# Brady II Wind Energy Center
# Brady Wind II, LLC
# Hettinger County, North Dakota
# (Ancillary Facilities in Stark County)

## Amended Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility

## PSC Case Number PU-16-042



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# 1. INTRODUCTION

Brady Wind II, LLC (Brady Wind II), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC (NEER), is submitting this Amended Application for a Certificate of Site Compatibility (Certificate) to construct the Brady II Wind Energy Center (the Project). All Project facilities are proposed to be located in Hettinger County, North Dakota, with the exception of collection lines, which will also be placed in southern Stark County (**Figures 1–3, Appendices A and B**). The proposed Project will have a nameplate capacity of approximately 150 megawatts (MW), consisting of up to 72 wind turbines using both General Electric (GE) 2.1 MW and GE 1.79 MW Xle wind turbine generators. Additional facilities proposed in this Application include access roads, electrical collection systems and cabling, and meteorological evaluation towers (METs) (four temporary and one permanent) (**Figure 3, Appendices A and B**). All wind turbines are proposed to be located in Hettinger County. Facilities proposed to be located in Stark County are limited to underground electrical collection systems and cabling (**Figure 3, Appendices A and B**).

The proposed Project will be located adjacent to the southern boundary of the proposed Brady Wind Energy Center. An Application for a Certificate of Site Compatibility for the Brady Wind Energy Center is currently under consideration by the North Dakota Public Service Commission (PSC). The proposed Project will utilize the temporary laydown and turbine storage areas identified for the Brady Wind Energy Center during construction, and the Operations & Maintenance (O&M) building proposed for the Brady Wind Energy Center will be shared with the proposed Project. Substation equipment to support the proposed Project will be located within the same 8-acre parcel where the Brady Wind Energy Center substation is proposed to be located (**Figure 4**). The overhead transmission line proposed to serve the Brady Wind Energy Center will also serve the proposed Project. Impacts associated with the laydown area, O&M facility, and the substation are described in a separate Certificate of Site Compatibility Application, submitted to the PSC in December 2015. Impacts associated with the overhead transmission line were described in a separate Certificate of Corridor Compatibility and Route Permit application, which was also submitted to the PSC in December 2015. The proposed Project would not cause additional impacts associated with the laydown area, substation facilities, O&M building, and transmission line other than those already described in those applications. Impacts associated with these facilities are therefore not discussed in this Application.

NEER, through its affiliates, develops renewable projects throughout the United States and Canada. NEER is the largest generator of wind-powered electricity in North America, with nearly 11,300 MW of capacity in 19 states and Canada as of December 2015. In North Dakota specifically, NEER, through its affiliates, owns and operates 851 MW of wind generation and operates an additional 139 MW. NEER designs, constructs, and operates its facilities in an environmentally sound and responsible manner. Attached as **Appendix C**, please find the sections from NextEra Energy, Inc.'s 2015 Corporate Responsibility Report that describe NextEra

Energy, Inc.'s environmental accountability, management, and stewardship policies that are intended to:

- Design, construct, operate, and maintain our facilities in an environmentally sound and responsible manner;
- Prevent pollution, minimize waste, and conserve natural resources;
- Avoid, minimize and/or mitigate impacts to habitat and wildlife; and
- Engage stakeholders to build trust and partner toward common goals for environmental stewardship and protection.

## 1.1 Compliance with the Energy Conversion and Transmission Facility Siting Act Chapter 49-22

The North Dakota Energy Conversion and Transmission Facility Siting Act requires an application for a Certificate to meet the criteria set forth in North Dakota Century Code (NDCC) Chapter 49-22 and North Dakota Administrative Code (NDAC) Article 69-06. The siting of an energy conversion facility is to be made in an orderly manner compatible with environmental preservation and the efficient use of resources (NDCC 49-22-02).

Brady Wind II considered the exclusion and avoidance areas and selection and policy criteria set forth in NDAC Section 69-06-08-01 in the design of the proposed Project and has provided information on such areas in this Application. In addition, sufficient Project design, wind resource, and technical information have been provided for a thorough evaluation of the proposed Project. **Table 1** outlines the information required to fulfill the requirements for a Certificate with the PSC and where these requirements are addressed in this document.

**Table 1. Certificate Completion Checklist**

| State Authority | Description | Section |
|---|---|---|
| **NDAC 69-06-04-01** | **Certificate of Site Compatibility Application** | |
| **Section 2** | **Contents** | |
| a. | A description of: | |
| | (1) The type of energy conversion facility proposed | 1.0, 4.0 |
| | (2) The gross design capacity | 1.0 |
| | (3) The net design capacity | 1.3.2 |
| | (4) The estimated thermal efficiency of the energy conversion process and the assumptions upon which the estimate is based | Not applicable |
| | (5) The number of acres that the proposed facility would occupy | 1.3.1, **Table 4** |

**Table 1. Certificate Completion Checklist**

| State Authority | Description | Section |
|---|---|---|
| | (6) The anticipated time schedule for:<br>(a) Obtaining the certificate of site compatibility<br>(b) Completing land acquisition<br>(c) Starting construction<br>(d) Completing construction<br>(e) Testing operations<br>(f) Commencing commercial production<br>(g) Beginning any expansions or additions | 1.4 |
| b. | Copies of any evaluative studies or assessments of the environmental impact of the proposed facility submitted to any federal, regional, state, or local agency. | **Appendix D, Appendix E, Appendix F, Appendix G** |
| c. | An analysis of the need for the proposed facility based on present and projected demand for the product or products to be produced by the proposed facility, including the most recent system studies supporting the analysis of the need. | 2.1 |
| d. | A description of any feasible alternative methods of serving the need. | 2.2 |
| e. | A study area that includes the proposed facility site, of sufficient size to enable the commission to evaluate the factors addressed in NDCC Section 49-22-09. | 1.3.1, 3.0, 7.0-7.17, 10.0-10.12, **Figures 1-3, Figures 5-6, Figures 10-12, Figures 14-15** |
| f. | The Application shall contain a discussion of the utility's policies and commitments to limit the environmental impact of its facilities, including copies of board resolutions and management directives. | **Appendix C** |
| g. | A map identifying the criteria that provides the basis for the specific location of the proposed facility within the study area. | **Figure 6** |
| h. | A discussion of the criteria evaluated within the study area, including exclusion areas, avoidance areas, selection criteria, policy criteria, design and construction limitations, and economic considerations. | 3.0-3.6, **Table 5, Table 6, Table 7, Table 8, Figure 6** |
| i. | A discussion of the mitigative measures that the application would take to minimize adverse impacts which result from the location, construction, and operation, of the proposed facility. | 7.2.3, 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3, 7.10.3, 7.11.3, 7.12.3, 7.13.3, 7.14.3, 7.15.3, 7.16.3, 7.17 |
| j. | The qualifications of each person involved in the facility site location study. | 11.0 |
| k. | A map of the study area showing the location of the proposed facility and the criteria evaluated. | **Figures 5 and 6**, 1.2, 3.0 |
| l. | An 8-1/2 by 11-inch black and white map suitable for newspaper publication depicting the site area. | Provided on CD |
| m. | A discussion of present and future natural resource development in the area. | 7.3.1 |
| n. | Map and GIS requirements. The applicant shall provide information that is complete, current, presented clearly and concisely, and supported by appropriate references to technical and other written material available to the commission. | **Figures 1-3, Figures 5 -6, Figures 10-12, Figures 14-15** |

**Table 1. Certificate Completion Checklist**

| State Authority | Description | Section |
|---|---|---|
| **NDCC 49-22-08** | **Application for a certificate** | |
| **Section 1** | **An application for a certificate shall be in such form as the commission may prescribe, containing the following information:** | |
| a. | A description of the size and type of facility. | 1.0, 1.3.1, 4.0, **Table 3, Table 4** |
| b. | A summary of any studies which have been made of the environmental impact of the facility. | 7.0 |
| c. | A statement explaining the need for the facility. | 2.1 |
| d. | An identification of the location of the preferred site for any energy conversion facility. | 1.3.1, **Figures 1-3** |
| e. | An identification of the location of the preferred corridor for any transmission facility. | Not applicable |
| f. | A description of the merits and detriments of any location identified and a comprehensive analysis with supporting data showing the reasons why the preferred location is best suited for the facility. | 7.0 |
| g. | A description of mitigative measures that would be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility. | 7.2.3, 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3, 7.10.3, 7.11.3, 7.12.3, 7.13.3, 7.14.3, 7.15.3, 7.16.3, 7.17 |
| h. | An evaluation of the proposed site or corridor with regard to the applicable considerations set out in Section 49-22-09 and the criteria established pursuant to Section 49-22-05.1. | 10.0 |
| i. | Such other information as the applicant may consider relevant or the commission may require. | **Appendix H** |
| **NDCC 49-22-09** | **Factors to be considered in evaluating applications and designation of sites, corridors, and routes.** | **10.0** |
| 1. | Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment. | 10.1 |
| 2. | The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects. | 10.2 |
| 3. | The potential for beneficial uses of waste energy from a proposed energy conversion facility. | 10.3 |
| 4. | Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated. | 10.4 |
| 5. | Alternatives to the proposed site, corridor or route which are developed during the hearing process and which minimize adverse effects. | 10.5 |
| 6. | Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated. | 10.6 |
| 7. | The direct and indirect economic impacts of the proposed facility. | 10.7 |
| 8. | Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route. | 10.8 |
| 9. | The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites. | 10.9 |

**Table 1. Certificate Completion Checklist**

| State Authority | Description | Section |
|---|---|---|
| 10. | The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species. | 10.10 |
| 11. | Problems raised by federal agencies, other state agencies, and local entities. | 10.12 |

## 1.2 Flexibility in Siting

Wind facility siting is a process through which input is considered from several different entities. When considering where to locate this wind farm in North Dakota, Brady Wind II identified the Study Area (see **Figures 1–3**) for further investigation based on the modeled wind resource and potential offtaker, as outlined in **Section 1.3** below. The identified Study Area is considered optimal from a wind resource perspective, and is located adjacent to the southern boundary of the proposed Brady Wind Energy Center, which is currently under consideration by the PSC (Case Number PU-15-690). The location of the proposed Project adjacent to the Brady Wind Energy Center allows Brady Wind II to utilize already-proposed facilities associated with the Brady Wind Energy Center, including the construction laydown and turbine storage areas, O&M facility, substation, and transmission line. Brady Wind II analyzed the available land and initiated discussions with landowners and applied setbacks required by Hettinger County, the PSC, and Brady Wind II's internal setbacks. Although none of the wind turbines and only some collection lines will be located in Stark County, Brady Wind II voluntarily applied Stark County's setbacks to the proposed Project where they were more restrictive. Brady Wind II then conducted environmental desktop and field studies in the Study Area, the results of which are incorporated in the appropriate sections of this application.

Brady Wind II has negotiated agreements with landowners that are interested in having wind turbines and associated facilities placed on their property. Tracts owned by these participating landowners are included in the area defined as the "Project Area" (**Figures 1-3, Appendices A and B**). Simultaneously, Brady Wind II has identified preliminary turbine locations based on initial site inspection, topographic maps, known environmentally sensitive areas, review of North Dakota's power plant siting exclusion and avoidance areas, and communications with local, state, and federal agencies. Brady Wind II is not seeking a permit for each wind turbine indicated on **Figure 3**; rather, the preliminary layout indicates areas of the site with good wind resources and where there are no known environmental or regulatory siting issues.

Brady Wind II seeks a Certificate of Site Compatibility for the Project Area, as opposed to specific turbine locations. Brady Wind II suggests that the Certificate define the Project Area, number of turbines, and structures related to wind generation to be located within the Project Area based on the information presented in this Application. Within the permitted Project Area, Brady Wind II proposes that conditions be included specifying that final turbine placement be

subject to required setbacks from environmentally sensitive areas, and be sufficient to meet required noise levels.

Brady Wind II has completed additional required studies, including final cultural resource surveys and wetland delineations, and will provide the reports as soon as they are complete and at least 30 days prior to the hearing. In addition, Brady Wind II has modified the Project layout based on input from landowners regarding the location of wind turbines and associated facilities to the extent practicable. A final site plan for the proposed Project will be submitted to the PSC at least 30 days prior to the hearing, and a pre-construction conference call will be held with PSC staff to ensure that the site plan conforms to the Certificate requirements.

Brady Wind II believes that the aforementioned siting process is consistent with North Dakota siting rules and provides Brady Wind II with the flexibility necessary to develop a timely, cost-effective project in an environmentally responsible manner.

## 1.3 Project Summary

Brady Wind II selected a Study Area adjacent to the southern boundary of the proposed Brady Wind Energy Center for siting a 150 MW wind generation facility. The Study Area will capitalize on the proximity of the proposed Brady Wind Energy Center, and was identified as optimal from wind resource, land acquisition, transmission interconnection, environmental, and economic perspectives. The Study Area was selected considering the exclusion and avoidance criteria outlined in NDAC 69-06-08-01.

### *1.3.1 Study Area*

The Study Area encompasses approximately 27,264 acres (43 square miles) in northern Hettinger County and southern Stark County (**Table 2, Figures 1-3**). Approximately 21,193 acres (78%) of the Study Area is in Hettinger County, and 6,071 acres (22%) of the Study Area is in Stark County. The collection lines are the only Project facilities proposed to be located in Stark County.

**Table 2. Study Area Location**

| County | Township | Range | Sections |
|---|---|---|---|
| Hettinger County | 136 N | 95 W | 18, 19 |
| | 136 N | 96 W | 1-8, 10-13, 15, 18, 19, 22-24, 26, 27 |
| | 136 N | 97 W | 1--14, 17, 18, 24, 25, 36 |
| Stark County | 137 N | 95 W | 31, 32 |
| | 137 N | 96 W | 25, 26, 31-36 |

The proposed Project Area is defined as the locations within the Study Area for which Brady Wind II has negotiated easements with landowners and where proposed Project facilities are proposed to be located (**Figures 1-3, Appendices A and B**). The proposed Project Area was selected to include all areas necessary for Brady Wind II to optimize the wind resource while

complying with required setbacks and avoiding and minimizing impacts to environmental resources. Brady Wind II has acquired all of the easements required for the proposed Project Area. The proposed Project Area encompasses approximately 20,317 acres (32 square miles) in northern Hettinger County and southern Stark County. Approximately 17,762 acres (87%) of the Project Area are in Hettinger County, and 2,554 acres (13%) are in Stark County. The only infrastructure that will be located in the Project Area in Stark County will be collection lines.

Although the turbines will be placed throughout the participating land within Project Area, the permanent Project structures will only occupy up to 74 acres during operation (See **Tables 3 and 4 below**), or less than 1 percent of the total Project Area. **Table 3** summarizes the assumptions used to calculate impacts by proposed Project facility. Permanent impacts are considered to be the proposed Project footprint during operation. Temporary impacts are considered those impacts that result during construction to accommodate equipment and temporary activities outside the areas that will remain as the permanent Project footprint during operation. **Table 4** summarizes the estimated impact for each proposed Project component for both construction (temporary) and operation (permanent). The Study Area, Project Area and proposed Project layout are shown on **Figures 1–3 and in Appendices A and B**. The impact assumptions are shown on **Figure 5**.

**Table 3. Proposed Project Impact Assumptions**

| Proposed Project Component | Construction Disturbance | Temporary Construction Disturbance to be Reclaimed | Permanent Disturbance (Operation) |
|---|---|---|---|
| Wind Turbines a/ | 4.5 acres per turbine | 4.3 acres per turbine | 0.2 acres per turbine |
| Access Roads b/ | 50 feet wide per linear foot of road | 34 feet wide per linear foot of road | 16 feet wide per linear foot of road |
| Collection Lines c/ | 50 feet wide per linear foot | 50 feet wide per linear foot minus 12 feet x 8 feet for each junction box | 12 feet x 8 feet for each junction box |
| Meteorological Evaluation Towers d/ | 1.25 acres per tower | 1.25 acres per tower | 5 sq. feet per tower |
| Temporary Crane Paths | 80 feet wide per linear foot | 80 feet wide per linear foot | 0 acres |

a/ Construction impacts assumed a 250-foot construction radius around the turbine, which equates to approximately 4.5 acres per turbine. Impacts during operation account for a 40-foot x 100-foot gravel pad with a 15-foot buffer, or 0.2 acres per turbine.

b/ Easement width necessary for construction based on turbine types. Temporary and permanent impacts represent a conservative estimate of disturbance. Roads required to support crane access to turbines during operation will remain up to 34 feet wide; other access roads may be built at 16 feet or reduced later to 16 feet. Access road impacts also assume all proposed roads are new access roads and do not consider improvements to existing roads separately.

c/ Where collection lines run parallel to access roads, the respective impact buffers generally do not overlap.

d/ Area of impact is 1.25 acres per guyed tower during installation. Once installed, each tower has a 1 square-foot base plate and four 1 square-foot anchor points, or 5 square feet per tower.

**Table 4. Proposed Project Impacts**

| Proposed Project Component | Construction Disturbance (acres) | Temporary Construction Disturbance to be Reclaimed (acres) | Permanent Disturbance (Operation) (acres) |
|---|---|---|---|
| Wind Turbines a/ (72 turbines, not 10 alternates) | 324 | 310 | 14 |
| Access Roads b/ | 186 | 126 | 60 |
| Collection Lines c/ | 269 | 269 | <0.1 (2,304 sq. ft.) |
| Meteorological Evaluation Towers d/ | 6 | 6 | <0.1 (5 sq. ft.) |
| Temporary Crane Paths e/ | 126 | 126 | 0 |
| **Total** | 911 | 837 | 74 |

a/ Assumes 72 turbines x 4.5 acres of ground disturbance during construction, 0.2 acre/turbine of that remaining as permanent. The 10 alternate turbines were not included in the calculation; calculations for the associated roads and collection lines included all roads and collection lines shown in the layout.

b/ Assumes a 50-foot wide easement for roads during construction, 16 feet of that remaining during operation. Assumes total of approximately 35.8 linear miles of service roads. The overlapping area for turbines were excluded from the road impact calculations to avoid double counting the same footprint.

c/ The overlapping areas between the collection line corridor buffer and the access road corridor buffer were removed from impact calculation. Approximately 17 miles of collection lines run parallel to the access roads, with a 150-foot distance designed between the collection line and access road centerlines. The impacts also include approximately 64 miles of collection lines not collocated with access roads. Junction boxes will be located on the ground throughout the Study Area and will each require approximately 12 feet x 8 feet. Currently 24 junction boxes are anticipated to be required.

d/ Four temporary and 1 permanent METs x 1.25 acres = 6.25 acres disturbance during construction; 1 permanent MET, assuming guyed, equals 5 square feet of permanent disturbance.

e/ At the time of publication, temporary crane paths have not been identified. Access roads and county roads will be utilized for crane travel and new crane paths will be avoided if possible. The estimated impacts assume an 80-foot wide crane path for 13 miles that does not overlap with other infrastructure footprints.

### *1.3.2 Projected Output*

The proposed Project will have a nameplate (gross) capacity of approximately 150 MW. Assuming a net capacity factor of 52.4 percent, the projected average annual output is estimated at 688,536 MW hours per year. As with all wind projects, output is dependent upon wind resource, final design, site-specific features, and equipment.

## 1.4 Proposed Project Schedule

The commercial operation date is dependent upon permitting, equipment deliveries, and other development activities. Brady Wind II is targeting site construction to begin in mid-July 2016 provided all pre-construction permits and approvals have been obtained. Key schedule milestones include the items described below.

1. **Certificate of Site Compatibility**: Brady Wind II anticipates and has requested with this filing that the Certificate be issued in mid-July.

2. **Land Acquisition**: Brady Wind II obtained all necessary land easement agreements for the wind generation facility as of April 2016.

3. **Permits**: All wind turbines associated with the proposed Project will be located in Hettinger County. Brady Wind II received approval for its Conditional Use Permit to Hettinger County in April 2016. Stark County permitting is not required for the proposed Project, because only underground collection lines will be placed in Stark County. Brady Wind II is responsible for undertaking all required environmental studies, and will obtain all permits and licenses that are required following issuance of the Certificate. Completing permits is on the "critical path" for the proposed Project and will allow Brady Wind II to move forward with other commitments on the proposed Project.

4. **Equipment Procurement, Manufacture, and Delivery**: Brady Wind II has ordered all long-lead equipment for the proposed Project, including substation equipment, and transformers, and has a purchase order in place with GE for the wind turbines.

5. **Construction**: Construction is scheduled to begin in mid-July 2016. The engineering, procurement, and construction (EPC) contractor will be responsible for completing all project construction, including roads, wind turbine assembly, electrical, and communications work. Construction will take approximately 6 months to complete.

6. **Testing Operations**: Brady Wind II anticipates testing to begin in November 2016.

7. **Commercial Operation**: Brady Wind II anticipates commercial operation of the proposed Project to occur in December 2016.

8. **Expansions or Additions**: NEER is currently developing another wind energy facility adjacent to this Project in Stark County, the Brady Wind Energy Center. The Stark County Commission approved the Conditional Use Permit for the Brady Wind Energy Center on December 22, 2015. An application for that proposed project was submitted to the PSC in December 2015.

## 1.5 Project Ownership

Brady Wind II will own the entire proposed Project and, as a result, will manage the construction of all equipment and associated facilities related to the proposed Project. Brady Wind II will select a third-party EPC contractor to perform the majority of the engineering and construction of the wind farm. Brady Wind II will procure the turbine/tower equipment directly from a manufacturer.

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# 2. NEED FOR FACILITY

## 2.1 Need Analysis

In October 2015, Brady Wind II signed a 30-year power purchase agreement with Basin Electric Power Cooperative (Basin) for the proposed Project. Pursuant to this agreement, Basin will purchase all of the electrical output generated by the proposed Project. The proposed Project will help to increase the renewable portion of Basin's generating portfolio and help meet Basin members' energy needs while keeping member electricity rates low.

## 2.2 Alternatives

Feasible technology alternatives to wind include electricity generation using coal, natural gas, or biomass. None of these alternatives were considered because, as stated above in Section 2.1, Brady Wind II signed a 30-year power purchase agreement with Basin for the proposed wind energy project.

Although the proposed Project will include 72 planned turbines, an additional 10 alternate turbine locations have been included in the proposed Project layout to provide siting flexibility based on on-going environmental studies and landowner preferences.

## 2.3 10-Year Plan

As required by NDCC 49-22-04, Brady Wind II will file a 10-Year Plan with the PSC by July 1, 2016.

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# 3. SITE SELECTION CRITERIA

Brady Wind II has evaluated the proposed Project Area to determine the best locations for up to 72 wind turbines. Siting turbines is a process through which input from several different entities is considered. The 27,264-acre (41-square-mile) Study Area was identified as an optimal site from wind resource, transmission, landowner participation, economic, and environmental perspectives. An additional 10 alternate turbine locations have been included in the proposed Project layout on participating land within the proposed Project Area to provide siting flexibility based on issues that may be encountered during construction, however, only up to 72 wind turbines will be constructed.

