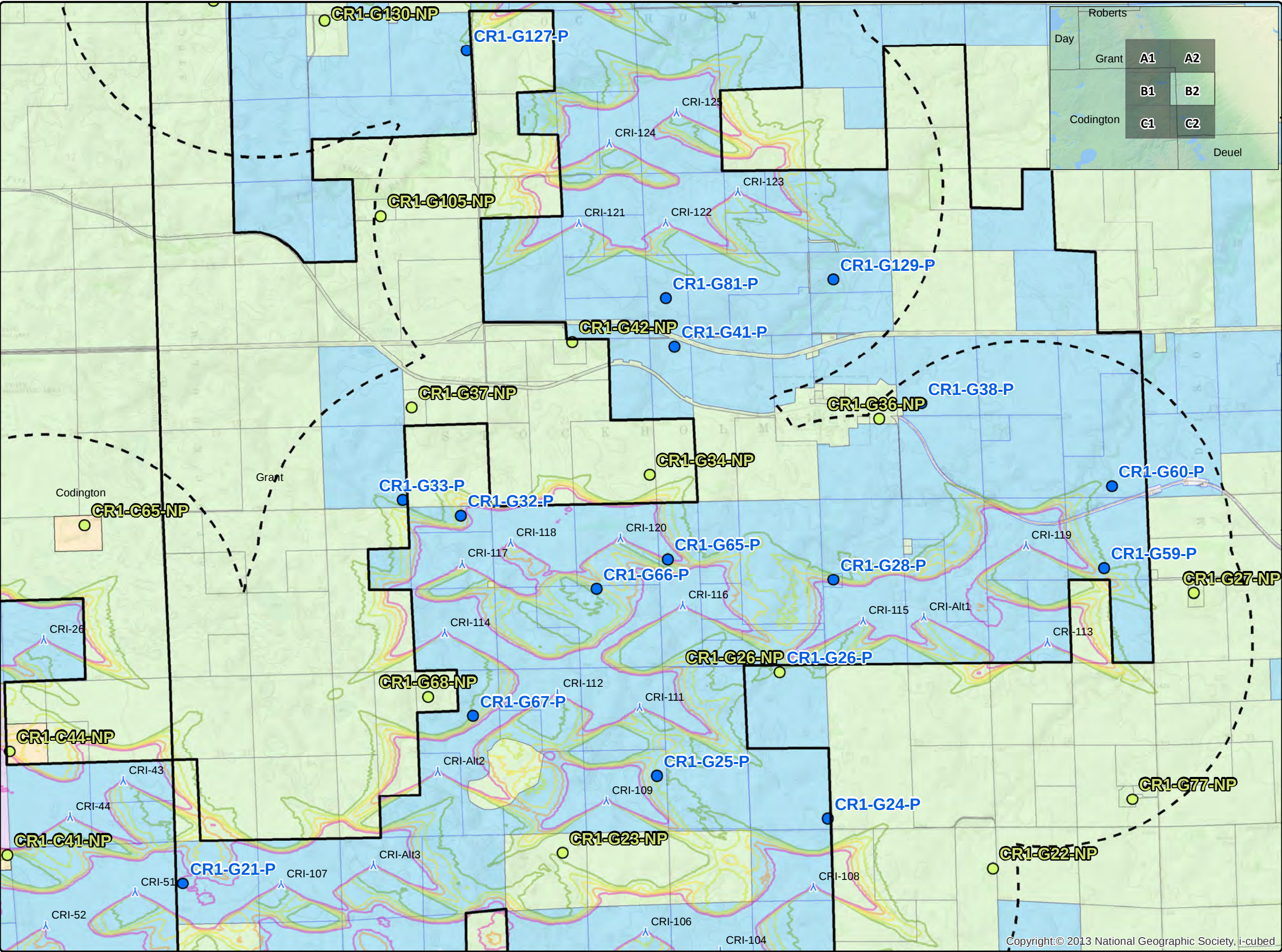
N
W
E
S





35

020830





EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Shadow Flicker Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates	
#	Description
1	Original
	Date

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

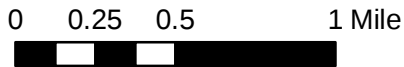
Shadow Flicker (hr/yr)