Brady Wind II has secured voluntary wind option agreements with landowners and identified preliminary turbine locations based on site inspection, topographic maps, known environmentally sensitive areas, review of North Dakota's power plant siting exclusion and avoidance areas, review of Hettinger County, Stark County, and state wind siting requirements, and communications with local, state, and federal agencies. NEER has used this siting process in developing recent wind turbine projects, including 11 projects in North Dakota. Through this process, NEER addresses environmental issues that commonly arise during project development and works within the parameters of State rules. North Dakota has several site selection criteria that are considered by the PSC to determine suitability of the site. Brady Wind II has reviewed the criteria in Chapter 69-06-08 and has considered these criteria in the proposed Project design. These criteria are discussed in this section.

## 3.1 Exclusion Areas

In accordance with NDAC Section 69-06-08-01(1) and (2), the geographical areas listed in **Table 5** shall be excluded in the consideration of a site for an energy conversion facility. The area of exclusion shall include a buffer zone of a reasonable width to protect the integrity of the area. Exclusion areas are mapped for the Study Area on **Figure 6**.

## 3.2 Avoidance Areas

In accordance with NDAC Section 69-06-08-01(3) and (4), the geographical areas listed in **Table 6** shall not be approved as a site for an energy conversion facility unless the applicant shows that, under the circumstances, there is no reasonable alternative. In determining whether an avoidance area should be designated for a facility, the PSC may consider, among other things: the proposed management of adverse impacts; the orderly siting of facilities; system reliability and integrity; the efficient use of resources; and alternative sites. Avoidance areas are also mapped for the Study Area on **Figure 6**.

**Table 5. Exclusion Areas**

| Exclusion Area | Present within Study Area? | Description | Section Addressed |
|---|---|---|---|
| Designated or registered national areas: parks; memorial parks; historic sites and landmarks; natural landmarks; historic districts; monuments; wilderness areas; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; and grasslands. | None | N/A | 7.7, 7.8, 7.17 |
| Designated or registered state areas: parks; forests; forest management lands; historic sites; monuments; historical markers; archaeological sites; grasslands; wild, scenic, or recreational rivers; game refuges; game management areas; management areas; and nature preserves. | Present | An archaeological survey has been completed; archaeological and architectural resources have been identified through a Class I Literature Search, and a Class III Cultural Resources Inventory has been completed for the proposed construction footprint. Sites are not shown on **Figure 6** due to confidentiality. | 7.7, 7.8, 7.9, 7.15, 7.17, **Figures 6 and 10** |
| County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands. | None | N/A | 7.8, 7.17 |
| Prime farmland and unique farmland, as defined by the land inventory and monitoring division of the soil conservation service, United States department of agriculture, in 7 C.F.R. part 657; provided, however, that if the Commission finds that the prime farmland and unique farmland that will be removed from use for the life of the facility is of such small acreage as to be of negligible impact on agricultural productions, such exclusion shall not apply. | Present | The Study Area contains 459 acres (approximately 2 percent) of prime farmland soils. Prime farmland has been avoided to the extent practical. Permanent impacts to prime farmland soils from turbine placement and access roads are expected to be up to 49 acres and 0.2 acres, respectively, which is less than 1 percent of the Study Area. | 7.9, 7.10, 7.17, **Figure 14** |
| Irrigated land | None | N/A | 7.9, 7.17 |
| Areas critical to threatened or endangered animal or plant species | None | The Study Area is outside the whooping crane migration corridor; there is no designated critical habitat for any federally protected species in the Study Area. | 7.16, 7.17 |
| Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged. | None | N/A | 7.13, 7.14, 7.15, 7.16, 7.17 |
| Areas within 1,200 feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility. | None | N/A | 7.3, 7.17 |

**Table 5. Exclusion Areas**

| Exclusion Area | Present within Study Area? | Description | Section Addressed |
|---|---|---|---|
| Wind-energy specific exclusion areas | N/A | The proposed Project complies with the following exclusion areas:<br>1.1 x height of turbine from interstate and state road rights-of-way<br>1.1 x height of turbine plus 75 feet from centerline of county or maintained township roadways<br>1.1 x height of turbine from railroad right-of-way<br>1.1 x height from 115kV or higher transmission lines<br>1.1 x height from property line of non-participating landowners | 4.1.1 |

**Table 6. Avoidance Areas**

| Avoidance Areas | Present within Study Area? | Description and Proposed Buffer | Section Addressed |
|---|---|---|---|
| Historical resources which are not designated as exclusion areas | Present | Historic farmsteads and cemeteries are present within two miles of the proposed Project turbines. Brady Wind II will avoid directly impacting all historic resources. | 7.7, 7.17 |
| Areas within the city limits of a city or the boundaries of a military installation | None | N/A | 7.3, 7.17, Figures 1–3 |
| Areas within known floodplains as defined by the geographical boundaries of the 100-year flood | Present | Approximately 1 percent of the Study Area is within the 100-year floodplain. These areas occur primarily within creek beds and will be avoided or permitted as required by Hettinger County. | 7.12, 7.17, Figure 15 |
| Areas that are geologically unstable | None | N/A | 7.11, 7.17 |
| Woodlands and wetlands | Present | Permanent impacts to jurisdictional wetlands will be avoided and minimized as practicable. Few woodland impacts are anticipated, and all trees that are removed will be replaced at a 2 to 1 ratio as required by the PSC. | 7.13, 7.14, 7.17, Figures 10 and 15 |
| Areas of recreational significance which are not designated as exclusion areas | Present | North Dakota Department of Trust Lands (School Trust Lands) occur within the Study Area and are open to walk-in hunting unless otherwise posted with official State Land Department signage. If Brady Wind II pursues an agreement for development of any Project facilities on this parcel, there would be no impact to recreation on these lands once construction is complete. | 7.8, 7.17, Figure12 |

**Table 6. Avoidance Areas**

| Avoidance Areas | Present within Study Area? | Description and Proposed Buffer | Section Addressed |
|---|---|---|---|
| Geographic area where, due to operation of the facility, the sound levels within 100 feet of an inhabited residence or a community building would exceed 50 dBA. | None | Noise modeling results indicated that received sound levels are all below 50 dBA within 100 feet of an inhabited residence. | 7.6.2, 7.17 |

## 3.3 Selection Criteria

In accordance with NDAC Section 69-06-08-01(5), a site shall be approved in an area only when it is demonstrated to the PSC by the applicant that any significant adverse effects resulting from the location, construction, and operation of the facility in that area, as they relate to the criteria listed in **Table 7**, will be at an acceptable minimum, or that those effects will be managed and maintained at an acceptable minimum.

**Table 7. Selection Criteria**

| Selection Criteria | Potential Adverse Effects | Section Addressed |
|---|---|---|
| **The impact upon agriculture:** | | |
| Agricultural production | Up to 911 acres of land would be temporarily disturbed during construction for turbine installation, road construction, collection line trenching, temporary MET installation, and temporary crane paths. Approximately 92 percent of the area that is temporarily disturbed would be reclaimed, and approximately 74 acres would have permanent disturbance because of placement of wind turbines, permanent access roads, junction boxes, and the permanent MET. These impacts represent a minor portion of the land area available for agricultural production. Landowner agreements include compensation for crop damage, if any, during surveys and construction. As a result, the proposed Project would not result in significant impacts to agricultural production. | 1.3.1, 7.3, 7.9, 7.17 |
| Family farms and ranches | The proposed Project will comply with state, county, and other voluntary setbacks. Although some land area would be converted to wind turbine foundations and pads and access roads, wind lease payments to farmers would provide a supplemental source of income. As stated above, landowner agreements also include compensation for crop damage, if any, during surveys and construction. | 4.1.1, 7.2, 7.3, 7.10, 7.17, **Table 9, Figure 5** |
| Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation | Participating landowners have not expressed concerns related to economically suitable irrigation on their land. Currently no irrigation is occurring within the Study Area. | 7.9, 7.10, 7.17, **Figures 14 and 15** |
| Surface drainage patterns and ground water flow patterns | A wetlands and waters survey was completed in spring 2016. Project infrastructure will be built to avoid impacts to surface waters to the extent practicable, and will be designed in such a manner that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. Temporarily disturbed areas will be returned to their original contours. | 7.11, 7.12, 7.13, 7.17, **Figure 15** |

**Table 7. Selection Criteria**

| Selection Criteria | Potential Adverse Effects | Section Addressed |
|---|---|---|
| The agricultural quality of the cropland | Minimal impacts to the agricultural quality of the cropland are anticipated. Landowner agreements include compensation for crop damage, if any, during surveys and construction. If compaction of soils occurs during construction, Brady Wind II will work with the landowners to alleviate the compaction. | 7.9, 7.10, **Figure 14** |
| **The impact upon the availability and adequacy of:** | | |
| Law enforcement | No adverse impacts to law enforcement are anticipated. | 7.4, 7.17 |
| School systems and education programs | No adverse impacts to school systems and education programs are anticipated. The Project will provide revenue for the New England School District. | 7.4, 7.17 |
| Governmental services and facilities | No adverse impacts to governmental services and facilities are anticipated. | 7.4, 7.17 |
| General and mental health care facilities | No adverse impacts to general and mental health care facilities are anticipated. | 7.4, 7.17 |
| Recreational programs and facilities | No recreational programs or facilities will be directly affected by the Project. Recreational impacts would be auditory and visual in nature and limited to individuals using public or private property in and near the Study Area for hunting, fishing, or nature observation. | 7.4, 7.8, 7.17 |
| Transportation facilities and networks | An increase in vehicle trips per day is anticipated for the duration construction, but is expected to be temporary and not significant. During facility operation, no significant impacts are anticipated. | 7.4, 7.17, **Figure 11** |
| Retail service facilities | No adverse impacts are anticipated. Local services such as hotels, restaurants, and convenience stores are likely to experience an increase in business during construction. | 7.2, 7.4, 7.17 |
| Utility services | The proposed Project will utilize station service from Slope Electric Cooperative, Inc., which will suggest appropriate configurations for the electrical system, and Brady Wind II will abide by the recommendations to prevent impacts to the transmission system. | 1.0, 2.0, 6.0, 7.4, 7.17 |
| **The impact upon:** | | |
| Local institutions | No adverse impacts are anticipated. | 7.4, 7.17 |
| Noise sensitive land uses | The noise sensitive land uses within the Study Area are the residences near turbine locations. The sound impacts from the proposed Project turbines will be within the PSC limit at inhabited residences. | 7.6, 7.17 |
| Rural residences and businesses | The proposed Project will comply with state and local setbacks. | 4.1.1, 7.2, 7.3, 7.17, **Figure 5** |
| Aquifers | Based on the small amount of increased impervious surface area that will be created by proposed Project components relative to the separation of these components and the size of the entire Study Area, the proposed Project would likely have minimal impacts to regional groundwater recharge. | 7.11, 7.17 |
| **The impact upon:** | | |
| Human health and safety | No impacts to human health and safety are anticipated based on the implementation of the mitigative measures discussed in Section 7.5.3 and maintenance schedules. | 6.3, 7.5, 7.17 |

**Table 7. Selection Criteria**

| Selection Criteria | Potential Adverse Effects | Section Addressed |
|---|---|---|
| Animal health and safety | No impacts to livestock are anticipated from construction or operation of the facility. Based on avian surveys performed to date, mean raptor use was generally low compared to other wind facilities. For other avian species, fatalities from the proposed Project, if any, are not anticipated to have population-level effects. Brady Wind II will implement measures to avoid and minimize effects to wildlife by siting facilities away from active raptor nests and wetlands to the extent practicable. A BBCS will be prepared for the proposed Project. In addition, Brady Wind II will implement a post-construction WRRS and 1 year of post-construction bird and bat mortality monitoring for the proposed Project to monitor avian/turbine interaction. | 7.15, 7.16, 7.17 |
| Plant life | The proposed Project will result in up to 74 acres of permanent impact. Land where the turbines will be sited is primarily undeveloped pasture/hay, cropland, and grassland. Areas of highest quality native prairie were avoided. Trees and shrubs will be replaced consistent with PSC requirements. | 7.14, 7.17, **Figure 10** |
| Temporary and permanent housing | Existing temporary housing, such as hotels, will be utilized during construction. No adverse impacts are anticipated. | 7.2, 7.17 |
| Temporary and permanent skilled and unskilled labor | No adverse effects are anticipated. Local contractors employed for construction would benefit the local economy. | 7.2, 7.17 |
| The cumulative effect of the location of the facility in relation to existing and planned facilities and other industrial development | Wind energy development is anticipated to have a positive cumulative impact on air quality and minimal impacts to geology, soils, water, noise, safety and health issues, and cultural resources. Socioeconomic impacts are anticipated to be positive, as the rural economy and energy production is diversified. Wind energy development removes less total land from agricultural use than other forms of energy generation development. | 7.17, 10.11 |

## 3.4 Policy Criteria

In accordance with NDAC Section 69-06-08-01(6), the PSC may give preference to an applicant that will maximize benefits that result from the adoption of the policies and practices listed in **Table 8**, and may require the adoption of such policies and practices as appropriate.

**Table 8. Policy Criteria**

| Policy Criteria | Suitable Policy or Practice of Applicant | Section Addressed |
|---|---|---|
| Recycling of the conversion byproducts and effluents | Not applicable. | N/A |
| Energy conservation through location, process, and design | Brady Wind II is developing the site to maximize energy output and will develop a site layout that optimizes wind resources while minimizing the impact on land resources and any potentially sensitive areas. Developing the Project adjacent to another proposed wind energy facility eliminates the need for a new transmission line, substation, O&M facility, and temporary laydown areas. | 4.1, 4.2 |

**Table 8. Policy Criteria**

| Policy Criteria | Suitable Policy or Practice of Applicant | Section Addressed |
|---|---|---|
| Training and utilization of available labor in this state for the general and specialized skills required | Brady Wind II will use local labor to the extent practicable. | 7.2 |
| Use of a primary energy source or raw material located within the state | The energy generated at the site will utilize the wind resources of the State of North Dakota. | 5.2, 5.3 |
| Non-relocation of residents | No residents will be required to relocate as a result of the proposed Project. | 7.2.2 |
| The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management | The proposed Project will not interfere with adjacent land uses. It is not anticipated that areas adjacent would be dedicated to recreation, agriculture, or wildlife management, although much of the Study Area is already used for agriculture and hunting areas exist within the Study Area, and these uses could continue once the Project is constructed. | 7.3, 7.8, 7.9, 7.15 |
| Economies of construction and operation | Brady Wind II will utilize local contractors to the extent practicable. The proposed Project will be located adjacent to the southern boundary of the proposed Brady Wind Energy Center, and will utilize the temporary laydown and turbine storage areas identified for the Brady Wind Energy Center during construction. The O&M building proposed for the Brady Wind Energy Center will be shared with the proposed Project. Substation equipment to support the proposed Project will be located within the same 8-acre parcel as the Brady Wind Energy Center. The overhead transmission line proposed to serve the Brady Wind Energy Center will also serve the proposed Project. | 1.0, 1.2, 1.3, 7.2 |
| Secondary uses of appropriate associated facilities for recreation and enhancement of wildlife | None. | N/A |
| Use of citizen coordinating committees | Brady Wind II has coordinated with County officials on the location of the proposed Project and is consulting with participating landowners on the proposed Project. | 8.0 |
| A commitment of a portion of the energy produced for use in this state | Energy transmitted will be injected into the Belfield to Rhame Transmission Line and will be delivered to Basin's grid system. Basin's service area includes North Dakota. | 1.0, 4.0 |
| Labor relations | Brady Wind II will utilize local contractors to the extent practicable. | 6.4, 7.2 |
| The coordination of facilities | Existing facilities and facility corridors were considered in the location of the wind farm and associated facilities. The proposed Project will be located adjacent to the proposed Brady Wind Energy Center, and will utilize the temporary laydown and turbine storage areas identified for the Brady Wind Energy Center during construction. The O&M building proposed for the Brady Wind Energy Center will be with the proposed Project. Substation equipment to support the proposed Project will be located within the same 8-acre parcel as the Brady Wind Energy Center substation. The overhead transmission line proposed to serve the Brady Wind Energy Center will also serve the Project. | 1.0, 1.2, 1.3, 1.4, 3.0, 3.6 |

**Table 8. Policy Criteria**

| Policy Criteria | Suitable Policy or Practice of Applicant | Section Addressed |
|---|---|---|
| Monitoring of impacts | Brady Wind II and the EPC contractor will employ best management practices during construction to monitor soil impacts and segregate topsoil. A stormwater prevention plan will be prepared for the proposed Project. Brady Wind will conduct 1 year of post-construction bat and bird fatality monitoring and rely on the WRRS system for the life of Project operations. | 7.10, 7.11, 7.12, 7.15, 7.16 |

## 3.5 Design and Construction Limitations

Key design and construction limitations when building any wind farm are wind resources, landowner easements, regulatory setbacks (local and state), and available transmission. The wind resource is essential to selecting and designing a wind farm. Brady Wind II has conducted an analysis of the Study Area to ensure that the site has ample wind energy to generate revenue for the wind farm. Easements allowing construction of turbine towers are also critical to the proposed Project. Brady Wind II has negotiated land agreements with landowners necessary to develop the proposed Project. The proposed Project complies with all applicable county setbacks and PSC exclusion areas (see **Section 4.1.1**).

## 3.6 Economic Considerations

Economics were considered when selecting a location for the proposed Project. As discussed above, it is important to select a site with a wind resource capable of generating energy. The Study Area takes advantage of the wind resource in the area. Information on the wind resource at the site is discussed in **Sections 5.2 and 5.3**.

One of the most important economic considerations related to the proposed Project is the need to qualify for the Federal Production Tax Credit (PTC). The PTC is an income tax credit of 2.3 cents/kilowatt-hour allowed for the production of electricity from utility-scale wind turbines. This incentive was created under the Energy Policy Act of 1992, and has been renewed and expanded many times, most recently in the 2016 spending package passed by Congress on December 18, 2015. The wind energy PTC will now be extended through 2016, and then continue at a decreased value through 2019. Wind projects qualify for the PTC if construction is started before the end of 2019 (AWEA 2015a).

# 4. GENERAL DESCRIPTION OF THE PROPOSED FACILITY

## 4.1 Wind Power Technology

As the wind passes over the blades of a wind turbine, it creates lift and causes the rotor to turn. The rotor is connected by a hub and main shaft to a system of gears, which are connected to a generator. Exact turbine models are subject to change to ensure selection of a turbine that is both cost effective and optimizes land and wind resources. Brady Wind II is proposing to install up to 72 wind turbines. The current layout includes 65 GE 2.1 MW and seven GE 1.79 MW Xle turbines. Brady Wind II is seeking flexibility from the PSC to select the most appropriate technology for the proposed Project at the time of construction to ensure optimization of wind and land resources and cost efficiency.

The GE 2.1 MW utility-grade wind turbine has a nominal nameplate rating of 2.1 MW. Each turbine will have an 80-meter (262 feet) hub height and a 116-meter (381 feet) rotor diameter (**Figure 7**). The GE 1.79 MW Xle turbine has a nominal nameplate rating of 1.79 MW, an 80-meter hub height, and a 100-meter (328 feet) rotor diameter. Both turbines begin operation in wind speeds of 3.5 meters per second (m/s), or 7.8 miles per hour (mph), and are designed to operate in wind speeds of up to 25 m/s (56 mph). The 2.1 MW turbine is designed to reach its rated capacity at a wind speed of 11.0/s (24.6 mph), whereas the 1.79 MW turbine is designed to reach its rated capacity at a wind speed of 11.5 m/s (25.7 mph).

Each tower will be secured by a concrete foundation that can vary in design depending on soil conditions. A control panel inside the base of each turbine tower houses communication and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates with the turbine's control system to signal when sufficient winds are present for operation. Turbines feature variable-speed control and independent blade pitch to ensure aerodynamic efficiency.

The electricity generated by each turbine is brought to a pad-mounted transformer where the voltage is raised (stepped up) to power collection line voltage of 34.5 kilovolts (kV). The electricity is collected by a system of underground power collection lines (**Figure 8**). Both power collection lines and communication cables will be buried on private property within the proposed Project Area.

Each wind turbine will be accessible via all-weather, aggregate-surfaced roads between 16 and 34 feet in width that will connect with public roads. At the point where the access and public roads meet, the communication and power lines will continue as underground feeder lines. The feeder system distributes power to the Brady Wind Energy Center substation facilities. **Figure 8** is a diagram of the path of energy from a wind farm to energy users and **Figure 9** shows a typical wind farm facility layout. The power will be transformed to 230kV at substation facilities that will be located within the proposed substation for the Brady Wind Energy Center, on Section 25 of Township 137 North, Range 96 West. The Brady Wind Energy Center substation

and associated transmission line are being permitted separately in applications pending before the PSC. The proposed Project will not cause additional impacts outside the footprint for these facilities as identified in the separate permit applications.

### *4.1.1 Wind Energy Center Layout*

Brady Wind II is developing a wind farm layout that optimizes the wind resource while minimizing the impact on land resources and any potentially sensitive areas. Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind increases at the third power of the wind speed. In other words, a doubling of the wind speed would increase the available energy by a factor of 8. Analysis of wind direction data suggests that the optimal turbine string alignments are generally from southwest to northeast. Design of the turbine array and collection system will minimize energy loss due to wind turbine wakes (e.g., adverse impacts of one turbine on an adjacent turbine) and turbulence, and electrical line losses.

The setbacks used in designing the proposed Project are the most restrictive of those required by Hettinger County, Stark County,[1] the PSC, GE, or NEER's internal standards. The proposed Project also complies with or exceeds the following wind energy-specific exclusion areas provided in Section 69-06-08-01 (2):

- 1.1 x height of turbine from interstate and state road rights-of-way
- 1.1 x height of turbine plus 75 feet from centerline of county or maintained township roadways
- 1.1 x height of turbine from railroad right-of-way
- 1.1 x height from 115kV or higher transmission lines
- 1.1 x height from property line of non-participating landowners

**Table 9** lists the setbacks utilized in designing the proposed Project layout. The distances are based on the GE 2.1 MW turbine, which has a larger rotor diameter than the GE 1.79 MW Xle turbine model, and has a total turbine height (from the bottom of the turbine tower to the top of the blade when vertical) of 453 feet. Hettinger County land use regulations specify that the proposed Project turbines must not be located within 1,320 feet of occupied dwellings or commercial buildings or publicly-used structures or facilities, or within 200 feet of public roads or above-ground communication or electrical lines. Hettinger County also specifies a setback requirement from the wind energy facility perimeter. Brady Wind II will comply with all applicable county setbacks.

[1] Although no turbines will be located in Stark County and Stark County setbacks therefore do not apply to the Project, because the Project is adjacent to Stark County, Brady Wind II voluntarily adopted Stark County's more restrictive 2,000-foot setback from occupied structures.

**Table 9. Setback Distances for Wind Turbines**

| Setback Type | Distance |
|---|---|
| **PSC Exclusion Areas** | |
| Interstate and state road rights-of-way | 1.1 x turbine height (498.3 feet) |
| Centerline of county or maintained township roadways | 1.1 x turbine height plus 75 feet (573.3 feet) |
| Railroad rights-of-way | 1.1 x turbine height (498.3 feet) |
| 115kV or higher transmission lines | 1.1 x turbine height (498.3 feet) |
| Property line of non-participating landowners | 1.1 x turbine height (498.3 feet) |
| **Hettinger County Setbacks** | |
| Occupied dwellings, commercial buildings, or publicly-used structure or facilities | 1,320 feet (although Stark County's more restrictive 2,000-foot setback was applied to the Project because it is adjacent to Stark County) |
| Public roads and above-ground communication and electrical lines | 200 feet (determined at the center of the existing right-of-way) |
| Wind Energy Facility Perimeter | 2.5 x the rotor diameter of the wind turbine (953 feet for the 2.1 MW turbines and 820 feet for the 1.79 MW turbines) |
| **Other** | |
| GE-provided setback from barns, abandoned houses, and roads (more conservative than PSC setback) | 1.5 x turbine height (679.5 feet) |

## 4.2 Associated Facilities

In addition to turbines, the proposed Project includes electrical collection lines, access roads, and METs. The electricity generated by each turbine is stepped up to a power collection line voltage of 34.5kV via a pad-mounted transformer at the base of each turbine. The electricity generated at each turbine will be collected by a system of underground power collection lines and brought to the substation. Four temporary METs have been installed for the proposed Project, and one permanent Supervisory Control and Data Acquisitions (SCADA) MET will be installed. The locations of the four temporary METs and one permanent SCADA MET are shown in **Figure 3**.

Equipment will be added within the proposed 8-acre footprint of the proposed Brady Wind Energy Center's substation to accommodate Project needs. The O&M facility and temporary laydown and turbine storage areas proposed for the Brady Wind Energy Center will also be used for the proposed Project.

## 4.3 Land Rights

Brady Wind II has negotiated easements in Hettinger and Stark counties for the proposed 150 MW Project. Land acquisition was completed in April 2016. Land rights will encompass the proposed wind farm and all associated facilities, including but not limited to wind and buffer easements, wind turbines, access roads, underground collection lines, and METs.

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# 5. PROPOSED SITE

## 5.1 Identification of Study Area

Brady Wind II selected the Study Area based on its wind resource, location adjacent to another planned wind farm and transmission line, presence of willing landowners, land-use patterns, and low presence of environmentally sensitive features. The Study Area boundary encompasses an area of 27,264 (43 square miles). However, the land occupied by turbines and other wind farm infrastructure during operation will be less than 1 percent of the Study Area and also less than 1 percent of the Project Area. It is anticipated that the area of permanent land use during operation would be up to 74 acres for the turbines, aggregate-surfaced access or service roads up to 16 feet wide, electrical junction boxes, and one permanent MET. Total temporary land disturbance during construction for the proposed Project is expected to be up to approximately 911 acres, including temporary disturbance due to turbine installation, road construction of roads up to 34 feet wide, collection line trenching, four temporary METs, and temporary crane paths. See **Table 4** in **Section 1.3.1** and **Section 7** for a detailed description of the Study Area impacts. **Figure 3** shows the proposed turbine locations, which are subject to shifts during micrositing to avoid sensitive resources.

## 5.2 Wind Resource Areas–General

The U.S. Department of Energy's Wind Program and the National Renewable Energy Laboratory published a wind resource map for the state of North Dakota. This resource map shows wind speed estimates at 50 meters above the ground and depicts the resource that could be used for utility-scale wind development. As a renewable resource, wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, at 50 meters, wind power Class 4 or higher can be useful for generating wind power with large turbines. The map indicates that North Dakota has wind resources consistent with utility-scale production. Good-to-excellent wind resource areas are located throughout North Dakota; winds within the proposed Project vicinity generally consist of Class 4 and 5 winds (USDOE 2014).

## 5.3 Wind Characteristics in Study Area

Brady Wind II has utilized wind data from METs in the vicinity of the Study Area to characterize the wind resource. Brady Wind II has secured information from other long-term references to aid in correlating the wind data on site, including 30-year re-analysis data processed by the National Aeronautics and Space Administration (NASA) and processed by NEER. Industry standard software, such as Windographer, Openwind, WRF, and ArcGIS as well as internal NEER tools were used to analyze the available wind data and make corrections for site effects (topography, surface roughness, and obstacles) to produce a site independent characterization of the local wind climate. The resulting local wind climate was applied in conjunction with the Study Area effects to predict the spatial wind variations in the Study Area. Various site layouts and wind turbine generator parameters can be tested to predict energy production and array efficiency to optimize the site layout and turbine selection. Project site data have been compared to regional

wind measurements using a parallel time period. Based on analysis by NEER's internal wind resource group, there is good correlation between the long-term wind measurements and the short-term Project-specific wind measurements.

# 6. ENGINEERING AND OPERATIONAL DESIGN ANALYSIS

This section provides a summary description of the proposed Project, which includes a description of the proposed Project layout, turbines, electrical system, and associated facilities. Additional design components addressed in this section are proposed Project construction, schedule, operation, and decommissioning of the site. There are other turbines that are feasible choices for the Project that are available from various manufacturers and Brady Wind II wishes to reserve the right to select alternative turbines representative of the 2.1 MW and 1.79 MW Xle class of wind turbines. Turbine type may affect the number and configuration of the turbine array. Details for the GE 2.1 MW and 1.79 MW Xle turbines are presented below.

## 6.1 Proposed Project Layout and Associated Facilities

The proposed Project will consist of an array of wind turbines and transformers. The turbines will be interconnected by underground 34.5kV power collection cables and co-located fiber optic communication cables within the wind farm.

Land will be graded on site for the turbine pads. Drainage systems, access roads, storage areas, and construction laydown/turbine storage areas will be installed as necessary to fully accommodate all aspects of construction, operation, and maintenance.

Electrical system design and interconnection details will be determined as a result of studies and discussions with Basin. The proposed Project includes a computer-controlled communications system, the Supervisory Control and Data Acquisitions System (SCADA), which permits automatic independent operation and remote supervision, thus allowing the simultaneous control of many wind turbines. Brady Wind II will be responsible for O&M for the life of the proposed Project.

## 6.2 Description of Wind Turbines

The proposed Project is currently designed to include a total of 72 turbines; 65 GE 2.1 MW and 7 GE 1.79 MW Xle turbines. Brady Wind II is seeking flexibility from the PSC to select the most appropriate technology for the proposed Project at the time of construction to ensure optimization of wind and land resources and cost efficiency.

### *6.2.1 Turbine*

Both turbine models will have a hub height of 262 feet (80 meters); the 2.1 MW turbines will measure 453 feet from the base of the tower to the tip of the upright blade (**Figure 7**), and the 1.79 MW turbines will measure 427 feet.

The turbines have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive train design, where all nacelle components are joined on common structures to improve durability.

The turbines have SCADA communication technology to allow control and monitoring of the wind farm. The SCADA communications system permits automatic, independent operation and remote supervision, thus allowing the simultaneous control of many wind turbines. Operations, maintenance, and service for the proposed Project will be structured so as to provide for timely and efficient operations. The computerized data network will provide detailed operating and performance information for each wind turbine. Brady Wind II will maintain a computer program and database for tracking each wind turbine's operational history.

Other specifications of the turbines include:

- Rotor blade pitch regulation
- Gearbox with three-stage planetary/helical system
- Double fed three-phase asynchronous generator and an asynchronous 4-pole generator with a wound rotor
- A braking system for each blade (three self-contained systems) and a fail-safe disc brake
- Yaw systems are electromechanically driven

### *6.2.2 Rotor*

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. The 2.1 MW turbines have a 116-meter (381 feet) rotor diameter, with a swept area of 10,568 square meters (113,753 square feet) and a rotor speed between 8 to 15.7 revolutions per minute (rpm). The 1.79 MW turbines have a 100-meter (328 feet) rotor diameter, with a swept area of 5,346 square meters (57,544 square feet) and a rotor speed of 16.8 rpm.

### *6.2.3 Turbine Tower*

The turbine towers will all be conical tubular steel with a hub height of up to 80 meters (262 feet). The portion of the foundation that is above ground is 15 to 16 feet wide at the base of the tower. The turbine towers, on which the nacelle is mounted, consist of three to four sections manufactured from certified steel plates. All welds are made by automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower.

### *6.2.4 Lightning Protection*

Each turbine will be grounded and shielded to protect against lightning. The grounding system will be installed during foundation work, must be designed for local soil conditions, and must be in accordance with local utility or code requirements. Lightning receptors are placed in each rotor blade and in the turbine tower. The electrical components are also protected.

## 6.3 Description of Electrical System

At the base of each turbine, a step-up transformer will be installed to step up the voltage to the power collection line voltage of 34.5kV. The power from these transformers will be run through an underground collection system consisting of various sized buried cables that are generally located alongside the proposed Project access roads. Collection lines will be buried 42 to 48 inches deep and will not affect farming equipment. At the point where the access and public roads meet, the collection system will continue as underground lines. All the collection system cables will terminate at the proposed Brady Wind Energy Center substation, where additional substation equipment will be installed to accommodate the proposed Project. The substation will include power transformers to step up the voltage from 34.5kV to 230kV and provides the necessary protection and control for interconnection to the transmission grid. The Brady Wind Energy Center substation is proposed to be located along 109th Avenue SW in the northwest quarter of Section 25 in Township 137 North, Range 96 West. The proposed Brady Wind Energy Center substation and transmission line are proposed in separate permit applications (case numbers PU-15-690 and PU-15-797, respectively) currently being reviewed by the PSC.

All utility protection and metering equipment will meet Brady Wind II and National Electrical Safety Code standards for parallel operations. The construction manager will ensure that proper interconnection protection is established.

## 6.4 Temporary Meteorological Evaluation Towers

Four temporary METs have been installed, which monitor and collect wind data (speed, direction, etc.) over a period of time up to a maximum of 5 ½ years, according to the terms of the agreement. This data will be used to validate Brady Wind II's previous desktop analysis of available wind data in order to determine if this area possesses a wind resource that will support development of a wind energy center and provide critical wind data required for project financing after construction. These four temporary METs are shown on **Figure 3**.

Each of the proposed towers is an NRG 60 meter XHD Tall-tower consisting of galvanized steel tube construction that will be guyed at six levels in four directions, and will stand approximately 197 feet in height. The tower sits on a metal baseplate and is powered with small mounted solar panels, therefore requires no foundation or outside utilities. Four sets of guy anchors are placed at 40 meters (131 feet), 45 meters (147 feet), and the outermost guy anchor at 50 meters (164 feet). Bird diverters have been installed on all guy wires to reduce collision risk. The tower is constructed on the ground and is tilted into its final position with a temporarily anchored winch.

Based on the height and location of the four temporary METs, none will require to be filed with the Federal Aviation Administration (FAA) or be artificially lit for nighttime visibility. Each of the towers will be painted orange and white and have orange marker balls placed on the guy wires to aid in daytime visibility. This marking methodology is consistent with recommendations from the FAA and National Transportation Safety Board.

## 6.5 SCADA Meteorological Evaluation Tower

One SCADA meteorological evaluation tower (SCADA MET) will be installed during the construction phase of the proposed Project and remain in place for the life of the proposed Project. The purpose of the SCADA MET is to monitor real time wind data during the operation of the Project to ensure it is generating electricity at expected levels. The location of the single proposed permanent SCADA MET is included in this application and shown on **Figure 3**.

The monopole tower will stand approximately 80 meters in height (approximately 262 feet). Based on the height and location of the SCADA MET, Brady Wind II is required to file with the FAA and it is anticipated to be artificially lit for nighttime visibility. The tower will also be painted orange and white and have orange marker balls placed on the guy wires to aid in daytime visibility.

## 6.6 Proposed Project Construction

Several activities must be completed prior to the proposed commercial operation date. The majority of the activity relates to equipment ordering lead-time, as well as design and construction of the facility. Below is a preliminary schedule of activities necessary to develop the proposed Project. Pre-construction, construction, and post-construction activities for the proposed Project include:

- Ordering of all necessary components including turbine towers, nacelles, blades, foundations, and transformers
- Final turbine micrositing
- Complete survey to microsite locations of structures and roadways
- Soil borings, testing, and analysis for proper foundation design and materials
- Complete construction of access roads, to be used for construction and maintenance
- Construction of underground feeder lines
- Design and construction of the proposed Project substation facilities (to be installed within the proposed Brady Wind Energy Center substation's 8-acre parcel)
- Installation of turbine tower foundations
- Installation of underground and aboveground junction boxes
- Turbine tower placement and wind turbine setting
- Acceptance testing of facility
- Commencement of commercial operation

Private turbine access roads will be built adjacent to the turbine towers, allowing access to the turbines during and after construction. Access roads will be typically 16 feet wide,[2] will have an aggregate surface as cover, and will be adequate to support the size and weight of maintenance vehicles. The specific turbine placement will determine the amount of private roadway that will be constructed for the proposed Project.

[2] Roads required to support crane access to turbines during operation would remain up to 34 feet wide; all other roads may be built at 16 feet wide or reduced later to 16 feet.

During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the site, as well as private vehicles used by construction personnel. Brady Wind II estimates that there would be approximately 50 additional trips per day in the area during peak construction periods. That volume would occur during the peak time when the majority of the road, foundation and turbine tower assembly is taking place. At the completion of each construction phase, this equipment will be removed from the site or reduced in number.

### *6.6.1 Construction Management*

An EPC contractor will be primarily responsible for the construction management of the proposed Project. The EPC contractor will use the services of local contractors, where possible, to assist in construction. The EPC contractor, in coordination with local contractors, will undertake the following activities:

- Securing building, electrical, grading, road, and utility permits
- Perform detailed civil, structural and electrical engineering
- Schedule execution of construction activities
- Forecast labor requirements and budgeting

The EPC contractor also serves as key contact and interface for subcontractor coordination. The EPC contractor will oversee the installation of communication and power collection lines as well as the substation modifications. The EPC contractor will also oversee the installation of roads, concrete foundations, turbine towers, and blades, as well as the coordination of materials receiving, inventory, and distribution. The Project will be constructed under the direct supervision of an on-site construction manager with the assistance of local contractors. The Project construction consists of the following tasks:

- Site development, including roads
- Foundation excavation
- Concrete foundations
- All electrical and communications installation
- Turbine tower assembly and machine erection
- System testing

The construction team will be on site to handle materials purchasing, construction, quality control, testing, and start-up. The EPC contractor will manage local subcontractors to complete all aspects of construction. Throughout the construction phase, ongoing coordination will occur between the proposed Project development and the construction teams. The on-site Project construction manager will help to coordinate all aspects of the proposed Project, including ongoing communication with local officials, citizens groups and landowners. Even before the proposed Project becomes fully operational, the O&M staff will be integrated into the construction phase of the proposed Project. The construction manager and the O&M staff manager will work together continuously to ensure a smooth transition from construction through wind farm commissioning and, finally, operations.

### *6.6.2 Foundation Design*

The wind turbines' freestanding 80-meter (262-foot) tubular towers will be connected by anchor bolts to an underground concrete foundation. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations. Foundations for similar sized turbines are generally octagonal, approximately 40 to 60 feet across at the base, and extend seven to ten feet below grade. The wind turbine foundation design will be prepared by a registered professional engineer licensed to practice in the State of North Dakota.

### *6.6.3 Civil Works*

Completion of the proposed Project will require various types of civil works and physical improvements to the land. These civil works may include the following:

- Improvement of existing public access roads in the Project Area
- Construction of roads adjacent to the wind turbine strings (turbine access roads) to allow construction and continued servicing of the wind turbines
- Clearing and grading for wind turbine tower foundation installations
- Installation of underground cabling for connecting the individual wind turbines
- Installation of an on-site feeder system for connecting wind turbine strings for delivery to the electricity collection/metering location
- Installation of any site fencing and security
- Restoration and revegetation of disturbed land when construction activities have been completed

Any improvements to existing public access roads would consist of re-grading and filling the surface to allow access in inclement weather. No asphalt or other paving is anticipated. Turbine access roads will be constructed along turbine strings or arrays. These roads will be sited in consultation with local landowners and completed in accordance with local building requirements where these roads intersect with public roads. Turbine access roads will be located to facilitate both construction (cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The roads will be 16 to 34 feet wide and will be covered with road base designed to allow passage under inclement weather conditions. The roads will consist of graded dirt and will be covered with an aggregate surface. Once construction has been completed, the roads will be re-graded, filled, and dressed as needed.

### *6.6.4 Commissioning*

The proposed Project will be commissioned after completion of the construction phase. The proposed Project will undergo detailed inspection and testing procedures prior to final turbine commissioning. Inspection and testing will occur for each component of the wind turbines, as well as the communication system, meteorological system, obstruction lighting, high voltage collection and feeder system, and the SCADA system.

### *6.6.5 Proposed Project Operation and Maintenance*

Brady Wind II will operate the wind energy facility for the life of the proposed Project. Approximately seven people will be employed on site to operate and maintain this Project. The O&M staff will have full responsibility for the facility to ensure O&M are conducted consistent with the applicable permits, prudent industry practice, and equipment manufacturer recommendations for the turbines.

In addition to the on-site O&M staff, NEER's Fleet Performance and Diagnostic Center (FPDC) will control, monitor, operate, and maintain the proposed Project remotely by means of a SCADA computer software program. The operation of the entire wind farm, including discrete settings for individual turbines, is managed by the onsite operations staff and remotely via the FPDC.

The SCADA system offers access to wind turbine generation or production data, availability, meteorological, and communications data, as well as alarms and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can also be viewed, and machine status can be changed. There is also a "snapshot" facility that collects frames of operating data to aid in diagnostics and troubleshooting of problems.

The primary functions of the SCADA system are to:

- Monitor wind farm status
- Allow for autonomous turbine operation
- Alert operations personnel to wind farm conditions requiring resolution
- Provide a user/operator interface for controlling and monitoring wind turbines
- Collect meteorological performance data from turbines
- Monitor field communications
- Provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel
- Collect wind turbine and wind farm material and labor resource information
- Provide information archive capabilities
- Provide inventory control capabilities
- Provide information reporting on a regular basis

**Maintenance Schedule**

Brady Wind II's on-site operations staff will be responsible for the maintenance of the proposed Project on a daily basis. This monitoring will be accompanied by visual inspections by the on-site operating staff. Several daily checks will be made in the first 3 months of commercial operation to verify that the proposed Project is operating within expected parameters. Once installed, the proposed Project service and maintenance is carefully planned and divided into the following intervals:

**A. First Service Inspection.** The first service inspection will take place 1 to 3 months after the turbines have been commissioned. At this inspection, particular attention is paid to tightening all bolts by 100 percent, a full greasing, and filtering of gear oil.

**B. Semiannual Service Inspection.** Regular service inspections commence 6 months after the first inspection. The semiannual inspection consists of lubrication and a safety test of the turbine.

**C. Annual Service Inspection.** The annual service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of every bolt assembly. If any bolts are found to be loose, all bolts in that assembly are tightened 100 percent and the finding is recorded.

**D. Two-Year Service Inspection.** The two-year service inspection consists of the annual inspection, plus checking and tightening of terminal connectors.

**E. Five-Year Service Inspection.** The five-year inspection consists of the annual inspection, an extensive inspection of the wind braking system, and checking and testing of oil and grease, balance check, and tightness of terminal connectors.

### *6.6.6 General Maintenance Duties*

O&M field duties include performing all scheduled and unscheduled maintenance, including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities and equipment, safety systems, controls, instruments, and machinery, including:

- Maintenance of the wind turbines and of the mechanical, electrical power, and communications system
- Performance of all routine inspections
- Maintenance of all oil levels and changing oil filters
- Maintenance of the control systems, all proposed Project structures, access roads, drainage systems and other facilities necessary for the Project operation
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the proposed Project
- Maintenance of all parts, price lists, and computer software
- Maintenance and operation of Project substation facilities (located within the Brady Wind Energy Center Substation being permitted as part of the Brady Wind Energy Center's application)
- Provision of all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts
- Cooperation with avian and other wildlife studies as may be required, to include reporting and monitoring
- Management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations

- Maintenance of appropriate levels of spare parts to maintain equipment. Order and maintain spare parts inventory
- Provision of all necessary equipment including industrial cranes for removal and reinstallation of turbines
- Hiring, training, and supervision of a work force necessary to meet the general maintenance requirements
- Implementation of appropriate security methods
- Remote monitoring on a daily basis

Brady Wind II affiliate NextEra Energy Operating Services will also remotely monitor the proposed Project on a daily basis.

## 6.7 Decommissioning and Restoration

Brady Wind II will develop a Decommissioning Plan in accordance with NDCC 49-02-27, NDAC 69-09-09, and Hettinger County Special Provisions 6.14.8 of the 2012 Land Use Regulations. Additionally, Brady Wind II has a contractual obligation to the landowners to remove the wind facilities, including foundations to a depth of three feet below ground, when the wind easement expires and to restore the area to the same physical condition that existed immediately before the construction of the turbines. Brady Wind II also reserves the right to explore alternatives regarding decommissioning at the end of the proposed Project's Certificate term. For example, retrofitting the turbines and power system with upgrades based on new technology may allow the wind farm to produce efficiently and successfully for many more years.

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# 7. ENVIRONMENTAL ANALYSIS

This section provides a description of the environmental conditions that exist within the Study Area. Consistent with the North Dakota Energy Conversion and Transmission Facility Siting Act, exclusion and avoidance criteria, as well as selection and policy criteria, were considered in the selection and design of the site. To support this siting process, maps of the Study Area were generated that indicate the presence or absence of many of the criteria highlighted in NDCC 69-06-08-01.

## 7.1 Description of Environmental Setting

The Study Area is located in northwestern Hettinger County and southern Stark County in western North Dakota, a primarily rural agricultural area located approximately 15 miles south of Dickinson, North Dakota.

## 7.2 Socioeconomics

### *7.2.1 Description of Resources*

The proposed Project is located in a primarily rural agricultural region in the northwestern portion of Hettinger County and the southern portion of Stark County, North Dakota, and is immediately adjacent to the Slope County boundary to the west. The Study Area is located between U.S. Highway 85 to the west and State Highway 8 to the east; State Highway 22 crosses through the west central Study Area. There are no incorporated communities within the Study Area. The Study Area is approximately 2 miles northeast of the small community of New England (2010 population 600) (U.S. Census Bureau 2015a). The unincorporated communities of Lefor and Schefield (part of the Dickinson Micropolitan Statistical Area, 2010 population 24,982; U.S. Census Bureau 2015a) are located north and northeast of the Study Area, respectively, in Stark County. There are approximately 16 inhabited residences and several agricultural operations within in the Study Area, but there is no indication of any new residential construction within the Study Area.