- 10
- 15
- 20
- 25
- 30

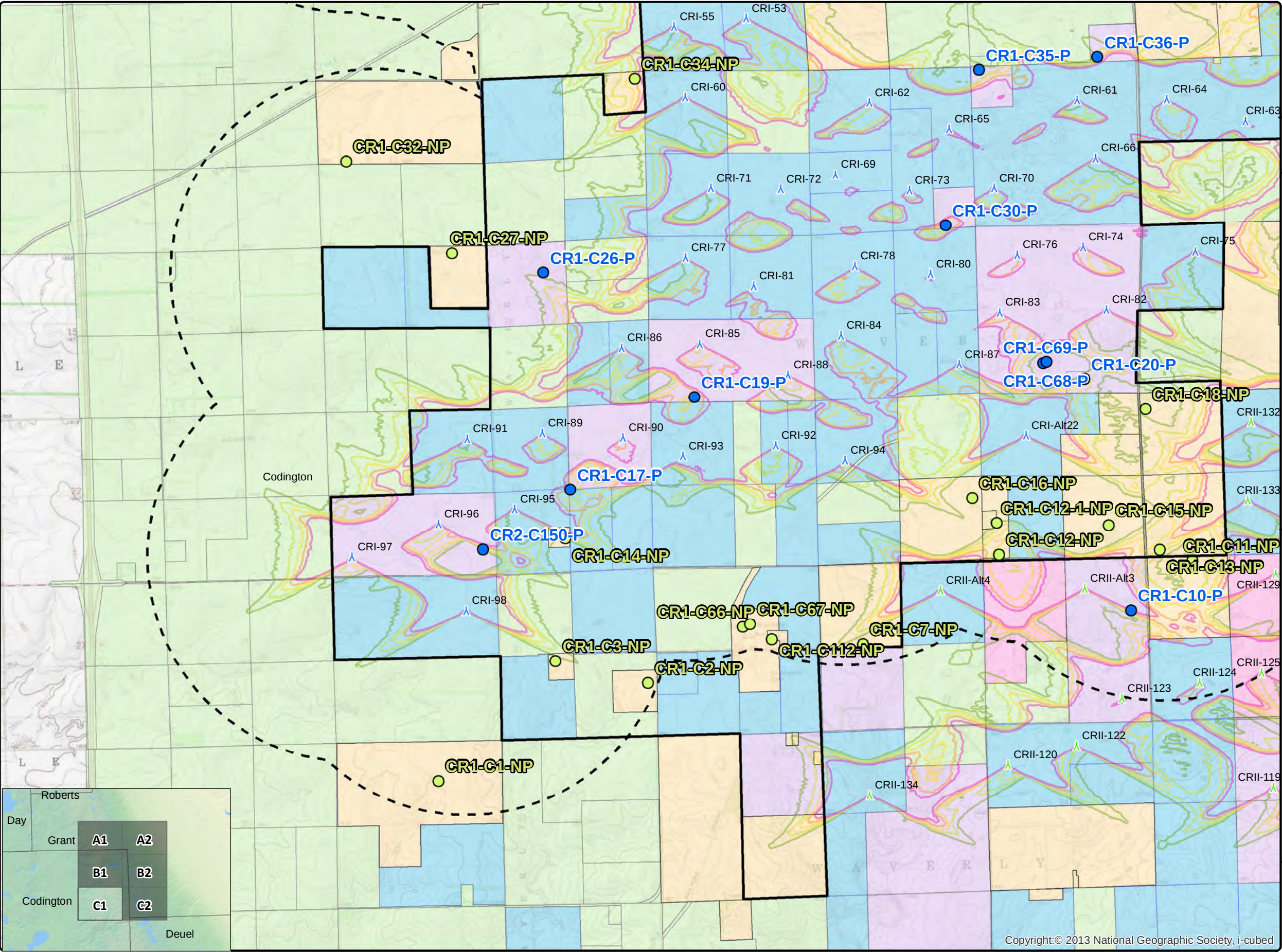
- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.