#### *Hettinger County*

Hettinger County had a population of 2,477 persons in 2010, a decrease of 8.7 percent from the 2000 population (U.S. Census Bureau 2015). Recent 2014 estimates indicate the population is increasing (2,660 persons). The county contains 1,134 square miles of land, with a density of approximately 2.2 persons per square mile. The majority of the county population resides in the cities of New England (600) and Mott (721), located approximately 3.5 miles southwest, and 21 miles southeast of the proposed Project, respectively (U.S. Census Bureau 2015). The population density within the rural area surrounding the Study Area is much lower than the county average. Approximately 96 percent of the population of Hettinger County is composed of white persons who are not of Hispanic or Latino origin. As of 2014, it is estimated that approximately 26 percent of the county population is 65 years or older, while approximately 5 percent of the population is under 5 years of age (U.S. Census Bureau 2015).

According to the 2014 U.S Census Bureau American Community Survey (U.S. Census Bureau 2016a) over 15 percent of the Hettinger County workforce worked in education, health, and social services, and 26 percent worked in agriculture, forestry, fishing and hunting, and mining. Retail trade accounted for approximately 15 percent of the jobs in the county. Per capita income estimated in 2014 was $28,719 and the median household income was $51,176 (U.S. Census Bureau 2016a). In 2014, approximately 8.9 percent of the county population lived below the poverty level (U.S. Census Bureau 2016a), compared to 15.6 percent nationwide (U.S. Census Bureau 2016b).

Agriculture continues to play a significant role in both counties' land use and economy. In 2012, there were 494 farms in Hettinger County, comprising approximately 99 percent of the land area. According to the 2012 Census of Agriculture (USDA 2012), total market value of agricultural products produced in Hettinger County was $159,032,000, 91 percent of which was from crops and 9 percent from livestock sales. The primary livestock is cattle and the principal crops include wheat and spring wheat. Canola, durum wheat, and corn are also grown.

### *Stark County*

Stark County had a population of 24,199 persons in 2010, a 6.5 percent increase from the 2000 population (U.S. Census Bureau 2015). The county contains 1,335 square miles of land, with a density of approximately 18 persons per square mile. The majority of the county population and the Dickinson Micropolitan Statistical Area (73 percent and 72 percent, respectively) resides in Dickinson, located approximately 15 miles north of the proposed Project (U.S. Census Bureau 2015). The population density within the rural area surrounding the Study Area is much lower than the county average. Approximately 94 percent of the population of Stark County is composed of white persons who are not of Hispanic or Latino origin. As of 2014, it is estimated that approximately 13 percent of the county population is 65 years or older, while approximately 8 percent of the population is under 5 years of age (U.S. Census Bureau 2015).

According to the 2013 U.S Census Bureau American Community Survey (U.S. Census Bureau 2016a) over 19 percent of the Stark County workforce worked in education, health, and social services, and over 14 percent worked in agriculture, forestry, fishing and hunting, and mining. Retail trade accounted for approximately 11 percent of the jobs in the county. Per capita income estimated in 2014 was $33,396 and the median household income was $70,243 (U.S. Census Bureau 2016a). In 2014, approximately 7.6 percent of the county population lived below the poverty level (U.S. Census Bureau 2016a), compared to 15.6 percent nationwide (U.S. Census Bureau 2016b).

In 2012, there were 837 farms in Stark County, comprising approximately 97 percent of the land area. According to the 2012 Census of Agriculture (USDA 2012), total market value of agricultural products produced in Stark County was $152,583,000, 78 percent of which was from crops and 22 percent from livestock sales. The primary livestock is cattle and the principal crops include wheat and spring wheat. Winter and durum wheat are also grown.

### *7.2.2 Impacts*

No residents will be displaced due to the proposed Project. The proposed Project will have positive economic impacts for the local population, including lease and royalty payments for participating landowners, employment, and property and sales tax revenue.

Brady Wind II estimates that the proposed Project will provide over $21 million in tax revenue to Hettinger County over 30 years. In addition, the proposed Project will create approximately 200 construction jobs and up to 7 permanent full-time jobs. The proposed Project will also provide over $24 million in payments to participating landowners over 30 years, which will not only benefit those landowners, but also the local economy as that money is reinvested in local goods and services.

Up to 74 acres (less than 1 percent) of the Project Area would be permanently affected due to conversion to turbine sites, access roads, junction boxes, and the permanent SCADA MET. Landowner compensation has been established under individual lease agreements, and includes compensation for crop damage during surveys and construction. In general, agricultural areas surrounding each turbine can still be farmed. In addition, in an environment of uncertain and often declining agricultural prices and yields, the supplemental income provided to farmers from wind energy leases is expected to provide stability to farm incomes and thus would help ensure the continued viability of farming in the Study Area. Proposed Project construction would not cause additional impacts to leading industries within the Study Area. There is no indication that any minority or low-income population is concentrated in any one area of the proposed Project, or that the wind turbines would be placed in an area occupied primarily by any minority group.

To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Hettinger and Stark counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the counties as well as the state by circulation and recirculation of dollars paid out by the applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies and other products and services will benefit businesses in the counties and the state.

Up to 200 construction workers are expected to be required for approximately 6 months for construction of the proposed Project. It is likely that general skilled labor is available either in the counties or the state to serve the basic infrastructure and site development needs of the proposed Project. Specialized labor will be required for certain components of wind farm development. It is likely that this labor will be imported from other areas of the state or from other states, as the relatively short duration of construction does not warrant special training of local or regional labor. Balancing the use of local contractors and imported specialized contractors will likely alleviate any labor relations issues.

No effects on permanent housing are anticipated. During construction, out-of-town laborers will likely use lodging facilities in and around the city of Dickinson or the city of New England.

Operation and maintenance of the facility is anticipated to require seven full-time employees in addition to those employed by the Brady Wind Energy Center, most of whom are expected to reside locally. Sufficient permanent housing is available within the host and surrounding counties to accommodate these new employees.

Long-term beneficial impacts to the counties' tax bases as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of North Dakota. The development of wind energy in this region has been important in diversifying and strengthening the economic base of southeast North Dakota. In addition, establishing the central region of North Dakota as an important producer of renewable energy, such as wind, has spurred the development of wind-related businesses in the area and in turn contribute to the economic growth in the region; there are at least four wind energy-related manufacturing facilities in North Dakota (AWEA 2015b).

### *7.2.3 Mitigative Measures*

Socioeconomic impacts associated with the proposed Project would be primarily positive, with an influx of wages and expenditures made at local businesses during the proposed Project construction and an increase in the counties' tax base due to construction and operation of the wind turbines and associated infrastructure. In addition, the lease payments paid to landowners will offset potential financial losses associated with removing land from agricultural production.

## 7.3 Land Use

### *7.3.1 Description of Resources*

The land in Hettinger and Stark counties within the Study Area boundary is primarily agricultural with scattered farmstead residences. The proposed Project will be located on privately owned land in northwestern Hettinger County and southern Stark County, approximately 15 miles south of Dickinson, and 2 miles northeast of New England. Brady Wind II proposes to install a 150-MW wind generating facility, consisting of up to 72 wind turbines within an approximately 43-square mile (27,264-acre) Study Area. Current land use within the Study Area is primarily agricultural, supporting both crops and livestock grazing. No city limits are within the Study Area. The Study Area is not within any known military installation (**Appendix D**) or near an intercontinental ballistic missile launch or launch control facility.

Natural resource development in the Study Area consists primarily of agriculture. There are coal reserve/deposits, clay resource deposits, and two potential sand and gravel resource sites within the Study Area. Agricultural production is anticipated to continue in the future.

**Table 10** and **Figure 10** identify land cover as an indicator of land uses in the Study Area based on 2011 US Geological Survey (USGS) National Land Cover Database (NLCD). Land cover in the Study Area is dominated by cultivated crops (51 percent), followed by grassland/herbaceous (32 percent). Pasture/hay land and developed, open space land are also present but limited, accounting for 11 and 4 percent of the Study Area, respectively. Forest, shrub/scrub, wetland, and water categories were each 1 percent or less of the Study Area.

**Table 10. Land Cover within the Study Area**

| Land Cover | Acreage | Percent of Study Area |
|---|---|---|
| Cultivated Crops | 13,889 | 51% |
| Grassland/Herbaceous | 8,646 | 32% |
| Pasture/Hay | 3,067 | 11% |
| Developed, Open Space | 1,150 | 4% |
| Woody Wetlands | 254 | 1% |
| Shrub/scrub | 164 | 1% |
| Deciduous Forest | 46 | <1% |
| Developed, Low Intensity | 19 | <1% |
| Emergent Herbaceous Wetlands | 12 | <1% |
| Open Water | 12 | <1% |
| Evergreen Forest | 3 | <1% |
| **TOTAL** | **27,264** | |

Source: Homer et al. 2015.

The National Resource Conservation Service (NRCS) administers a number of conservation-based programs for private landowners. The Conservation Reserve Program (CRP) is a program administered by the US Department of Agriculture (USDA) Farm Service Agency (FSA) in coordination with NRCS that provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The CRP conserves soil and water resources and provides wildlife habitat by removing enrolled tracts from agricultural production, generally for a period of 10 years. These tracts cannot be hayed, tilled, seeded, or otherwise disturbed without the authorization of the NRCS. The FSA does not distribute the location of CRP lands without written authorization According to the USDA FSA, approximately 75,085 acres of land in Hettinger County were active in the CRP program as of December 2015, and 34,198 acres were active in Stark County (USDA FSA 2015). Brady Wind II will confirm enrollment of lands within the proposed Project footprint in the CRP or other NRCS easement programs with participating landowners prior to negotiating final easements.

North Dakota Department of Trust Lands (School Trust Lands) are present within the Study Area and are shown on **Figures 6 and 12** as State Trust Lands. Project facilities are not proposed to be located on School Trust Lands. The North Dakota Department of Trust Lands manages School Trust Lands to generate income for various schools and institutions. Income is derived from grazing and agricultural leases, rights-of-way, salt water disposal, and gravel and scoria mining. School Trust Lands may be open to the public during hunting seasons (North Dakota Department of Trust Lands 2016).

### *7.3.2 Impacts*

The development of the proposed Project would not result in a significant change in land use. The development of the proposed Project would not displace any residents or existing or planned industrial facilities. Wind turbines will be sited a minimum of 2,000 feet from inhabited

residences (see table in **Appendix A**). The area would largely retain the rural characteristics of the vicinity. At other wind developments in North Dakota, landowners frequently plant crops and/or graze livestock to the edge of the access roads and turbine pads. The access roads will be between 16 and 34 feet wide[3] and low profile to allow cross-travel by farm equipment. Brady Wind II will work closely with landowners in locating access roads to minimize land use disruptions to the extent possible. Consideration will be taken in locating access roads to minimize impact on current or future row crop agriculture and environmentally sensitive areas. During the construction of the wind power facilities, additional areas may be temporarily disturbed for contractor staging areas and underground power lines. These areas will be graded to original contour and, if necessary, reseeded with appropriate vegetation.

It is estimated that installation of up to 72 turbines and the associated access roads, and the SCADA MET would result in the permanent conversion of up to 74 acres of land. An additional 837 acres are estimated to be temporarily disturbed during the construction phase of the proposed Project, and would be reclaimed. The temporary disturbance is primarily for installation of the turbines, road construction, collection line trenching, and four temporary METs. Because no project facilities are proposed on School Trust Lands, no impacts to School Trust Land are anticipated.

### *7.3.3 Mitigative Measures*

Brady Wind II is working closely with landowners and seeking input from local, state, and federal agencies in locating wind turbines and access roads to minimize land use disruptions and impacts to environmentally sensitive areas to the extent possible. Operation of the wind farm would not change the land use in the Study Area. The proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment.

## 7.4 Public Services

### *7.4.1 Description of Resources*

**Local Government Services**

The proposed Project is located in a sparsely populated, rural area in western North Dakota. There is an established transportation and utility network that provides access and necessary services to the small cities, homesteads, and farms existing near the proposed Project. There are no incorporated communities within the Study Area. The closest communities are the small unincorporated community of New England, located approximately 2 miles south/southwest; and the communities of Schefield and Lefor, located approximately 2 miles northeast and 7 miles northeast, respectively. New England, Schefield, and Lefor are located approximately 3 miles, 3 miles, and 7 miles, respectively, from the nearest proposed Project turbines. Dickinson, the county seat of Stark County, is located approximately 15 miles north of the Study Area. Dickinson provides sanitary sewer, water, utility services, educational facilities, and recreational facilities and parks to its residents and visitors. Dickinson's local services include emergency services, ambulance service, a hospital, clinics, a landfill, and a police department.

[3] Roads required to support crane access to turbines during operation would remain up to 34 feet wide; all other roads may be built at 16 feet wide or reduced later to 16 feet.

New England provides many of these services for the homes in the Study Area, and the Study Area is located in the New England School District.

### Electrical Service

Rural electrical service in the Study Area is provided by Slope Electric Cooperative, Inc.

### Roads

County and township (section line) roads characterize the existing roadway infrastructure in and around the proposed Project. The Study Area is accessed via I-94, U.S. Highway 85, State Highway 22, State Highway 21, State Highway 8, and other local two-lane paved and gravel county roads.

### Traffic

Existing traffic volumes on the area's major roadways are documented in **Table 11** and on **Figure 11**. Determining the specific capacity of any highway is a complex process. However, general estimates are used for planning purposes. For purposes of comparison, the functional capacity of a two-lane paved rural highway is approximately 5,000 vehicles per day, or Average Annual Daily Traffic (AADT).

Additional county and township roads run through the Study Area, but no vehicle count data are available for them. In general, the North Dakota Department of Transportation (NDDOT) indicated that roads with vehicle counts under 100 AADT are rarely counted. According to NDDOT, vehicle counts on routes with no count data are likely lower than those with count data.

**Table 11. Existing Daily Traffic Levels**

| Roadway Segment | Existing AADT/Commercial Truck Traffic |
|---|---|
| State Highway 22 north of Study Area | 1,910/NA |
| State Highway 22 south of Study Area | 1,835/NA |
| State Highway 22 north if New England | 1,850/495 |
| 12th Street west of Highway 22 | 340/NA |
| State Highway 22 through New England | 1,530/215 |
| State Highway 21 through New England | 485/75 |
| 3rd Avenue East north of Elevator Road | 100/NA |
| 50th Street Southwest east of State Highway 22 | 50/10 |
| 51st Street Southwest west of State Highway 22 | 75/10 |
| 55th Street Southwest east of State Highway 22 | 25/NA |

Source: 2014 Traffic Volumes (NDDOT 2014).
NA = data not available

### Water Supply

The Southwest Water Authority supplies potable water to communities within and near the Study Area. Brady Wind II would likely obtain water for construction from the Southwest Water Authority; water would be trucked to the construction site. Brady Wind II will obtain a Southwest

Pipeline crossing permit from the Southwest Water Authority for locations where the proposed Project facilities will cross the Southwest Pipeline Project.

**Communications**
With the switch to digital television in 2009 throughout the United States, the concern of ghost images and flickering that may be caused by wind turbine interference with analog signals is no longer an issue.

In December 2015, Brady Wind II conducted a preliminary telecommunications study to identify all non-federal microwave telecommunication systems within the Study Area. There are several beam paths crossing the Study Area (**Appendix E**).

### *7.4.2 Impacts*

The proposed Project is expected to have a minimal effect on the existing services and infrastructure. The following is a brief description of the impacts that may occur during construction and operation of the proposed Project.

**Local Government Services**
No impact is expected to local services.

**Electrical Service**
The proposed Project will require station service from the local electric provider when the Project is not generating electricity.

**Roads**
Construction of the proposed Project will require approximately 35.8 miles of new aggregate-surfaced access roads. During operation of the proposed Project, the access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between turbine towers, offset as necessary to allow for adequate crane access. One road will be required for each string of turbines. Although a 34-foot wide temporary disturbance area is likely during construction, the permanent access roads will primarily be 16 feet wide and low profile to allow cross-travel by farm equipment.

**Traffic**
There will be a temporary increase in truck traffic during construction activities. The maximum construction workforce is expected to generate approximately 800 additional vehicle trips per day on roads where construction is active within the Study Area. Using any combination of state and county highways and other township roads throughout the Study Area, the traffic impacts are considered negligible. Approximately 30 concrete trucks will be required to pour the foundation for each turbine. This is typically completed within two days. While there may be some noticeable increase in heavy vehicle traffic in discrete locations for limited amounts of time, for the Study Area as a whole, impacts to the capacity of route and level-of-service to the traveling public will be negligible as any combination of state and county highways and other township roads throughout the Study Area will be used.

Truck access to the proposed Project site is provided by Highway 22, which runs north and south through the center of the Study Area. Specific additional truck routes will be dictated by delivery location. Additional operating permits will be issued by the State or County for over-sized truck movements.

**Water Supply**

Construction and operation of the proposed Project will not significantly impact local water supply. Construction of the proposed Project would require approximately three million gallons of water for foundations, backfill, and compaction; five million gallons of water for road construction and civil infrastructure; and 10 million gallons of water for dust control. Construction water estimates are subject to change due to final site investigation and weather. The construction water would be brought on site via trucks, most likely from the Southwest Water Authority, the city of Dickinson, or the city of New England. Water for operation of the O&M facility would be obtained from the Southwest Water Authority. The abandonment of wells is not required for the proposed Project. The proposed Project will not require appropriation of surface water or permanent dewatering. Temporary dewatering of groundwater may be required during construction of turbine foundations.

**Communications**

Telephone and fiber optic cables within the Study Area will be located in the field by the respective utility companies prior to construction and would not be negatively affected during construction.

Brady Wind II contacted the National Telecommunications and Information Administration (NTIA) regarding the proposed Project in October 2015. In its response in December 2015, NTIA concluded that after a 45+ day period of review, no agencies had issues with turbine placement in this area stating No Harmful Interference Anticipated (NHIA). This correspondence is included in **Appendix H**.

No impacts to FCC-licensed microwave beams are anticipated from the proposed Project turbines because a setback of blade length (56.9 meters for the 2.1 MW turbines) plus 10 meters (total 66.9 meters, or 219.5 feet) has been incorporated in the turbine layout.

The extent of the interference created by wind turbines on AM and FM radio and television has been gradually diminished over the past decade due to advances in turbine manufacturing and transmitter/receiver antenna design. This has reduced the impact on AM and FM radio systems to the point where only small degradation of signal is noticed a few meters from a turbine location. Coverage of AM and FM radio services are not expected to be impacted by the wind farm because turbines will be constructed a sufficient distance from each dwelling. With the switch to digital television in 2009, the concern of ghost images and flickering caused by wind turbine interference with analog signals is no longer an issue.

### *7.4.3 Mitigative Measures*

Construction and operation of the proposed Project will be in accordance with all applicable local, state, and federal permits and laws, as well as industry construction and operation standards.

**Local Government Services**
No impact to local services is anticipated, and no mitigation is required.

**Electrical Service**
Brady Wind II will purchase station service from Slope Electric Cooperative, which will suggest appropriate configurations for the electrical system that Brady Wind II will abide by to prevent impacts to the transmission system. Brady Wind II has established a setback of 498.3 feet (110 percent the turbine height) from existing transmission lines (**Table 9**). No additional mitigation is necessary.

**Roads**
Brady Wind II is working closely with local landowners to locate access roads to minimize land-use disruptions to the extent possible. The preliminary layout of the turbines and access roads is shown in **Figure 3**.

**Traffic**
The capacity of any route and level-of-service to the traveling public will not be affected, and as such, no mitigation is necessary.

**Water Supply**
The abandonment of wells is not required for the proposed Project. However, in the event wells are abandoned, they will be sealed as required by North Dakota law. If temporary dewatering of groundwater is required during construction activities, discharge of dewatering fluid will be conducted under the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP).

**Communications**
Collection and telecommunication lines will be buried underground to avoid collisions, to the extent practicable. An underground utilities locator company will be contacted prior to construction to locate and avoid underground facilities. To the extent proposed Project facilities cross or otherwise affect existing communications systems, Brady Wind II will enter into agreements with service providers as necessary to avoid interference with their facilities.

## 7.5 Human Health and Safety

### *7.5.1 Description of Resources*

**Air Traffic**
There are no public airports or no private airports/airstrips within 5 nautical miles of the Study Area. Nautical miles are the standard measure for aviation; 1 nautical mile is equal to 1.15 statute miles. The nearest airport certified for commercial carrier operations is the Dickinson–

Theodore Roosevelt Regional Airport, located 3.5 miles south of Dickinson and approximately 8.3 nautical miles north of the Study Area.

**Federal Radar Interference**
Wind turbines may interfere with radar systems and airspace navigation. A query of the online Department of Defense (DoD) Preliminary Screening Tool was conducted to obtain a preliminary review of potential impacts to Long Range Radar (FAA 2016) and the National Weather Services' NEXRAD radar systems. The latitude and longitude of a polygon encompassing the Study Area was submitted for review (**Appendix D**).

The Federal Aviation Administration (FAA) reviews potential impacts to DoD radar as part of its aviation hazard review of structures that file a Notice of Proposed Construction or Alteration (FAA Form 7460-1). The FAA will request that the DoD and the U.S. Department of Homeland Security (DHS) review the filing and may issue a Notice of Presumed Hazard if the DoD and DHS determine that impacts to radar are considered significant. The impact of a wind energy project on radar systems primarily depends on the distance to the radar, and the number and configuration of the turbines.

**Shadow Flicker**
A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker, and can be a temporary phenomenon experienced by people at nearby residences or public gathering places. The impact area depends on the time of year and day (which determines the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker generally occurs during low angle sunlight conditions, typical during sunrise and sunset times of the day.

**Hazardous Materials / Hazardous Waste**
The site is located in a relatively rural area of North Dakota. Hazardous wastes from large industrial or commercial activities are not likely. Potential hazards may exist in rural areas from farm dumps and agricultural chemicals. A Phase I Environmental Site Assessment will be conducted prior to construction to identify any recognized environmental conditions that may exist.

Potentially hazardous materials associated with the proposed Project include fluids found in association with turbines and substation/transformer equipment. There will be three types of fluids used in the operation of the wind turbines, all of which are petroleum products. These fluids are necessary for the operation of each turbine and include gear box oil, hydraulic fluid, and gear grease. The transformers contain mineral oil.

**Security**
The Study Area is located in an area that has a low population density. Construction and operation of the proposed Project would have minimal impact on the security and safety of the local communities.