Neither EAPC nor any person acting on their behalf: (a) makes any warranty, express or implied, with respect to the use of any information disclosed on this drawing; or (b) assumes any liability with respect to the use of any information or methods disclosed on this drawing. Any recipient of this document, by their acceptance or use of this document, releases EAPC, its parent corporations and its affiliates, from any liability for direct, indirect, consequential, or special loss or damage whether arising in contract, warranty, express or implied, tort or otherwise, and irrespective of fault, negligence, and strict liability. The responsibilities for the applications and use of the material contained in this document remain solely with the client.





www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Shadow Flicker Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Legend

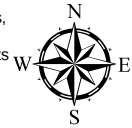
- ▲ Crowned Ridge Turbines
- ▲ Crowned Ridge II Turbines
- ▲ Dakota Range Turbines
- - - 2 km Turbine Buffer
- ▬ County Lines
- ▬ CR1 Project Boundary
- Non Participants
- Participants

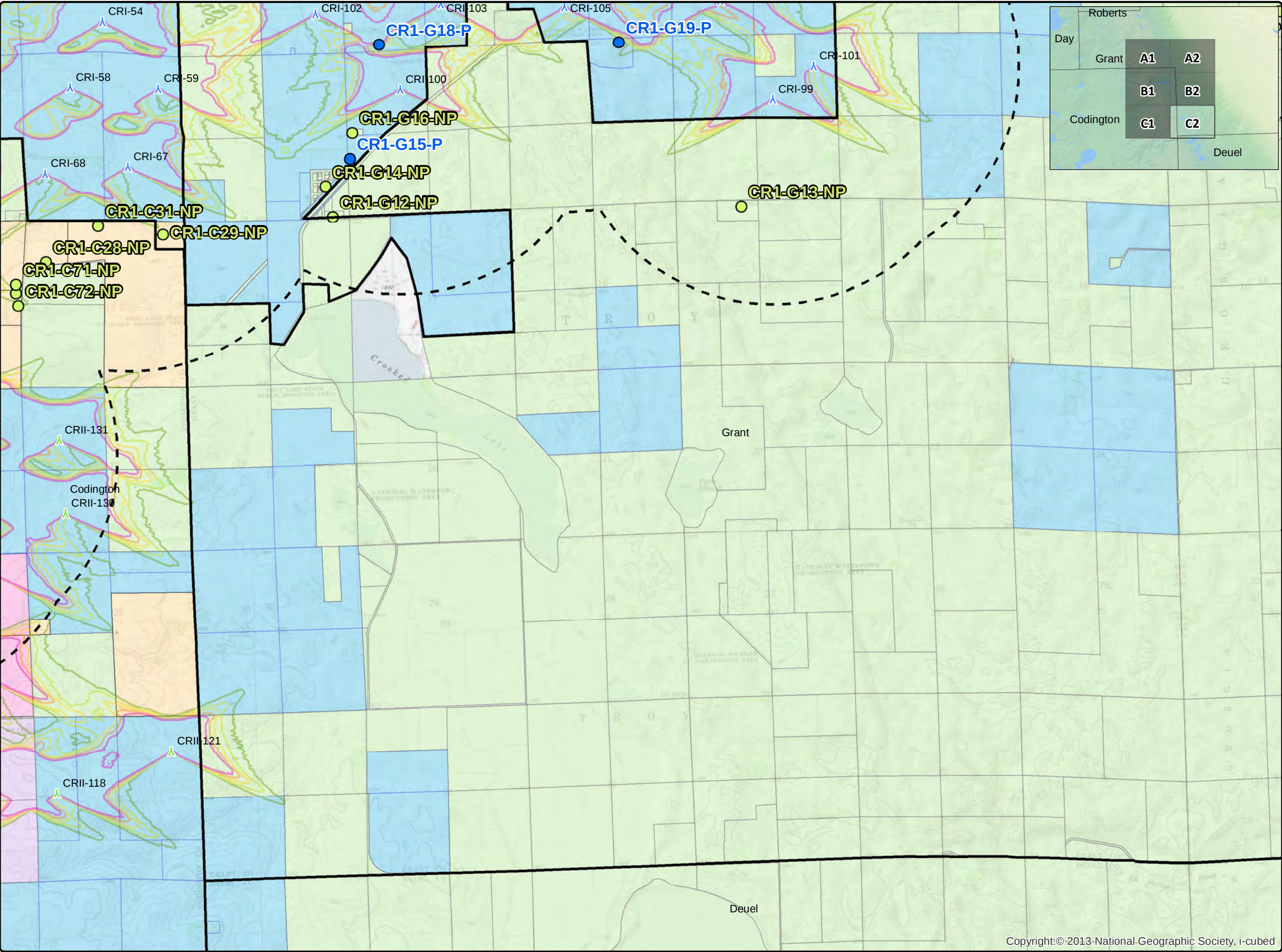
Shadow Flicker (hr/yr)

- 10
- 15
- 20
- 25
- 30

Non-Part. Occupied Codington Parcels
Participating Occupied Codington Parcels
Non-Participating Parcels
Participating Parcels
Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.







EAPC
WIND ENERGY

www.eapc.net | 701.775.3000

Crowned Ridge Wind Farm Shadow Flicker Iso-Lines

Client
SWCA Environmental Consultants

Project Description
Wind turbine layout with occupied structures within 2 km.

Predicted shadow flicker levels at existing residences.

Location: Watertown, SD
Project #: 20174430

Issue Dates

#	Description	Date
1	Original	2019.07.27

Drawn By: AS Checked By: JH

Legend

- Crowned Ridge Turbines
- Crowned Ridge II Turbines
- Dakota Range Turbines
- 2 km Turbine Buffer
- County Lines
- CR1 Project Boundary
- Non Participants
- Participants

Shadow Flicker (hr/yr)

- 10
- 15
- 20
- 25
- 30

- Non-Part. Occupied Codington Parcels
- Participating Occupied Codington Parcels
- Non-Participating Parcels
- Participating Parcels
- Pending Parcels

COPYRIGHT:
All maps, plans, specifications, computer files, field data, notes and other documents and instruments prepared by EAPC as instruments of service shall remain the property of EAPC. EAPC shall retain all common law, statutory and other reserved rights, including the copyright thereto.



**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA**

IN THE MATTER OF THE APPLICATION)	
BY CROWNED RIDGE WIND, LLC FOR A)	EL19-003
PERMIT OF A WIND ENERGY FACILITY)	
IN GRANT AND CODINGTON COUNTIES)	CERTIFICATE OF SERVICE
)	

I hereby certify that true and correct copies of Crowned Ridge Wind, LLC's
Compliance Filings in this matter were served electronically to the parties listed below on
the 29th day of July, 2019, addressed to:

Ms. Patricia Van Gerpen
Executive Director
patty.vangerpen@state.sd.us

Ms. Kristen Edwards
Staff Attorney
Kristen.Edwards@state.sd.us

Ms. Amanda Reiss
Staff Attorney
Amanda.reiss@state.sd.us

Mr. Darren Kearney
Staff Analyst
Darren.kearney@state.sd.us

Mr. Jon Thurber
Staff Analyst
Jon.thurber@state.sd.us

Mr. Eric Paulson
Staff Analyst
Eric.paulson@state.sd.us

Mr. Brian J. Murphy
Senior Attorney
NextEra Energy Resources, LLC
Brian.j.murphy@nee.com

Mr. Tyler Wilhelm
Associate Project Manager
NextEra Energy Resources, LLC
Tyler.Wilhelm@nexteraenergy.com

Mr. Mikal Hanson
Staff Attorney
South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
Mikal.hanson@state.sd.us

Ms. Cindy Brugman
Auditor
Codington County
14 First Ave. SE
Watertown, SD 57201
cbrugman@codington.org

Ms. Karen Layher
Auditor
Grant County
210 E. Fifth Ave.
Milbank, SD 57252
Karen.Layher@state.sd.us

Mr. David Ganje
Representing Intervenors Mr. Allen Robish.
Ms. Amber Christenson, Ms. Kristi Mogen,
Ms. Melissa Lynch and Mr. Patrick Lynch
Ganje Law Offices
davidganje@ganjelaw.com



Miles F. Schumacher *by Eric Kuhel*
Attorneys for Applicant
Lynn, Jackson, Shultz & Lebrun, PC
110 N. Minnesota Ave., Suite 400
Sioux Falls, SD 57104