### *7.5.2 Impacts*

**Air Traffic**

The installation of wind turbines creates a potential for air traffic collision. The wind turbines and METs will have lighting and markings that comply with FAA requirements and the FAA's review will include the evaluation of any potential interference with air traffic. Brady Wind II submitted Notices of Proposed Construction or Alteration to the FAA for all proposed Project turbines, and in April 2016, the FAA completed their review of the turbines and concluded that no turbines exceeded obstruction standards and would not be a hazard to air navigation provided they are marked and lighted in accordance with FAA regulations. The wind turbines and METs will have lighting and markings that comply with FAA requirements.

**Federal Radar Interference**

According to the DoD Long Range Radar screening tool, the proposed Project is not anticipated to impact Air Defense and Homeland Security radars. The results of the Preliminary Screening Tool indicate that the entire Study Area appears as green on the map produced by the screening tool (**Appendix D**).

**National Weather Service Radar**

According to the DoD NEXRAD screening tool, the proposed Project is not likely to impact Weather Surveillance Radar—1988 Doppler (WSR-88D) weather radar operations. The National Oceanic and Atmospheric Administration will not perform a detailed analysis, but that agency requested that they be made aware of the proposed Project. The entire search area appears as green (no impact) on the map produced by the screening tool (**Appendix D**).

**Military Training Routes and Special Use Airspace**

According to the results of the Military Operations screening tool, military airspace and training routes do not overlap with the proposed Project; therefore impacts to military airspace are unlikely (**Appendix D**).

**Shadow Flicker**

Shadow flicker impacts are not regulated in applicable county, state, or federal law, and there is no permitting threshold with regard to hours per year of anticipated impacts to a receptor from a wind energy project. An analysis of potential shadow flicker impacts from the proposed Project turbine layout dated March 14, 2016, was conducted using the WindPro software package and is included in **Appendix F**. The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow flicker, which accounts for historical sunshine probability, wind speed, and wind direction). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors out to 2,500 meters (8,202 feet). The analysis assumes that the receptors all have a direct in line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions that may block sunlight.

There are approximately 114 inhabited residences in the vicinity of the Study Area and that are considered potential shadow flicker receptors for the purpose of this analysis. The predicted

shadow flicker impacts are less than 30 hours per year (the industry's generally accepted standard and the standard that has been used by the PSC) at all occupied receptors. The maximum predicted shadow flicker impact at any inhabited residence receptor is 24 hours and 2 minutes per year. As a result of the analysis, no significant shadow flicker impacts are anticipated to sensitive receptors.

**Hazardous Materials/Hazardous Waste**
A Phase I ESA will be conducted and results will be used to minimize risk associated with potential recognized environmental conditions that may pose a threat to human health and safety. Significant findings are not anticipated due to the known historic uses of the property.

As with any construction activity, there is the possibility of accidentally spilling fuel, hydraulic fluid, or other hazardous substances during construction of the proposed Project. The potential of such events would be minimized through implementation of a Spill Prevention, Control, and Countermeasures plan, which would include the following:

- Construction equipment will be equipped with spill cleanup kits.
- Equipment refueling will take place at secure areas, away from wetlands or drainages.
- Workers will be trained in spill clean-up and the use of the spill cleanup kits.

These measures ensure that surface and groundwater quality would not be degraded through inadvertent spillage of contaminants.

**Security**
Proposed Project construction and operation would have minimal impacts to the security and safety of the local communities.

### *7.5.3 Mitigative Measures*

**Air Traffic**
Brady Wind II submitted Form 7460-1 to FAA for each turbine to determine whether the proposed Project layout and lighting would impact navigable airspace or communications technology used in aviation operations. In April 2016, the FAA completed their review of the turbines and concluded that no turbines exceeded obstruction standards and would not be a hazard to air navigation provided they are marked and lighted in accordance with FAA regulations. Wind turbines and METs will have lighting and markings according to FAA requirements that minimize any potential for air traffic impacts.

**Shadow Flicker**
The primary mitigation measure used to minimize shadow flicker from wind turbines is setback distance. Brady Wind II is committed to a 2,000-foot setback distance from all existing inhabited residential structures, which is more conservative than the 1,320-foot setback required by Hettinger County. Because no significant impacts are anticipated, no additional mitigation is proposed at this time.

**Hazardous Materials / Hazardous Waste**
Because no significant findings are anticipated, no mitigation is proposed at this time. All petroleum fluids will be contained within the wind turbines and electrical equipment. Any petroleum wastes generated will be handled and disposed of in accordance with local, state, and federal regulations.

**Security**
The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The turbine towers will be placed at least 498.3 feet (1.1 x turbine height) from interstate and state road right-of-way, at least 573.3 feet (1.1 x turbine height plus 75 feet) from county and maintained township road right-of-way, and 2,000 feet from inhabited residences. These distances are considered to be safe based on developer experience, and are consistent with the required local setbacks.
- Security measures will be taken during the construction and operation of the proposed Project, including temporary and permanent (safety) fencing, warning signs, and locks on equipment and wind power facilities.
- Turbines will sit on solid steel-enclosed tubular towers in which all electrical equipment will be located, except for the pad-mounted transformer. Access to the turbine tower is only through a solid steel door that will be locked when not in use.
- Where necessary or requested by landowners, Brady Wind II will construct gates or fences such as those around the collection substation.

## 7.6 Noise

### *7.6.1 Description of Resources*

The Study Area is primarily rural and agricultural. There are approximately 114 inhabited residences in the vicinity of the Study Area, of which 16 are located within the Study Area. The Study Area is approximately 2 miles northeast of the town of New England. There are no populated towns within the Study Area. The acoustic environment is defined primarily by Highway 22, which runs through the Study Area north to south, as well as aircraft flyover events, farming equipment and local traffic. In addition to anthropogenic noise sources, the windy conditions of this site define a somewhat elevated ambient sound level, which increases with wind speed. Windy conditions can generate noise caused by the rustling of grass and tree leaves.

### *7.6.2 Impacts*

The PSC's rules (NDAC 69-06-08-01(4)) specify that sound levels from a wind facility may not exceed 50 dBA within one hundred feet of an inhabited residence or a community building, unless waived in writing by the owner. According to the Special Provisions (Section 6.8) of the Hettinger County Land Use Regulations, sustained noise of over 75 decibels (dB) during the day and 65 dB at night is prohibited.

Wind turbine generators produce noise through a number of different mechanisms roughly grouped into mechanical and aerodynamic sources. Modern wind turbines include design features that minimize mechanical sound sources. The interaction of air and the turbine blades produces aerodynamic noise through a variety of processes as air passes over and past the blades. Unlike other sound sources, wind turbines generally radiate more noise as wind speed increases. However, at elevated wind speeds the wind tends to generate significant background noise by moving trees and grasses, which can create a masking effect and may aid in reducing the audibility of wind turbine sound.

In March 2016, an acoustic engineering analysis was developed to address sound levels resulting from wind turbine operations, as well as the consideration of sound from the electrical substation and sound generated during construction and maintenance activities (**Appendix G**).

Wind turbine operation was analyzed for the proposed Project employing the GE 2.1 MW and GE 1.79 MW Xle turbine models, as well as the planned Brady Wind Energy Center substation in the northeast corner of the northwest quarter of Section 12, Township 139 North, Range 94 West. Noise specifications for the GE 2.3 MW turbine were used to represent the sound characteristics of the GE 2.1 MW turbine model in the acoustic model because the noise specifications for the GE 2.1 MW turbine were not available at the time of analysis, and the GE indicated that the sound characteristics of the GE 2.1 MW and 2.3 MW wind turbines would be comparable. Acoustic modeling was completed for the turbine layout dated March 14, 2016. The entire range of future Project operational conditions were analyzed, including wind turbine cut-in, maximum rotational conditions, and anomalous meteorological conditions. Additionally, the cumulative noise impacts of the Project were analyzed in association with the Brady Wind Energy Center, a proposed project in neighboring Stark County. Project compliance was assessed at a total of 175 receptors in and near the Study Area, 114 of which were determined to be inhabited residences.

The noise modeling results indicate that the received sound levels at all 114 inhabited receptors are all below the North Dakota noise requirement (Chapter 69-06-08-01(4)), which prescribes a limit of 50 dBA within 100 feet of an inhabited residence. The highest modeled sound level for an inhabited residence was 48 dBA.

Project construction may cause short-term but unavoidable noise impacts. The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. Sounds generated by construction activities are typically exempt from state and local noise oversight provided that they occur within weekday, daytime periods as may be specified under local zoning or legal codes. Reasonable efforts will be made to minimize the impact of noise resulting from construction activities.

Construction activity will generate traffic having potential noise effects, such as trucks traveling to and from the site on public roads. At the early stage of the construction phase, equipment

and materials will be delivered to the site, such as hydraulic excavators and associated spreading and compacting equipment needed to form access roads and foundation platforms for each turbine. Once the access roads have been constructed, equipment for lifting the towers and turbine components will arrive. Traffic noise is categorized into two categories: (1) the noise that would occur during the initial temporary traffic movements related to turbine delivery, haulage of components and remaining construction; and (2) maintenance and ongoing traffic from staff and contractors, which is expected to be minor.

### *7.6.3 Mitigative Measures*

The primary mitigation measure used for wind turbines is setback distance. Setback requirements set by the PSC, Hettinger County, and Stark County are listed in **Table 9**. Brady Wind II has applied a minimum 2,000-foot setback distance from all existing inhabited residential structures. This exceeds setback requirements of Hettinger County (Hettinger County Land Use Regulations Section 6.14.6 (2)). It should be noted that the acoustic model conservatively predicts outdoor sound levels and assumes no shielding or attenuation by trees or other vegetation. If a complaint is registered and sound is measured above the 50 dBA level, Brady Wind II can provide improved insulation, landscaping, or other appropriate candidate mitigation measures.

## 7.7 Cultural and Archaeological Impacts

### *7.7.1 Description of Resources*

**Archaeological Resources**

Tetra Tech performed a Class I Literature Review for archaeological and architectural resources for the Survey Corridor (the construction easement[4]) and a 1-mile buffer around the Survey Corridor (i.e., the Archaeological Study Area). The file review was completed at the State Historical Society North Dakota in July and November 2015, and March 2016. This file review included identifying previously recorded archaeological sites identified during previous surveys, and historic structures, bridges, and cemeteries within the Survey Corridor and within the Archaeological Study Area.

The literature review identified no previously recorded archaeological resources within the Survey Corridor **(Table 12)**. However, six previously recorded archaeological sites and five site leads were previously recorded in the Archaeological Study Area (**Table 12**). Site leads refer to resources that lack sufficient information to fully record and complete all necessary data fields on the North Dakota Cultural Resources Survey (NDCRS) site forms. Examples of site leads include: (1) locations recorded from various historic documents, (2) locations reported by a landowner or other non-professional, (3) isolates, a location with five or fewer surface visible artifacts which, in the professional judgment of the archaeologist, is likely to be a limited surface

[4] To allow for flexibility in Project planning and design, Tetra Tech's archaeology team surveyed a 500-foot diameter circular area centered on the proposed turbine locations, a 200-foot corridor for the proposed access roads, a 50-foot corridor for the proposed collection lines, and a 400-foot diameter circle centered on the proposed meteorological tower locations. These areas comprise the Survey Corridor, which includes approximately 1,276 acres.

expression of a former occupation area where most of the artifacts are still buried, and/or (4) locations recorded by a cultural resource specialist outside of their project area(s), and thus not fully recorded.

All six previously recorded archaeological resources are Native American cultural material scatters. The five site leads include one Native American stone effigy, one Native American chipped stone isolate, two Euro-American coal mines, and one Euro-American abandoned farmstead (**Table 12**).

**Table 12. Previously Recorded Archaeological Resources within the Survey Corridor and within the Archaeological Study Area**

| Smithsonian Number | Cultural Affiliation | Description | Avoidance |
|---|---|---|---|
| **Archaeological Resources within Survey Corridor - None** | | | |
| **Archaeological Resources within the Archaeological Study Area** | | | |
| 32HT24 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32HT28 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32HT32 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32HT69 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32HT78 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32HTx79 | Native American | Rock Feature – Effigy | Avoid direct impacts to site |
| 32HTx128 | Euro-American | Coal Mine | Avoid direct impacts to site |
| 32HTx138 | Euro-American | Abandoned Farmstead | Avoid direct impacts to site |
| 32SK86 | Native American | Cultural Material Scatter | Avoid direct impacts to site |
| 32SKx89 | Euro-American | Coal Mine | Avoid direct impacts to site |
| 32SLx128 | Native American | Isolated Find | No further management necessary |

## Architectural Resources

The Class I Literature Review identified no architectural resources. Three historic farmstead and two cultural resources leads (also farmsteads) were identified within two miles of the proposed Project turbines (**Table 13**).

**Table 13. Previously Recorded Architectural Resources within 2 Miles of the Project Turbines**

| Smithsonian Number | Resource Type | Description | Avoidance |
|---|---|---|---|
| **Architectural Resources within the Survey Corridor - None** | | | |
| **Architectural Resources within 2 miles of the Project Turbines** | | | |
| 32HT79 | Euro-American – circa(ca) 1913 to Unknown | Abandoned farmstead | Avoid direct impacts to site |
| 32HTx138 | Euro-American—Period Unknown | Abandoned farmstead | Avoid direct impacts to site |
| 32SK157 | Euro-American— ca. 1900 to Present | Farmstead | Avoid direct impacts to site |

**Table 13. Previously Recorded Architectural Resources within 2 Miles of the Project Turbines**

| Smithsonian Number | Resource Type | Description | Avoidance |
|---|---|---|---|
| 32SK167 | Euro-American— ca. 1900 to Present | Farmstead | Avoid direct impacts to site |
| 32SKx201 | Euro-American— ca. 1900 to Present | Farmstead | Avoid direct impacts to site |

**Class III Cultural Resources Inventory for Architectural Resources**

The State Historical Society of North Dakota (SHSND) confirmed on January 15, 2016 that a survey for architectural resources should be completed for all areas within 2 miles of proposed Project turbines (**Appendix H**). An architectural historian completed a survey of architectural resources within two miles of proposed Project turbines in March 2016. A report will be submitted to the SHSND when complete for review and concurrence, and will also be submitted to the PSC.

**Class III Cultural Resources Inventory for Archaeological Resources**

Brady Wind II and Tetra Tech have coordinated with the SHSND on the appropriate scope and level of survey for the adjacent proposed Brady Wind Energy Center. A Class III Intensive Cultural Resources Inventory of the Survey Corridor has been completed to identify archaeological resources and a Class III Cultural Resources Inventory Report is underway. Once complete, the Class III Cultural Resources Inventory Report will be submitted to the SHSND for review and concurrence, and will also be provided to the PSC.

**Native American Consultation**

In November 2015,January 2016, and April 2016, Brady Wind II sent a letter to the North Dakota Indian Affairs Commission notifying the agency about the proposed Project and the preparation of this application for a Certificate; no response has been received to date.

Consistent with NEER's policy to reach out to Tribes in the vicinity of its projects, another letter was sent in January 2016 to all Tribes with potential interest in the proposed Project. The letter provided information about the proposed Project, cultural resources identified to date, and invited the Tribes to contact NEER with any questions.

### *7.7.2 Impacts*

**Architectural Resources**

The proposed Project would not directly impact any architectural resources. A report that evaluates potential visual effects on historic properties is underway. This report will be submitted to the SHSND when complete for review and concurrence, and will also be submitted to the PSC.

**Archaeological Resources**
Avoidance buffers have been created for archaeological sites recorded during the pedestrian survey of the Survey Corridor. Brady Wind II commits to avoid any newly documented sites and the previously-documented cultural resources within the Survey Corridor.

### *7.7.3 Mitigative Measures*

All sites for which avoidance was recommended will be fenced along the avoidance buffer perimeter to reduce the potential that they will be inadvertently disturbed. An Unanticipated Discovery Plan has been prepared for the Project outlining the procedure that will be followed to prepare for and address any unanticipated discoveries of cultural resources, including previously undiscovered archaeological sites and possible human remains. It will provide direction to on-site personnel and their consultants as to the proper procedure to follow in the event that unanticipated discoveries were to be made during construction of the proposed Project. No significant impacts to cultural resources would, therefore, be anticipated from the proposed Project.

In the event that human remains are identified during construction of the proposed Project, work would immediately halt within a minimum of 100 feet of the site and the site would be protected until the SHSND and the North Dakota Indian Affairs Commission are consulted, in addition to any involved Tribes that express interest in the proposed Project and identify a potential impact.

If confirmed or potential human skeletal remains are discovered, the Hettinger and Stark County Sheriff's offices will be contacted. The Sheriff will call the North Dakota State Forensic Examiner to determine whether the remains are associated with a crime scene. If the remains are determined not to be part of an active crime scene or investigation, the North Dakota Chief Archaeologist will be contacted.

## 7.8 Recreational Resources

### *7.8.1 Description of Resources*

Recreational opportunities in Hettinger and Stark counties primarily include hunting and wildlife observation. The closest park to the Study Area is the Dickinson Reservoir-Edward Arthur Patterson Lake. Other recreation near the Study Area include the Old Red/Old Ten Scenic Byway and the Enchanted Highway. North Dakota Department of Trust Lands (School Trust Lands) are present within the Study Area.

The Dickinson Reservoir-Edward Arthur Patterson Lake is located on the Heart River, approximately 1 mile west of Dickinson and approximately 14 miles north of the Study Area. Recreational activities include boating, fishing, camping, and water sports (USBR 2015). The park is managed by the Dickinson Park and Recreation District.

The Old Red/Old Ten Scenic Byway is a state-designated byway located approximately 15 miles north of the Study Area. The byway is oriented east to west and parallels Interstate 94 east of Dickinson. The North Dakota Scenic Byways and Backways Program is a tourism program managed by the North Dakota Parks and Recreation Department and the NDDOT.

The Enchanted Highway is a local tourist attraction consisting of various roadside art sculpture installations placed along Stark County Highway 100 ½ SW, each with a parking area and kiosk. The Enchanted Highway is oriented north and south and begins at I-94 near Gladstone and terminates 30 miles south in the small town of Regent. The Enchanted Highway is located approximately 5 miles east of the Study Area. The two closest sculptures to the Study Area are Grasshoppers in the Field (6 miles northeast). Fisherman's Dream (approximately 5 miles east), and Pheasants on the Prairie (6 miles southeast). The Enchanted Highway is not a federal or state designated scenic highway.

The North Dakota Game and Fish Department (NDGF) administers and regulates the Private Lands Open to Sportsmen (PLOTS) program to allow hunting access on private lands through lease agreements with landowners. PLOTS allow for walk-in hunting during legal hunting seasons. One parcel of North Dakota Department of Trust Lands School Trust Lands occur within the Study Area (**Figure 12**). These lands are open to walk-in hunting unless otherwise posted with official State Land Department signage (North Dakota Department of Game and Fish 2015).

### *7.8.2 Impacts*

No recreational resources will be directly affected by the proposed Project. Recreational impacts would be auditory and visual in nature and limited to individuals using public or private property in and near the Study Area for hunting, fishing, or nature observation. A photo of the typical landscape in the area of the proposed Project is provided in **Figure 13**. The turbines would introduce a new visual element into the landscape, but the area already has transportation and utility infrastructure such as transmission lines, railroads, and Interstate 94. There are also five existing wind farms in the vicinity of the proposed Project, including Thunder Spirit Wind Farm south of the Study Area near Hettinger in Adams County, and the four-phased Bison Wind Energy Center northeast of the Study Area near New Salem in Oliver and Morton counties. The Brady Wind Energy Center is planned for the area directly north of the Study Area.

The Brady Wind Energy Center is planned to be located between the proposed Project and potential viewers located at the Dickinson Reservoir-Edward Arthur Patterson Lake and the Old Red/Old Ten Scenic Byway. Proposed Project components are not anticipated to be noticeable to the casual observer from these viewing locations because of distance, existing infrastructure, and topography.

Stark County's zoning ordinance includes a 1-mile setback from the Enchanted Highway for structures greater than 30 feet in height. This setback is significantly exceeded for the proposed Project: The easternmost Study Area boundary is approximately 6 miles west of the Enchanted Highway. Views of the proposed Project from the Grasshopper sculpture would be completely screened by an existing windrow located west of the parking area. Visual impacts are not anticipated for the Fisherman's Dream and Pheasants on the Prairie sculptures because viewers would be looking east towards the art installation and the Study Area would be located behind them. The proposed Project may be visible to travelers along the Enchanted Highway; however, views would be screened by topography and/or vegetation and would appear in the

background. Portions of the proposed Project components that are visible may be noticeable to the casual observer, but at this distance they would appear as subordinate features in the landscape; therefore, the proposed Project would have no adverse effect to the Enchanted Highway.

The proposed layout does not have any Project facilities located on School Trust Lands, however, if Brady Wind II pursues an agreement for development of any Project facilities on this parcel, there would be no impact to recreation on these lands once construction is complete.

### *7.8.3 Mitigative Measures*

Because the proposed Project is not anticipated to result in significant adverse impacts to recreational resources, no mitigative measures are proposed.

## 7.9 Effects on Land-Based Economies

### *7.9.1 Description of Resources*

**Agriculture/Farming**

The majority of the Study Area is either pasture/hay or cropland (**Figure 10**). The principal crops include wheat and spring wheat; Alfalfa, canola, durum wheat, and corn are also grown.

Agriculture has historically played a dominant role in the local economy, and continues to play a significant role in the counties' land use and economy. In 2012, there were 494 farms in Hettinger County, comprising approximately 97 percent of the land area; approximately 78 percent of the land in farms is cropland, and 18 percent is pasture. According to the 2012 Census of Agriculture (USDA 2012), total market value of agricultural products produced in Hettinger County was $159,032,000, 91 percent of which was from crops and 9 percent from livestock sales. In 2012, there were 837 farms in Stark County, comprising approximately 97 percent of the land area; approximately 60 percent of the land in farms is cropland, and 36 percent is pasture. According to the 2012 Census of Agriculture (USDA 2012), total market value of agricultural products produced in Stark County was $152,583,000, 78 percent of which was from crops and 22 percent from livestock sales. For both counties, the primary livestock is cattle and the principal crop is wheat.

Prime farmland is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. **Table 14** lists the soils within the Study Area, including those considered prime farmland. **Figure 14** shows the prime farmland soil distribution in the Study Area.

Four prime farmland soils occur within the Study Area, comprising 459 acres or 2 percent of the Study Area.

**Woodlands**

Economically important forestry resources are not found in the Study Area. Trees and shrubs in the Study Area are sparse, and limited to windbreaks around residential properties and between fields, or those found in and along drainages and wetlands. Trees observed on-site include

plains cottonwood (*Populus deltoids*), green ash (*Fraxinus pensylvanica*), peach-leaved willow (*Salix amygdaloides*), coyote willow (*Salix exigua*), Siberian elm (*Ulmus pumila*), wild plum (*Prunus americana*), blue spruce (*Picea pungens*), and boxelder (*Acer negundo*).

### *7.9.2 Impacts*

**Agriculture/Farming**

Wind energy development removes less total land from agricultural use than other forms of development. No impacts are anticipated to animal health and safety due to the construction or operation of the wind farm and associated facilities. Except for the physical locations of the turbines, and access roads, all the land surrounding the proposed Project facilities will be available for grazing. Cattle have been observed using shade from turbines as a refuge at other wind energy projects.

Anticipated permanent impacts from the Project would be approximately 74 acres, primarily from turbine foundations and access roads (**Table 4**). This land is currently primarily used for grazing or growing crops.

The proposed Project would permanently disturb approximately 0.2 acre of soils classified as prime farmland, not including the collection lines, which would be buried and would be a temporary disturbance of soil, except where junction boxes are located. This would be a negligible impact to agricultural production in the county. As noted earlier, wind lease payments will provide farmers with a supplemental source of income, helping ensure that farmers can continue to operate financially viable farms, and thus helping to ensure the continuation of farming in Stark and Hettinger counties.

No turbines will be placed within 2,000 feet of inhabited residences. Other impacts to residences are discussed throughout **Section 7**. Family farms will be affected due to the loss of land associated with the construction of the turbines and access roads. The extent of impacts will not be known until final turbine locations are determined in conjunction with the landowners.

**Woodlands**

No significant impacts are anticipated to woodlands.

### *7.9.3 Mitigative Measures*

**Agriculture/Farming**

The wind turbines and access roads will be located so that the most productive farmland (prime farmland) would be avoided as much as practicable. Only land for the turbines and access roads will be unavailable for crop production and grazing. Brady Wind II will work with landowners to minimize impacts to their land. Once the wind turbines have been constructed, all land surrounding the turbines can still be farmed or grazed. All construction areas will be separated from grazing animals by temporary or permanent fencing.

**Woodlands**
If trees are removed as part of the proposed Project, they will be replaced per PSC's Tree and Shrub Mitigation Specifications.

## 7.10 Soils

### *7.10.1 Description of Resources*

USDA has mapped over 70 soil map units within the Study Area (USDA 2016). These soils are primarily well-drained loams, silt loams, and to a lesser extent fine sandy, and sandy loams. These soils are primarily derived from the underlying bedrock that consist of sandy and clayey unconsolidated materials including alluvium derived from mudstone, weathered mudstone, and, to a lesser extent, siltstones and sandstones. Twenty soil types comprise approximately 82 percent of the Study Area. The most extensive of these are the Cabba-Amor-Savage complex (8 percent of the Study Area), Belfield-Grail clay loams (6 percent), Amor-Cabba loams (9 percent of the Study Area), Belfield-Daglum complex (7 percent), Felor loam (6 percent), Savage silty clay loam (5 percent), and Regent-Savage silty clay loams (7 percent). **Table 14** provides a summary of the soil map units within the Study Area, including their acreages and percentages of the Study Area.

**Table 14. Soil Map Units Within the Study Area**

| Map Unit Name* | Area (acres) | Percentage of Study Area | Farmland Classification |
|---|---|---|---|
| Amor-Arnegard loams | 203 | 1 | Not prime farmland |
| Amor-Cabba loams | 2,344 | 9 | Not prime farmland |
| Amor-Shambo loams | 1,024 | 4 | Not prime farmland |
| Arnegard loam | 240 | 1 | All areas are prime farmland |
| Arnegard loam, saline | 31 | <1 | Not prime farmland |
| Barkof-Janesburg complex | 4 | <1 | Not prime farmland |
| Beisigl-Flasher-Telfer loamy fine sands | 9 | <1 | Not prime farmland |
| Beisigl-Lihen loamy fine sands | 118 | <1 | Not prime farmland |
| Belfield-Daglum clay loams, saline | 248 | 1 | Not prime farmland |
| Belfield-Daglum complex | 1,789 | 7 | Not prime farmland |
| Belfield-Grail clay loams | 1,664 | 6 | Not prime farmland |
| Belfield-Grail-Arnegard complex, saline | 246 | 1 | Not prime farmland |
| Belfield-Savage-Daglum complex | 626 | 2 | Not prime farmland |
| Cabba-Amor-Savage complex | 2,158 | 8 | Not prime farmland |
| Cabba-Chama-Sen silt loams | 37 | <1 | Not prime farmland |
| Cabba-Chama-Shambo loams | 458 | 2 | Not prime farmland |
| Chama-Cabba-Sen silt loams | 1,058 | 4 | Not prime farmland |
| Chama-Sen-Cabba silt loams | 622 | 2 | Not prime farmland |
| Cherry silt loam | 31 | <1 | Not prime farmland |
| Daglum fine sandy loam | 5 | <1 | Not prime farmland |
| Daglum-Rhoades complex | 309 | 1 | Not prime farmland |
| Dimmick silty clay | 9 | <1 | Not prime farmland |

**Table 14. Soil Map Units Within the Study Area**

| Map Unit Name* | Area (acres) | Percentage of Study Area | Farmland Classification |
|---|---|---|---|
| Ekalaka-Parshall-Desart fine sandy loams | 12 | <1 | Not prime farmland |
| Farfeld-Cedarpan loams | 70 | <1 | Not prime farmland |
| Farland silt loam, 0 to 2 percent slopes | <1 | <1 | Not prime farmland |
| Felor loam | 1,729 | 6 | Not prime farmland |
| Flasher-Vebar-Parshall complex | 169 | 1 | Not prime farmland |
| Grail silty clay loam | 207 | 1 | All areas are prime farmland |
| Grail-Savage silty clay loams | 29 | <1 | Not prime farmland |
| Harriet loam, occasionally flooded | 129 | <1 | Not prime farmland |
| Heil silty clay loam | 32 | <1 | Not prime farmland |
| Korchea-Fluvaquents complex, channeled, frequently flooded | 536 | 2 | Not prime farmland |
| Korell-Daglum-Fluvaquents complex, channeled, frequently flooded | 84 | <1 | Not prime farmland |
| Korell-Rhoades-Daglum complex | 22 | <1 | Not prime farmland |
| Lefor fine sandy loam | 1,717 | 6 | Not prime farmland |
| Lefor fine sandy loam | 34 | <1 | Not prime farmland |
| Lihen-Parshall complex | 28 | <1 | Not prime farmland |
| Manning fine sandy loam | 2 | <1 | Not prime farmland |
| Manning-Schaller-Wabek complex | 133 | 1 | Not prime farmland |
| Moreau-Barkof silty clays | 254 | 1 | Not prime farmland |
| Moreau-Regent complex, very stony | 21 | <1 | Not prime farmland |
| Moreau-Wayden silty clays | 11 | <1 | Not prime farmland |
| Morton-Farland silt loams | 103 | <1 | Not prime farmland |
| Parshall fine sandy loam | 71 | <1 | Not prime farmland |
| Parshall fine sandy loam, saline | 43 | <1 | Not prime farmland |
| Parshall, gravelly substratum-Manning fine sandy loams | 6 | <1 | Not prime farmland |
| Reeder-Farnuf loams | 1,092 | 4 | Not prime farmland |
| Regan silt loam, saline, occasionally flooded | 17 | <1 | Not prime farmland |
| Regent-Janesburg complex | 658 | 2 | Not prime farmland |
| Regent-Moreau-Cabba complex | 643 | 2 | Not prime farmland |
| Regent-Savage silty clay loams | 1,870 | 7 | Not prime farmland |
| Rhoades-Daglum complex | 144 | 1 | Not prime farmland |
| Savage silty clay loam | 1,451 | 5 | Not prime farmland |
| Savage-Daglum complex | 29 | <1 | Not prime farmland |
| Savage-Grail silty clay loams | 494 | 2 | Not prime farmland |
| Sen-Chama silt loams | 1 | <1 | Not prime farmland |
| Sen-Golva silt loams | 6 | <1 | Not prime farmland |
| Sen-Janesburg silt loams | 46 | <1 | Not prime farmland |
| Shambo loam | 487 | 2 | Not prime farmland |
| Shambo loam, gravelly substratum | 44 | <1 | Not prime farmland |

**Table 14. Soil Map Units Within the Study Area**

| Map Unit Name* | Area (acres) | Percentage of Study Area | Farmland Classification |
|---|---|---|---|
| Sinnigam-Janesburg complex | 115 | <1 | Not prime farmland |
| Stady loam | 16 | <1 | Not prime farmland |
| Stady-Lehr loams | 39 | <1 | Not prime farmland |
| Straw loam | 13 | <1 | All areas are prime farmland |
| Vebar-Cohagen fine sandy loams | 478 | 2 | Not prime farmland |
| Vebar-Flasher-Tally complex | 624 | 2 | Not prime farmland |
| Vebar-Parshall fine sandy loams | 191 | 1 | Not prime farmland |
| Wayden-Moreau silty clays | 71 | <1 | Not prime farmland |
| Yegen-Parshall fine sandy loams | 40 | <1 | Not prime farmland |

Source: USDA 2016. *Where possible, soil map units with different slope ranges and the same name were combined.

Approximately two percent of the soils within the Study Area are prime farmland. Approximately 18 percent of the soils in the Study Area (with the exception of areas mapped as "Water", which are unrated) have high susceptibility to erosion by water (i.e., K-factors of 0.37 or greater). Thirty-two percent of the soils also have high susceptibility to wind erosion (i.e., USDA Wind Erosion Groups of less than 6) (USDA 2016).

### *7.10.2 Impacts*

The impact to soils within the Study Area will be limited to areas removed from agricultural production by occupancy of proposed Project components, including turbines, roads, collection lines, and a permanent SCADA MET. Construction disturbance activities including grading for roads and turbine footprints, excavation for turbine foundations and underground lines and other infrastructure has the potential to contribute to soil erosion through exposure of soils that were previously vegetated or stable. Access roads will be 16- to 34-foot wide[5] aggregate-surfaced roadways. Impacts include permanent operations disturbance to soils due to turbine placement, access road construction, placement of junction boxes associated with collection system, and the permanent SCADA MET. If cuts are made during construction, topsoil will be segregated and reapplied after final contours have been graded.

### *7.10.3 Mitigative Measures*

Wind and water erosion are potential hazards for the soils found in the Study Area. To minimize erosion during and after construction, best management practices (BMPs) for erosion and sediment control will be utilized. Construction sites will maintain sediment control practices in accordance with the SWPPP. A Project-specific erosion control protocol based on the SWPPP will be developed to treat disturbed and exposed soil surfaces and prevent erosion and contamination of natural water resources. Because turbine towers will not be located on significant slopes, only non-structural practices should be required. These practices include

[5] Roads required to support crane access to turbines during operation would remain up to 34 feet wide; all other roads may be built at 16 feet wide or reduced later to 16 feet.

temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization. In addition, during construction and operation, vehicle speed will be limited to 25 miles per hour (mph) on proposed Project roads to minimize dust.

## 7.11 Geologic and Groundwater Resources

### *7.11.1 Description of Resources*

Southwestern North Dakota and the area of the proposed Project lie within the Unglaciated Missouri Plateau section of the Great Plains physiographic province and on the south-central flank of the Williston Basin, a broad structural depression underlying parts of North and South Dakota, Montana, Manitoba, and Saskatchewan (USGS 1975). The Study Area is located southwest of the glaciated area of North Dakota, and within the Rolling Soft Shale Plain major land resource area (MLRA) which is an old, moderately dissected, rolling plain with local badlands, buttes, and isolated hills (NRCS 2006). Gentle slopes characterize most of the Study Area and local relief ranges from less than 2,620 to over 2,920 feet (see **Figure 3**). The rolling plateau surface of the Study Area is highly dissected by erosion. Scattered buttes, capped by resistant sandstone, limestone, or scoria beds, are remnants of sedimentary strata that once covered the area more extensively (USGS 1975).

Unconsolidated surface deposits include alluvium and terrace deposits of the Oahe Formation of Pleistocene age. These surficial sediments are underlain by the Tertiary Age bedrock Sentinel Butte and Golden Valley Formations (USGS 1975, NDGS 1980). The Sentinel Butte formation is mapped within the entire Study Area and consists of layers of silt, clay and sand with interbedded sandstone, lignite, baked clay, and limestone. The formation forms rolling topography over broad areas and has been eroded to badlands near rivers. The Golden Valley formation consists of clayey and sandy layers that are commonly found on hills, along the sides of buttes, and over upland areas (USGS 1975). Recent/Pleistocene landslide and mass movement deposits are not mapped within or in the surrounding area (NDGS 2015a).

North Dakota Geological Survey (NDGS) maps (Anderson 2010) indicate two potential viable sand and gravel resource areas within the south-central Study Area in Hettinger County (NW Sections 13 and 36, T136N, R97W). These sites are noted as a prospective sand and gravel borrow site, previously identified and characterized for road construction uses by NDDOT. A historic and recent sand and gravel extraction operation, as reported in annual Surface Mining Reports (SMR) compiled by the North Dakota State Soil Conservation Committee (NDSSCC), is also located within the south-central Study Area in Hettinger County (NW Section 18, T136N, R97W). NDGS clay maps (NDGS 2013) indicate that 23 percent (6,272 acres) of the Study Area are mapped as potential clay resources. The deposits are known to occur within the Golden Valley Formation that is present in western and central portions of the Study Area. The alumina content of clays is an indicator of the quality of the clay for use in ceramic production; and the content ranges from 16 to 23 percent in the Study Area. However, these deposits are not currently mined in the area of the Project, but are noted as a potential viable mineral resource.

Desktop data from the North Dakota Department of Mineral Resources oil and gas database (NDDMR 2015a) lists 2 exploration wells in the vicinity of the Study Area. These wells are listed as “dry and permit now cancelled”.

Lignite (coal) is known to occur in the Sentinel Butte Formation. There is an extensive economically viable mapped lignite reserve area mapped within and surrounding the Study Area based on a review of available NDGS maps (NDGS 2015b). Approximately 1,651 acres of the reserve is located within the Study Area. The lignite reserve is located along the edges of the Study Area within Sections 1 through14 and 17, T136N, R97W. There are no historic mining operations mapped within the Study Area according to the same map, although the file search at the SHSND identified coal mines in the Study Area that are outside of the Project footprint. No coal mines were observed in site visits to the Study Area.

According to the USGS, North Dakota is located in an area of very low seismic risk (USGS 2014). There are no known active tectonic features or faults known to generate earthquakes with magnitudes of 6 or greater in North Dakota (USGS 2015). Related geologic hazards, such as soil liquefaction, are therefore also unlikely. The NDGS landslide mapping program has not yet inventoried the Study Area for landslides, but review of available landslide information indicates that landslide areas are not located in the Study Area (NDGS 2016a).

Thick beds of sandstone in the lower part of the Sentinel Butte formation are important sources of groundwater in the Study Area (USGS 1975). These beds are also referred to as the Sentinel-Tongue River aquifer. The Tongue River formation is approximately 500 feet below ground surface in the Study Area and has a thickness from less than 50 to 200 feet. The Sentinel Butte sandstone aquifer can reach as much as 245 feet in thickness (USGS 1975). Water levels below ground surface are about 20 feet in the Sentinel Butte aquifer and yields can reach up to 100 gallons per minute (gpm). The Hell Creek formation is also a source of groundwater in the Study Area; and occurs at depths of 800 feet and greater and has a thickness of 220 to 510 feet. The formation consists of sandstone, siltstone, shale, and claystone; and well yields are generally less than 10 gpm. The Golden Valley aquifer system and Quaternary deposits are also sources of shallow water in the Study Area. Well yields are generally 25 to 75 gpm.

Review of driller logs available from the North Dakota State Water Commission database (NDSWC 2015) indicates that only one well has been drilled within the Study Area. The well is listed as a plugged observation well and additional well log information was not available.

### *7.11.2 Impacts*

Impacts of the proposed Project to available mineral resources are likely to be very limited. No coal resources are known to be actively or historically mined in the Study Area, however an economic deposit of lignite coal is present within the Study Area. Currently there are only six operations mining 32 million tons of coal annually in North Dakota (NDGS 2015c). Four operations are mining coal to feed steam boilers for electric generating plants in North Dakota. Two smaller operations are mining Leonardite (oxidized lignite) to be used in soil stabilization

and as drilling fluid additives. Per landowner agreements, Brady Wind II will coordinate with landowners to facilitate the compatibility of any future coal resource development. Based on the lignite reserve map, the Project will not affect to the coal resource area.

Two viable sand and gravel resources, and one recent or historic sand and gravel operation occur within the south central portion of the Study Area. Per landowner agreements, Brady Wind II will coordinate with landowners to facilitate the compatibility of any future development of these resources. Even if the proposed Project affects any of these sand and gravel deposits, the regional supply of these materials would not incur adverse effects, because the resource is abundant in the area.

A large area of viable clay resources occurs within western and central portions of the Project. Based on the available clay map, the Project will permanently impact 10 acres of these clay resources. Per landowner agreements, Brady Wind II will coordinate with landowners to facilitate the compatibility of any future development of these resources. Even if the proposed Project affects any of these clay resource deposits, the regional supply of these materials would not incur adverse effects, because the resource is abundant in the area. In addition, clay mining and alumina processing do not currently take place in this area of North Dakota.

The Study Area is located in a region of low seismic risk and landslide areas are not located in the Study Area based on review of available landslide information (NDGS 2015a). Consequently, geologic hazards are unlikely to impact the proposed Project, and the proposed Project is not likely to affect geologic hazards. No significant impacts to geology are, therefore, be anticipated.

Impacts to groundwater resources in the Study Area are anticipated to be minimal. Major withdrawals of groundwater will not be necessary due to the limited water supply needs of the proposed Project. Water sources for the proposed Project will be obtained from the Southwest Water Authority in Dickinson or the city of New England. Based on the small amount of increased impervious surface area that will be created by proposed Project components relative to the separation of these components and the size of the entire Study Area, the proposed Project will likely have minimal impacts to regional groundwater recharge. There are only a small number of private wells in the Study Area and proposed Project construction activities such as excavation and construction of foundations are unlikely to affect groundwater quality or flow patterns. Brady Wind II is coordinating with participating landowners to ensure that private water wells are not directly or indirectly impacted by the proposed Project. In addition, each turbine will be located a minimal distance of 2,000 feet away from inhabited residences, thereby minimizing the risk of impacts to private wells in the area, which are assumed to be located in proximity to the structures they serve.

Development of the turbine foundations may require subsurface blasting, which could potentially fracture bedrock and affect groundwater flow in the immediate vicinity of the disturbance. In the event that subsurface blasting is required, potential disturbances due to blasting will be localized and temporary, with groundwater likely to resume its natural course of flow down gradient of the

foundation. Although it is not anticipated, if dewatering of excavations is necessary, water would be discharged to the surrounding surface, allowing it to infiltrate back into the ground to minimize potential impacts and in compliance with a stormwater permit.

### *7.11.3 Mitigative Measures*

Brady Wind II is coordinating with land owners and mineral rights owners to identify potential future development issues. However, these resources are relatively abundant in Hettinger County and southwestern North Dakota, and it is expected that impacts to these resources would not result in overall adverse impacts to development of sand and gravel, and coal resources in the greater region.

Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within 2,000 feet of inhabited residences and the location of known water wells were mapped for avoidance. In the event that subsurface blasting is required, a blasting plan will be developed and implemented to keep the impacts localized and fracture the least amount of bedrock necessary for construction.

## 7.12 Surface Water and Floodplain Resources

### *7.12.1 Description of Resources*

Surface water and floodplain resources for the Study Area were identified by reviewing U.S. Geological Survey topographic maps, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, and US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data, and surface water features were surveyed for proposed Project facilities. There are numerous intermittent, unnamed tributaries within the Study Area (see **Figure 15**). The northern portions of the Study Area are primarily drained to the north by small unnamed intermittent streams into Antelope Creek. The Antelope River flows into the Heart River to the east/southeast. The Heart River is a major river that is a tributary of the Missouri River. The southern/western portion of the Study Area is drained to the south/southeast by small unnamed intermittent streams into the Cannonball River. The upper reaches of Thirtymile Creek drain the very eastern portion of the Study Area. Thirtymile Creek is a tributary of the Cannonball River which flows east/southeast to eventually join the Missouri River.

According to electronic data from FEMA, approximately 1 percent of the Study Area is within 100-year floodplains (**Figures 6 and 15**, **Appendix H**; FEMA 2015). These areas occur along Thirtymile Creek and tributaries to Thirtymile Creek in the eastern portion of the Study Area; and along small streams and drainages that drain northward toward Antelope Creek in the northern portion of the Study Area. The 100-year floodplain is defined as the area that would have a 1-percent chance to be inundated by a flood event in any given year.

### *7.12.2 Impacts*

Construction of the wind turbines, transformer pads, and access roads will disturb land within the Study Area. The wind turbines will be located to avoid Thirtymile Creek, intermittent streams/drainages, and 100-year floodplains. The current Project layout shows approximately

0.09 acres of permanent impacts from access roads in floodplains in Hettinger County; Brady Wind II will coordinate with the appropriate Hettinger County official to determine whether a floodplain permit is required. Access roads to the turbines will be built to avoid impacts to surface waters to the extent practicable.

### *7.12.3 Mitigative Measures*

Access roads constructed adjacent to Thirtymile Creek, intermittent streams/drainages, and 100-year floodplains will be designed in such a manner that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. An application (Notice of Intent) to obtain coverage under the NPDES general permit for stormwater discharges associated with construction activity will be submitted to the North Dakota DOH prior to construction of the proposed Project.

## 7.13 Wetlands

### *7.13.1 Description of Resources*

Wetlands are an important natural resource providing a number of critical ecosystem functions. Some of these functions include flood flow attenuation, streambank stabilization, discharge and recharge of ground water, detention and removal of sediments, and the detention, removal, and transformation of nutrients and contaminants. Wetlands also may provide habitat for wildlife and sites for human recreation, education, and aesthetic enjoyment.

Desktop analysis was employed to identify probable locations of wetlands and waterbodies prior to field work. Desktop analysis included review of NWI maps (USFWS 2014a), aerial photo imagery (USDA NAIP 2014), web soil survey maps (NRCS 2013), and national hydrography dataset (USGS 2010).

The initial desktop analysis was followed by a site visit to microsite turbine locations in November 2015. Wetland delineations conducted for the proposed Project began in November 2015. The delineations are being conducted using the methodologies cited in the US Army Corps of Engineers (USACE) Jurisdictional Determination Form Instruction Guidebook (USACE and EPA 2007), including the December 2, 2008 revised Rapanos guidance (EPA and USACE 2008). Additional micrositing site visits occurred in January and February 2016. The remainder of the proposed Project layout was surveyed in February and March 2016. Delineated features will be avoided where feasible. A report of findings will be provided to the PSC upon completion and within 30 days prior to the hearing.

### *7.13.2 Impacts*

Brady Wind II has committed to minimizing impacts to jurisdictional wetlands or other water of the United States (WoUS) to the extent practicable. Based on desktop analysis and preliminary field surveys, the proposed Project is not expected to have any “single and complete project” that would meet or exceed the 0.10-acre impact threshold that would require a preconstruction notification (PCN) to the USACE Bismarck Regulatory Office. “Single and complete project” refers to each discrete intersection between proposed Project infrastructure and jurisdictional

wetlands and other WoUS. Horizontal directional drilling may be used where necessary to avoid impacts to wetlands from collection line trenching during construction.

Based on discussions with the USACE, the proposed Project would likely meet the authorization criteria for a Section 404 Nationwide Permit (NWP) 12 (Utility Line Activities) and/or NWP 14 (Linear Transportation Projects). No Section 404 written permit is anticipated to be required as a result of construction of this proposed Project because it is not anticipated that the proposed Project would exceed the 0.10-acre threshold for PCN for NWP 12 or NWP 14. Nevertheless, if the proposed Project does cause minor impacts less than 0.10-acre in jurisdictional wetlands/WoUS, then general and state of North Dakota NWP requirements will be adhered to. These requirements are included in the USACE response letter in **Appendix H**.

A wetland survey report is underway and will be submitted to the PSC.

Brady Wind II will obtain a stormwater runoff permit from the North Dakota Department of Health prior to construction. Compliance with the conditions of this permit and those of the associated stormwater pollution prevention plan will ensure that surface water will not be adversely affected by runoff from areas disturbed by proposed Project construction activities.

### *7.13.3 Mitigative Measures*

Brady Wind II has committed to avoiding and minimizing impacts to potentially jurisdictional wetlands and other WoUS, as practicable. Wetlands will be delineated and flagged prior to construction when in close proximity to proposed Project features.

## 7.14 Vegetation

### *7.14.1 Description of Resources*

The Study Area is in a rural location with farming and livestock grazing and related agricultural operations dominating the land use. According to the NLCD data, 94 percent of the Study Area land use is either cultivated crops (51 percent) or grasslands/herbaceous (32 percent) or hay/pasture (11 percent; Homer et al. 2015). A desktop native prairie assessment for the proposed Project was conducted in July 2015 and updated in December 2015. Areas identified during the July 2015 desktop assessment were field verified in August 2015 where possible from public rights-of-way.

### *7.14.2 Impacts*

Areas of highest quality native prairie were avoided. Access road construction would result in the greatest effects to native vegetation, resulting in permanent loss of these habitats where they occur along selected routes. Installation of the proposed buried collection lines would result in some temporary effects to native and non-native grasslands.

### *7.14.3 Mitigative Measures*

Brady Wind II will work to avoid and to minimize impacts to existing trees and shrubs. Trees and shrubs anticipated to be cleared will be inventoried for replacement. Tree replacement will be on

a 2-to-1 basis with 2-year-old saplings; shrub replacement will be on a 2-to-1 basis with stem cuttings. Trees and shrubs will be replaced by the same species or similar species, according to the PSC Tree and Shrub Mitigation Specifications.

Impacts to grassland vegetation will be mitigated by reseeding the construction areas with native grasses following completion of construction activities, if approved by the landowner. Areas currently in crop will be replaced with crop in coordination with landowner preferences.

## 7.15 Wildlife

### *7.15.1 Description of Resources*

Although wind energy provides a clean, renewable, energy source, wind energy facilities have the potential to negatively impact wildlife, especially birds and bats, which can be killed or injured as a result of colliding with turbine blades. To address these concerns, field studies to document wildlife and habitat within the Study Area in accordance with the voluntary USFWS Land-Based Wind Energy Guidelines (USFWS 2012a), are currently planned or underway. Desktop habitat assessments for bats and whooping crane (*Grus americana*) are being prepared. Bat acoustic monitoring, avian point-count surveys, and grouse lek surveys will be conducted in spring 2016. Biweekly eagle use surveys began in November 2015 and are scheduled to continue through summer 2016. An aerial fall raptor nest inventory was conducted in mid-November 2015, after the deciduous trees lost their leaves. Raptor nest surveys were also conducted in January, February, and March 2016.

**Avian Species**

Based on the location of the Study Area and the habitat present, it is expected that the majority of avian species present within the Study Area would be those typically associated with agriculture and grassland habitats. The most common species observed during fall avian surveys were red-winged blackbird (*Agelaius phoeniceus*), horned lark (*Eremophila alpestris*), American crow (*Corvus brachyrhynchos*), western meadowlark (*Sturnella neglecta*), American robin (*Turdus migratorius*), barn swallow (*Hirundo rustica*), and common grackle (*Quiscalus quiscula*). Additionally, other birds migrating between breeding and wintering grounds may also pass through the Study Area given its position within the Central Flyway (USFWS 2015a).

Breeding, wintering, and migratory bird habitat within the Study Area is primarily grassland or agriculture, but there are also small, scattered wooded, riparian, and wetland areas available.

**Bats**

Based on available information, five bat species (big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) are expected to have a moderate or high potential to occur within, or in the vicinity of the Study Area. Migratory tree-roosting bats, such as eastern red bats, silver-haired bats, and hoary bats, travel long distances at altitudes that may overlap with the height of wind turbine blades, making them particularly susceptible to direct mortality from wind turbines. These species have been the predominant species found during post-construction mortality studies at operational wind energy facilities in North America (Arnett et al.

2013).The remaining bat species found in North Dakota are expected to have a low potential of occurrence.

Suitable natural roosting habitats in the Study Area are limited to individual trees, windrows, woodlots, buildings, bridges, and riparian zones. The availability of tree-roosting habitat in the Study Area is limited due to the small size and fragmented nature of the wooded habitat and accounts for approximately 1 percent of the Study Area. Farmstead buildings (houses, barns, etc.) could also provide potential roosting locations within the Study Area; however, the suitability of these man-made structures has not been evaluated. There are no known abandoned mines within the Study Area that bats could use for roosting (PSC 2013). Therefore, bat use of the Study Area is likely to be low given the limited availability of roosting habitat.

### *7.15.2 Impacts*

Potential impacts from the proposed Project to avian and bat species include collisions with wind turbines, and guyed temporary METs, as well as loss of habitat.

**Avian Collisions**

The collision risk for birds at the proposed Project would likely be low based on records of fatalities at other wind energy facilities. Recent meta-analyses relevant to the proposed Project have estimated an average all-bird (mostly small birds) fatality rate of 1.81 birds/MW/year in the Great Plains (Loss et al. 2013) and 2.29 small birds/MW/year in the Prairie biome (Erickson et al. 2014). Discrepancies between the two rates are most likely due to differences in the way geographic areas were defined in the studies; however, both regions encompassed the Study Area and it is likely that rates of collision at the proposed Project would be similar to rates reported by these studies.

**Bat Collisions**

The collision risk for bats at the proposed Project would likely be low based on records of fatalities at other wind energy facilities in the Great Plains which average 3.07 bats/MW/year and range from 0.12 to 10.85 bats/MW/year (Hein et al. 2013).

**Habitat Loss**

As stated in the USFWS voluntary wind energy guidelines, a species of habitat fragmentation concern is a species “for which a relevant federal, state, tribal, and/or local agency has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area” (USFWS 2012a). The USFWS North Dakota field office has developed a list of species of habitat fragmentation concern for the state (USFWS 2013a). The range for seven of the eleven species of habitat fragmentation concern includes the Study Area – Baird’s sparrow (*Ammodramus bairdii)*, chestnut-collared longspur (*Calcarius ornatus*), grasshopper sparrow (*Ammodramus savannarum*), northern harrier (*Circus cyaneus*), sharp-tailed grouse (*Tympanuchus phasianellus*), Sprague’s pipit (*Anthus spragueii*), and upland sandpiper (*Bartramia longicauda*) (USFWS 2013a). Habitat fragmentation from the construction of a wind energy project may potentially reduce habitat available for these species.

However, because the proposed Project would be largely located in already disturbed agricultural areas that are generally considered suboptimal habitat for most avian species, habitat fragmentation is likely to be minimal for most species. Some short-term displacement in grassland areas would be expected, but the effects would be mostly limited to the construction period and the immediate area around the turbines (Pearce-Higgins et al. 2012, Shaffer and Buhl 2015). For bats, the limited and highly fragmented nature of existing habitat in the Study Area suggests that development of the Project will be unlikely to reduce or fragment bat habitat.

Potential impacts to sensitive species are discussed in more detail in **Section 7.16.2** below.

### *7.15.3 Mitigative Measures*

Brady Wind II is conducting environmental studies of the Study Area to aid in the final placement of turbines, roads, and associated facilities to avoid and minimize impacts to wildlife and native habitat. The following measures will be used, to the extent practicable, by Brady Wind II to help avoid potential impacts to wildlife in the Study Area during selection of the turbine locations and subsequent development and operation:

- Siting access roads and turbines away from wetlands and waterbodies to the greatest extent practicable.
- Designing the layout of the proposed Project to avoid permanent impacts where feasible. Avoiding wetland impacts generally reduces potential impacts to migratory birds and bats and sensitive habitat.
- Burying collection lines from the turbines to the collection substation to avoid collision risk following the APLIC (2006) suggested practices, if practicable.
- Bird diverters have been installed on the guy wires for the four temporary MET towers to reduce collision risk.
- Temporarily disturbed areas will be reseeded or restored to crop, depending on original conditions and landowner preference. Native prairie will be avoided to the extent practicable, and will be reseeded using a native prairie mix in accordance with landowner preferences.
- Implementing a Wildlife Response and Reporting System (WRRS) once turbine construction has been completed. The WRRS would include protocols for field technicians to report and document bird and bat mortalities during routine maintenance operations. If any dead or injured birds or bats are found within the proposed Project boundaries by Project personnel, its location will be marked and reported promptly to the on-duty Plant Lead/Site Supervisor. Dead or injured birds or bats will not be moved by any unpermitted individual.
- Conducting post-construction bird and bat mortality surveys for 1 year following construction of the proposed Project.
- Developing a voluntary Bird and Bat Conservation Strategy (BBCS), which includes an adaptive management approach, so that information gathered and experience gained from post-construction monitoring can be used to inform future management decisions at the proposed Project.

- Consulting with NDGF regarding grouse habitat, and conducted lek surveys in April 2016, after consulting with NDGF to develop survey protocols (**Appendix H**).
- Proposing in its lighting plan to use the minimum number of aviation hazard lights acceptable to the FAA to avoid attracting migrating birds and bats to the turbines. Brady Wind II will also install motion-activated lighting or down-shielded lighting on other proposed Project facilities that require lighting at night (i.e., the collection substation) to avoid the potential to draw birds and bats toward the facility.
- During construction and operation, limiting vehicle speed limited to 25 mph on proposed Project roads to minimize wildlife collisions.

## 7.16 Rare and Unique Natural Resources

### *7.16.1 Description of Resources*

The Endangered Species Act (ESA), as administered by the USFWS, mandates protection of species federally listed as threatened or endangered and their associated habitats. Candidate species receive no statutory protection from the USFWS unless they are formally listed.

The following federally listed species have potential to occur within Hettinger and Stark counties and potentially the Study Area: whooping crane, black-footed ferret (*Mustela nigripes*), northern long-eared bat, and gray wolf (*Canis lupus*) (USFWS 2015b). Although the USFWS is not aware of occurrences of Dakota skipper (*Hesperia dacotae*) in Hettinger or Stark counties (WAPA and USFWS 2015), Brady Wind II is coordinating with USFWS to review updated known occurrences to evaluate if Dakota skippers occur in the vicinity of the Study Area (K. Shelley, USFWS, pers. comm.). Additionally, there is potential for bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos,* respectively*)* to occur within the Study Area; both species are protected under the Bald and Golden Eagle Protection Act (BGEPA).

These federally protected species are described below in taxonomic order.

**Black-footed Ferret (Federally Endangered)**
The black-footed ferret, a medium-sized member of the weasel family, was listed as endangered in 1967 (USFWS 2014b). The black-footed ferret is an obligate predator of prairie dogs and occurs exclusively in prairie dog colonies which it depends upon for food and shelter (USFWS 2014b). Previously believed extinct, 18 individuals were discovered in 1986 and were then used to develop a breeding and reintroduction program (USFWS 2010). It is estimated that over 1,000 black-footed ferrets occur in the wild with another 300 within breeding facilities (USFWS 2014b). Although it is thought to be extirpated from the state (NDGF 2012), there was an unconfirmed report of a black-footed ferret sighting near the town of Dickinson, north of the Project in 2012. The USFWS is not aware of any black-footed ferrets in the vicinity of the Project (K. Shelley, USFWS, pers. comm.). No reintroductions of black-footed ferrets have been made in North Dakota (USFWS 2014b). Reintroductions were once considered in the area southwest of the town of New England, but this area is no longer under consideration for reintroductions (K. Shelley, USFWS, pers. comm.).

The grassland habitat within the Study Area is highly fragmented, and Black-footed ferrets only occur in large, contiguous prairie dog colonies. NDGF reported no prairie dog towns within the Project Area, and no prairie dog towns were found during aerial nest surveys conducted in March 2016. Activity at prairie dog towns within 10 miles of the Project Area was surveyed during the February raptor nest survey. Prairie dog activity was confirmed at one of the nine known prairie dog towns within 10 miles of the Project. That colony is located approximately 9 miles southwest of the Project Area. During the March 2016 raptor nest survey, all activity was observed at all nine prairie dog towns within 10 miles of the Project. Based on the range, known reintroduction locations of black-footed ferrets, and habitat within the Study Area, it is unlikely the black-footed ferret would occur within the Study Area.

**Northern Long-eared Bat (Federally Threatened)**

The northern long-eared bat was listed as threatened with a final 4(d) rule effective February 16, 2016 (USFWS 2016c). The final 4(d) rule limits the prohibition of incidental take to areas affected by white-nose-syndrome (WNS) and an additional 150-mile buffer around this area (WNS Zone). Under the final 4(d) rule, all other take incidental to other lawful activities would be allowed in those areas of the northern long-eared bat range. Additionally, lethal take by operating wind turbines is specifically excluded from the prohibition of incidental take throughout the range of the northern long-eared bat. Within the WNS Zone, incidental take is prohibited (1) if it occurs within a hibernaculum, or (2) if it results from tree removal within 0.25 miles of a known hibernaculum or within 150 feet of a known, occupied roost tree. North Dakota, and the Study Area specifically, fall outside of the area where take is prohibited as currently mapped by the USFWS.

Northern long-eared bats have been found from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming (USFWS 2013b). The northern long-eared bat is considered common only in discrete portions of its western range, including the Black Hills of South Dakota (USFWS 2013b). This species roosts in trees during the spring, summer, and fall (USFWS 2013b). The species prefers large, contiguous tracks of upland forested habitat during the summer residency period. Natural roosting habitats in the Study Area are limited to individual trees, wind breaks and woodlots. Northern long-eared bats do not undertake long-distance seasonal migrations between summer and winter ranges, but do undertake shorter distance movements between summer roosts and winter hibernacula. These seasonal movements are generally between 35 miles and 55 miles, but may be substantially longer in some areas, perhaps as great as 168 miles (USFWS 2013b). Information on habitat use during migration is limited, but individuals in transit are likely to use foraging habitats at least part of the time. Northern long-eared bats spend winter hibernating in caves and mines. However, there are no known wintering hibernacula within North Dakota (USFWS 2013b).

The northern long-eared bat has a low likelihood to occur in the Study Area during the summer residency period (approximately May 15–August 15) because of the lack of large contiguous woodlots and due to the species being uncommon in the far western extent of its range, which includes the Study Area. No northern long-eared bats were detected during acoustic monitoring

July through November 2015 at the adjacent proposed Brady Wind Energy Center. The species has been detected in Billings and Hettinger counties (Gilliam and Barnhart 2011, WAPA and USFWS 2015), and could occur in the Study Area during seasonal movements to and from hibernacula; however, no hibernacula are known to occur in the state. Therefore there is a low overall likelihood that the northern long-eared bat occurs within the Study Area.

**Gray Wolf (Federal Endangered)**
The gray wolf was listed as endangered in 1974 (USFWS 2014c, USFWS 2014d). Gray wolves previously inhabited a large portion of the United States in a variety of habitats including tundra, forests, grasslands and deserts. Although the gray wolf has been reported in Hettinger and Stark counties (USFWS and Western 2015), the Study Area lacks forested areas known to support wolf pack establishment and persistence (USFWS 2012b, NatureServe 2014). Therefore, there is a low to moderate likelihood of the species transiting the Study Area, but it is unlikely to maintain a local resident population.

**Whooping Crane (Federally Endangered)**
The whooping crane listed as threatened with extinction in 1967 and endangered in 1970 – both listings were 'grandfathered' into the ESA of 1973 (CWS and USFWS 2007). The whooping crane population belonging to one flock that migrated between Wood Buffalo National Park in Canada and the Aransas National Wildlife Refuge in Texas was reduced to 16 individuals during the winter of 1941-42. With conservation efforts the Aransas-Wood Buffalo National Park population, the single self-sustaining wild population, has been steadily rising with the population estimate at 304 individuals (with a 95 percent probability of actual flock size being between 267-350 birds) during the 2014-2015 winter census (USFWS 2015d). A 200-mile wide migration corridor has been delineated for this population that contains 95 percent of all verified sightings. Spring migration occurs primarily in April and May whereas fall migration occurs primarily in October and November (Lewis 1995). Stopover habitat during migration includes a variety of croplands with roosting occurring in shallow, freshwater inland wetlands (Lewis 1995). Four additional areas associated with major stopover areas are designated as critical habitat: Quivira National Wildlife Refuge and Cheyenne Bottoms State Wildlife Management Area in Kansas; a section of the Platte River in Nebraska; and the Salt Plains National Wildlife Refuge in Oklahoma (USFWS 2012a). Wind energy development has been identified as a threat to the species due to the potential for displacement due to the presence of the turbines, and potential for collisions with operational wind turbines and new power lines (USFWS 2012a).

A desktop likelihood assessment for whooping crane has been prepared for the Study Area. The Project is outside the whooping crane migration corridor, although there is foraging and roosting habitat available within the Study Area. The likelihood of whooping cranes occurring within the Study Area is low based on the location of the Study Area being outside of the migration corridor.

**Bald Eagle (Federally Protected under BGEPA)**
Bald eagles occur throughout the contiguous United States, Alaska, and Canada (Buehler 2000). Bald eagles may occur in North Dakota as breeders, winter residents, migrants or year-

round residents. The nesting period in North Dakota begins with nest building or maintenance in February and ends when the young fledge, typically in July (Johnson 2010). Nests are relatively close to water, typically less than 2 miles. Although bald eagle nests have historically been found primarily along the Missouri River and Red River (Johnson 2010), the number of bald eagle nests has increased in North Dakota over the last 20 years as the species continues to recover from population declines, primarily due to environmental contaminants. Nesting bald eagles now occur in more than half of the counties in the state (Dyke et al. 2015) growing steadily to 140–150 active bald eagle nests to date (Johnson 2015). Most of the nests occur near streams and mid- to large-sized lakes, but bald eagles are also initiating nests in areas not considered traditional nesting habitat such as cottonwood trees surrounded by cropland or grassland (Dyke et al. 2015). The home range of bald eagles is variable. Populations in Oregon and Washington have home ranges of 2.7 to 18.1 square miles, with an average of 8.5 square miles (Watson et al. 1991), and in Montana the average home range size was 3.5 square miles (Stangl 1994). Along the Mississippi River in Minnesota, nests were located an average of 0.94 mile from the nearest neighboring nest (Mundahl et al. 2013).

During the non-breeding season (September through January; USFWS 2013c), bald eagles concentrate near large bodies of water where the water remains unfrozen and roost up to 20 miles from foraging sites, depending on abundance of prey (Buehler 2000). Bald eagles are opportunistic foragers that prey primarily on fish but also feed on other aquatic and terrestrial vertebrates, as well as on carrion (Buehler 2000).

No bald eagle nests were found within the Study Area or 2-mile buffer surrounding the Study Area during a nest inventory conducted in November 2015. There is one known bald eagle nest within 10 miles of the Study Area. The nest was located during spring 2015 aerial raptor nest surveys conducted in support of another proposed wind energy facility (now canceled) approximately 15 miles to the northeast of the Study Area. The bald eagle nest is located approximately 8.5 miles to the northeast of the proposed Project in an isolated stand of trees surrounded by agricultural habitat. No additional bald eagle nests were found within 10 miles of the Study Area based on a query to NDGF in May 2015 (NDGF 2015) or during aerial raptor nest surveys conducted in January, February, and March 2016.

Bald eagles have a low likelihood of occurring in the Study Area during the winter given the absence of large bodies of water that remain unfrozen within or near the Study Area. Although bald eagles have a low likelihood of breeding within the Study Area due to a lack of suitable nesting habitat, bald eagles nesting in the vicinity of the Project could occur in the Study Area when foraging or migrating.

**Golden Eagle (Federally Protected under BGEPA)**

Golden eagles are common in western North America west of the 100th meridian with small populations also present in the eastern portions of Canada and the United States (Kochert et al. 2002). Golden eagles in the western U.S. are most commonly associated with open and semi-open habitats such as shrublands, grasslands, woodland-brushlands, and coniferous forests as well as in farmland and riparian habitats (Kochert et al. 2002). Both year-round and migratory

golden eagles occur in North Dakota (Dyke et al. 2015). Golden eagles nest on cliffs, utility poles, and in large trees in open areas from late January through August (Kochert et al. 2002). Golden eagles in North Dakota nest mainly west of the Missouri River (Johnson 2015) and egg-laying occurs from late March to early May (Stewart 1975, DeLong 2004). The species feeds upon a wide variety of prey species but tends to hunt small to medium-sized mammals such as hares, rabbits, ground squirrels, marmots, and prairie dogs depending upon local availability (Bloom and Hawks 1982, Kochert et al. 2002).

No golden eagle nests were found within the Study Area or 2-mile buffer surrounding the Study Area during a nest inventory conducted in November 2015. In response to a May 2015 request for locations of known eagle nests within 10 miles of the Study Area, NDGF provided locations of two known golden eagle nests within 10 miles of the Study Area (NDGF 2015). The nests were located on large sandstone bluffs and were among a group of six nests approximately 9.6 to 10.7 miles to the northwest of the Study Area. Aerial surveys conducted in 2016 determined that one nest was occupied by a ferruginous hawk and the other nest was destroyed. Subsequent aerial raptor nest surveys conducted in January, February, and March 2016 documented 4 occupied golden eagle nests within 10 miles of the Project Area. In March 2016, there was one occupied nest 0.2 miles outside edge of the Project Area; the other three nests were 0.1 – 8.2 miles outside of the Project Area.

Golden eagles have a moderate likelihood of breeding within the Study Area based on the observation of nesting activity outside the Study Area in 2016. However, nest density is expected to be low due to a general lack of suitable nesting habitat in the Study Area and lack of observations of eagles during eagle surveys conducted since November 2015. Golden eagles nesting in the vicinity of the Study Area may occur in the Study Area when commuting from the nest, foraging, or migrating, although the prey base appears to be limited (e.g., no prairie dog towns have been observed within the Study Area during eagle surveys).

**Dakota Skipper (Federal Threatened)**

The Dakota skipper (*Hesperia dacotae*) is a small butterfly found in the tallgrass and mixed-grass prairies of the Northern Great Plains. On October 24, 2014, the USFWS listed the Dakota skipper as a threatened species (USFWS 2014a). Although its historic range once consisted of vast, unbroken native prairie in the north-central U.S. and south-central Canada, its current range is now limited to scattered remnants of high quality native prairie in Minnesota, North Dakota, South Dakota, and southern Manitoba and Saskatchewan (USFWS 2015a). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and fire, and the loss of native prairie habitat. The USFWS proposed to designate 50 units, ranging in size from 31 acres to 2,887 acres, in North Dakota, Minnesota, and South Dakota as critical habitat (USFWS 2014b). The closest proposed critical habitat to the Study Area is approximately 70 miles to the north in McKenzie County. The Dakota skipper is not known to occur in Hettinger or Stark counties (USFWS and Western 2015); however, the two counties are on the western extent of the species' range (USFWS 2015a), and as a result, there is a low likelihood for the species to occur within the Study Area.

Brady Wind II has evaluated potential habitat for the Dakota skipper within the Study Area and has identified 177 acres (less than 1 percent of the Study Area) of excellent habitat and 7,120 acres (27 percent of the Study Area) of good habitat. Approximately 1,600 acres (6 percent of the Study Area) were classified as undetermined (i.e., could not be determined from desktop analysis or verified in the field due to access limitations).

### *7.16.2 Impacts*

Based on operational data from the WRRS protocol in use at NEER's 12 operating wind farms in North Dakota, there have been no fatalities of any federally-listed species. Per the WRRS protocol, if a dead or injured federally protected species is found, it must be left undisturbed and reported to USFWS.

**Black-footed Ferret**

Based on the limited range, lack of reintroduction locations of black-footed ferrets, and lack of habitat within the Study Area, and given that NDGF believes that the black-footed ferret is extirpated from the state (NDGF 2012), it is unlikely that the proposed Project would affect the black-footed ferret.

**Northern Long-eared Bat**

The northern long-eared bat is considered to be uncommon in North Dakota and the Study Area is located at the edge of the species' range (USFWS 2013b, Dyke 2014). There is little suitable roosting or foraging habitat in the Study Area and no known hibernacula in North Dakota for the northern long-eared bat. The species could potentially collide with operational turbines during the spring and fall periods when migrating between summer roosts and winter hibernaculum. Although northern long-eared bat fatalities have occurred at wind energy facilities, there have only been 41 confirmed records, all of which occurred at wind energy facilities located east of the Mississippi River (USFWS 2015c). No northern long-eared bat fatalities from wind energy facilities have been documented in North Dakota (USFWS 2015c). Therefore, there is a low likelihood that the proposed Project would affect the northern long-eared bat.

***Gray Wolf***

As gray wolves are unlikely to establish a resident population within the Study Area, it is unlikely the Project will impact the gray wolf. This conclusion is based on the high degree of agricultural use of the Study Area and the roadways associated with this use, which create a combination of human and road density that is less than optimal for wolves (e.g., Mech et a. 1988, Fuller et al. 1992, Erb and Sampson 2013).

**Whooping Crane**

Collisions with turbines, METs, or transmission lines are a potential impact from the proposed Project. However, the Project is outside of the whooping crane migration corridor and cranes exhibit avoidance behavior, which minimizes the potential for collisions. Sandhill cranes, which often accompany whooping cranes during migration, have been documented altering flight direction in response to turbines at a wind facility in South Dakota (Nagy et al. 2012), and multiple studies have documented sandhill cranes gradually climbing as they approach marked

power lines (Morkill and Anderson 1991, Murphy et al. 2009). Furthermore, no whooping crane fatalities have been recorded at wind facilities to date, suggesting that likelihood of collision may be low (USFWS 2009).

The potential for indirect impacts resulting from habitat loss is likely to be low, because the Study Area is outside the whooping crane migration corridor and less than one percent of the Study Area is suitable stopover habitat (**Table 10**).

Based on location of the Study Area outside of the migration corridor and the avoidance and minimization measures discussed in **Section 7.16.3** (e.g., buried collection systems), there is a low likelihood that the proposed Project would impact the whooping crane.

**Bald Eagle**
Six bald eagle mortalities associated with wind energy facilities within the United States were reported from 1997 through June 2012 (Pagel et al. 2013). To date, one bald eagle mortality has been reported at a wind energy facility in North Dakota (Public Prairie Broadcasting 2015). Bald eagles are believed to be at less risk of turbine collision than golden eagles because they tend to focus their hunting efforts for fish and waterfowl in lakes and rivers (Buehler 2000). Although the landscape within the Study Area does not support any large waterbodies or an abundance of smaller waterbodies that would attract bald eagles for nesting or foraging, there is one known bald eagle nest and one unoccupied large stick nest located approximately 5 miles to the northeast of the Study Area. Additionally, three unidentified large stick nests are located within 10 miles of the Study Area. Prairie dog activity was confirmed at all of the nine known prairie dog colonies within 10 miles of the Study Area in March 2016. The presence of occupied bald eagle nests in the vicinity of the Study Area suggests that the species may potentially forage in or pass through the Study Area during the breeding season. Eagle use surveys begun in November 2015 have detected no bald eagles within the Study Area.

**Golden Eagle**
Seventy-nine golden eagle mortalities associated with wind energy facilities within the United States were reported from 1997 through June 2012, excluding the Altamont Pass Wind Resource Area in California (Pagel et al. 2013.); however, to date no golden eagle mortalities have been reported at wind energy facilities in North Dakota. Golden eagles are believed to be more at risk of turbine collision than bald eagles because they hunt for land-based prey along topographic contours where turbines are often located (Kochert et al. 2002).

Eight known or potential golden eagle nests occur on sandstone bluffs within 10 miles of the Study Area. Four occupied nests, all within trees, are located within 10 miles of the Project Area. Golden eagles will likely forage in or pass through the Study Area; however, there are no known features that would concentrate golden eagles within the Study Area compared to the surrounding area. Eagle use surveys begun in November 2015 have detected no golden eagles in the Study Area.

**Dakota Skipper (Federal Threatened)**
The Dakota skipper is not known to occur in Hettinger and Stark counties, and the Study Area is on the western extent of the species' range. Approximately 28 percent of the Study Area was classified as Excellent/Likely or Good/Possible potential Dakota skipper habitat and approximately 6 percent was undetermined. Brady Wind II has avoided locating Project facilities on lands classified as Excellent/Likely, and has avoided locating Project facilities on lands classified as Good/Possible where practicable. Therefore, the impacts of the Project on the Dakota skipper are likely to be low.

### *7.16.3 Mitigative Measures*

General avoidance and minimization practices for vegetation and wildlife are discussed in **Sections 7.14.3** and **7.15.3**, respectively. Brady Wind II has committed to the following additional avoidance and minimization measures which are specific to potential impacts to federally threatened and endangered species:

- In addition to the training provided via the WRRS (see **Section 7.15.3**), Brady Wind II will provide all construction and maintenance staff with training in federally listed species identification and will provide identification guides for whooping cranes to be kept in all vehicles.
  If an injured or dead endangered or threatened animal is found in the Study Area, Brady II employees will promptly immediately notify the USFWS after completing the WRRS documentation process.

## 7.17 Summary of Impacts

**Table 15** summarizes the resources that would be affected as a result of the Project and the appropriate mitigation.

**Table 15. Summary of Impacts and Mitigation**

| Resource | Impact | Mitigation |
|---|---|---|
| Socioeconomics | Primarily positive due to increased expenditures during construction and the long term benefits of lease payments and an increased tax base of the county due to property taxes. | N/A |
| Land Use | Up to 74 acres of land would be permanently disturbed by turbines, associated access roads, junction boxes associated with collection lines, and a permanent SCADA MET. Temporary impacts during construction for turbine installation, road construction, cable trenching, laydown and contractor staging, and turbine storage would require an additional 837 acres. | Brady Wind II will work with landowners and regulatory agencies to minimize impacts of the proposed Project. |

**Table 15. Summary of Impacts and Mitigation**

| Resource | Impact | Mitigation |
|---|---|---|
| Public Services | Minimal impact to existing services and infrastructure. | Construction and operation of the proposed Project will be in accordance with all associated local, state, and federal permits and laws, as well as industry construction and operation standards. Due to the minor impacts expected, additional mitigation measures are not required. |
| Human Health and Safety | No adverse impacts are anticipated. No inhabited residences are predicted to have more than 30 hours per year of shadow flicker. | Turbines will be lighted to comply with FAA requirements. A variety of security measures will be implemented to reduce the chance of physical and property damage. |
| Noise | No adverse impacts are anticipated to noise-sensitive resources (inhabited residences). | Noise modeling results indicated that received sound levels are all below the North Dakota noise requirement (Chapter 69-06-08-01(4)), which prescribes a limit of 50 dBA within 100 feet of an inhabited residence. |
| Cultural and Archaeological | The proposed Project would not directly impact any architectural resources. Avoidance buffers have been created for archaeological sites recorded during the pedestrian survey of the Survey Corridor. Brady Wind II commits to avoid any newly documented sites and the previously-documented cultural resources within the Survey Corridor. | Sites within or adjacent to the construction easement will be fenced prior to construction. An unanticipated discoveries plan has been prepared for the Project. |
| Recreational Resources | No direct impacts to recreational resources are anticipated. | No mitigation measures are proposed at this time. |
| Land Based Economies | Up to 74 acres of land would be permanently affected. An additional 837 acres would be temporarily disturbed for turbine installation, road construction, cable trenching, and other construction activities. | Brady Wind II has worked with landowners to minimize impact to their land. |
| Soils | Impacts to soils limited to 74 acres of permanent disturbance and 837 acres of temporary disturbance. | BMPs for erosion and sediment control will be utilized to minimize wind and water erosion at the site in association with the Project SWPPP. Only land needed for the facility will be permanently affected. Temporarily disturbed areas will be restored. |
| Geologic and Groundwater Resources | Impacts to groundwater resources in the Study Area are anticipated to be minimal | N/A |
| Surface Water and Floodplain Resources | Access roads, turbines, and other proposed Project facilities will be located and constructed in such a manner that impacts to surface waters will be avoided to the extent practicable. | Brady Wind II will implement BMPs to minimize erosion and sedimentation at the site in association with the Project SWPPP. |
| Wetlands | Impacts to wetlands and WoUS will be avoided and minimized to the extent practicable. | Wetlands in close proximity to the construction easement will be delineated and flagged prior to construction. Horizontal directional drilling will be used where necessary to avoid permanent impacts to wetlands from collection line trenching during construction. |

**Table 15. Summary of Impacts and Mitigation**

| Resource | Impact | Mitigation |
|---|---|---|
| Vegetation | Up to 74 acres of land would be permanently affected. An additional 837 acres would be temporarily disturbed during construction. Areas of highest quality native prairie were avoided. Brady Wind II will minimize impacts to existing trees and shrubs as practicable and will use BMPs during construction and operation to minimize impacts. | If impacts to trees or shrubs cannot be avoided, the individual trees or shrubs will be replaced per PSC regulations. Temporarily disturbed areas will be reseeded or restored to crop, depending on original conditions and landowner preference. Native prairie will be reseeded using a native prairie mix in accordance with landowner preferences. |
| Wildlife | Potential avian and bat collisions may occur, but are anticipated to be relatively few. Habitat fragmentation is likely to be minimal for most avian species; the Project is unlikely to fragment bat habitat. | A variety of mitigative measures will be implemented, as discussed in Section 7.15.3. The proposed Project's WRRS will be implemented after construction of the proposed Project as described in Section 7.15.3.and Brady Wind II will complete 1 year of post-construction mortality monitoring. Brady II will prepare a Project-specific BBCS that documents these measures. |
| Rare and Unique Natural Resources | The Project is unlikely to affect the black-footed ferret and gray wolf; there is a low likelihood for the Project to affect the northern long-eared bat, whooping crane, and Dakota skipper. No eagle nests are located in the Study Area although 1 bald and 4 golden eagle nests are located within 10 miles of the Study Area. No eagle use has been detected within the Study Area. | O&M staff will be trained to identify federally protected species. Dead or injured federally protected species will be promptly reported to USFWS. |

# 8. PUBLIC AND AGENCY COORDINATION

## 8.1 Public Outreach

Principal stakeholders in the proposed Project are landowners that have entered into agreements with Brady Wind II to provide wind rights for the proposed Project.

A public open house was held in November 2015 for the Brady Wind Energy Center, which included discussion of the possibility of developing the Brady II Project.

## 8.2 Agency Coordination

Per Section 69-06-01-05 of the PSC's administrative rules, Brady Wind II and its representatives have contacted key local, state, and federal agencies to inform them of the proposed Project and for assistance in identifying concerns or issues within the Study Area. Letters identifying the Study Area boundary were sent to the list of agencies included in **Appendix H** in November 2015, January 2016, and April 2016. Agency correspondence and responses received as of April 14, 2016, are included in **Appendix H; Table 16** summarizes the responses received from agencies to date.

Brady Wind II will continue to meet with county officials as the proposed Project moves forward.

**Table 16. Summary of Agency Responses**

| Agency | Response Date | Response Summary |
|---|---|---|
| USACE | 11/24/15 | If a Section 10 and/or Section 404 permit is required, a permit application must be submitted to USACE. Permit application form and instructions were provided. |
| | 2/2/16 | The agency reviewed the revised Study Area. If a Section 10 and/or Section 404 permit is required, a permit application must be submitted to USACE. Permit application form and instructions were provided. |
| U.S. Department of Commerce NTIA | 12/17/15 | After a 45+ day period of review, no agencies had issues with turbine placement in this area. |
| USFWS | 1/20/16 | USFWS reviewed the Study Area boundary and confirmed there were no USFWS interests (fee-title lands) within or near the Study Area. |
| | 1/21/16 | Email communication confirming there are no grassland easements west of the Missouri River. |
| | 1/26/16 | NEER provided draft meeting minutes, updated habitat maps, native prairie assessment methodology, and shape file sets for cross checking against USFWS internal database – from a meeting held with USFWS in December 16, 2015. |
| State Historical Society of North Dakota | 11/27/15 | Recommends Class I file search and Class III Intensive Cultural Resources Inventories for archaeological sites and historic structures. |
| | 1/15/16 | Email from Susan Quinnell confirming that a 2-mile buffer is adequate for the architectural resources survey area. |

**Table 16. Summary of Agency Responses**

| Agency | Response Date | Response Summary |
|---|---|---|
| | 2/5/16 | Recommends Class I file search and Class III Intensive Cultural Resources Inventories for archaeological sites and historic structures. Provides a contact for assisting the architectural historian with development of the visual area of study. |
| NDGS | 12/04/15 | Coal and clay deposits are present within the Study Area. Landslide inventory has not been conducted in this area and landslide maps are not available. |
| ND Department of Health | 12/07/15 | The agency believes the environmental impacts of the Project will be minor. Impacts to streams should be avoided and disturbed areas should be revegetated. Projects disturbing one or more acres must have a permit to discharge stormwater runoff. The agency believes the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota. |
| | 2/12/16 | The agency provided comments in addition to those initially provided on 12/7/15. Fugitive dust emissions should be minimized during construction. A total maximum daily load (TMDL) for *E.coli* has been developed for Dead Horse Creek, and stormwater runoff from the project should not contribute to the impairment if appropriate practices are used to manage sanitary waste. Noise from construction activities can be minimized by ensuring that construction equipment is equipped with a working muffler and if construction activities are not conducted during early morning or late evening hours. |
| ND Parks and Recreation Department | - | No response received as of April 14, 2016. |
| ND State Water Commission | 12/08/15 | There are floodplains in the Study Area. There is Southwest Pipeline Project infrastructure in the area; contact information for the Southwest Water Authority was provided. All waste materials associated with the Project must be disposed of properly and not placed in floodway areas. No sole-source aquifers have been designated in North Dakota. |
| | 2/12/16 | The agency reviewed the revised Study Area boundary. In addition to comments provided on 12/8/15, the agency states that a surface drain permit may be needed from the State Engineer if wetlands are filled or drained. In addition, the agency maintains a network of monitoring wells and gaging stations throughout the state, many of which are located close to public ROW. Information on these locations can be found on the Commissions website. Requests that the Water Appropriations Division be informed if gaging stations or water wells may be affected or are accidently damaged. |
| NDGF | 12/28/15 | Requests avoidance of native prairie and suggests use of USFWS Land-Based Wind Energy Guidelines; recommends avoidance of wetland impacts and maintaining existing drainage patterns, and replacing wetlands that are affected. Requests burying of collection lines, marking overhead lines near streams or wetlands; recommends conducting aerial surveys for raptor nests prior to construction and implementing a ½ mile buffer around active eagle nest sites, as well as contacting the agency for locations of eagle nests; recommends monitoring for avian and bat mortality, and requests GPS coordinates of turbines once Project is constructed. |

**Table 16. Summary of Agency Responses**

| Agency | Response Date | Response Summary |
|---|---|---|
| | 1/20/16 | The agency provided GIS data for prairie dog towns and burrowing owls after Tetra Tech and NEER signed a GIS Data Sharing Agreement. |
| | 2/3/16 | Study Area does not overlap with NDGF grouse census blocks. Recommends that NDGF help design a survey protocol, and states that the Brady II project is in good sharp-tail grouse habitat. |
| | 2/26/16 | The agency reviewed the revised Study Area boundary and had nothing additional to offer. Their original comments were still applicable. |
| | 3/9/16 | The agency provided comments on the proposed lek survey protocol for Brady II. |
| | 4/13/16 | The agency provided information regarding eagle nests within 10 miles of the proposed Project. |
| NDDOT | - | No response received as of April 14, 2016. |
| ND Aeronautics Commission | - | No response received as of April 14, 2016. |
| ND Department of Agriculture | - | No response received as of April 14, 2016. |
| ND Indian Affairs Commission | - | No response received as of April 14, 2016. |
| ND Department of Trust Lands | 12/08/15 | Identified lands owned by the North Dakota School Trust in NW3 and SE4 of section 16, T136N, R96W in Hettinger County and provided a map of those lands. Reports that if School Trust land is included in the wind farm, or School Trust lands are crossed with access roads, collection lines or transmission lines, an online application must be completed. Trust Lands uses its own easement for wind tower sites and appurtenances. |
| | 2/15/16 | Identified lands owned by the North Dakota School Trust within the Study Area on the W2 36-137-96, E2 36-137-97, NE4 36-137-98 Stark County that lie within the Study Area. Provided website with online application in order to request review of proposed facilities on these tracts. |
| Central Stark & Western Soil Conservation District | - | No response received as of April 14, 2016. |

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# 9. POTENTIAL PERMITS/APPROVALS

The federal and state permits or approvals that have been identified as potentially required for the construction and operation of the proposed Project are shown in **Table 17**. Permits dependent on the final site layout will be applied for after receiving PSC approval, but prior to construction.

**Table 17. Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility**

| Agency | Type of Approval | Status* | Need |
|---|---|---|---|
| **Federal Approvals** | | | |
| USACE | NWP 12 and 14 | 3 | Wetland surveys were completed in Spring 2016 to ensure that the proposed Project minimizes impacts to WoUS and stays below the pre-construction notification threshold. |
| FAA | Form 7460-1, Notice of Proposed Construction | 1 | Determination of No Hazard received for all turbines April 2016. |
| EPA | SPCC | 2 | Required if more than 1,320 gallons of oil are stored on site. |
| **State of North Dakota** | | | |
| PSC | Certificate of Site Compatibility | 1 | Required for construction of generation facility over 0.5MW in size. |
| SHSND | Concurrence with effect determinations | 2 | Class I File Search is complete and a Class III Intensive Cultural Resources Inventory for archaeology is complete; a Class III Cultural Resources Inventory for historic architecture was completed. The reports will be submitted to SHSND for review when complete. |
| North Dakota Department of Trust Lands | Wind Energy Lease | 3 | A wind lease is required for construction of wind turbines or associated facilities on state trust land. |
| North Dakota Department of Health | NPDES Permit: General Construction Storm Water | 2 | Required for disturbance of over 1 acre of land. Must prepare a SWPPP. |
| North Dakota Highway Patrol | Overheight/Overweight Permit | 2 | Permit required for hauling construction equipment and materials on State Highways. |
| NDDOT | Road Approach/Access Permit | 2 | Permit required for construction of access roads from State Highways. |
| | Utility Permit/Risk Management Documents | 2 | Permit required for utility crossings on State Highway right-of-way. |
| ND State Water Commission | Drainage Permit | 3 | Required if draining a wetland with a drainage area of 80 acres or more. |

**Table 17. Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility**

| Agency | Type of Approval | Status* | Need |
|---|---|---|---|
| **Local Permits** | | | |
| Hettinger County | Wind Energy Facility Siting Permit | 1 | Application approved in April 2016. |
| | Conditional Use Permits | 2 | Permits required for SCADA MET. |
| | Road Crossing Agreement | 3 | Required for impacts to cross county rights-of-way. |
| | Road Haul Agreement | 3 | Required for impacts to county roads during construction of the proposed Project. |
| | Floodplain Permit | 2 | Required for impacts within the 100-year floodplain. |
| Stark County | Road Crossing Agreement | 3 | A utility permit granting permission to install collection lines across county right-of-way will not be required. Any crossings identified will be permitted by amendment to the crossing agreement developed for the Brady Wind Energy Center. |
| Southwestern Water Authority | Pipeline Crossing Permit | 3 | Required if proposed Project facilities cross the Southwest Pipeline Project. |

* Status Explanation:

1 Applied and/or Decision Pending

2 Would Apply Prior to Construction

3 Final Layout would Determine Whether Permit/Approval is Needed

# 10. FACTORS CONSIDERED

The North Dakota Energy Conversion and Transmission Facility Siting Act lists 11 factors to guide the PSC in the evaluation and designation of the site of the facility.

## 10.1 Public Health and Welfare, Natural Resources, and the Environment

The preceding sections discuss the research and investigations relating to the effects of the proposed facility on public health and welfare, natural resources, and the environment. These effects and the proposed mitigation to minimize these effects are summarized in **Section 7.17**.

## 10.2 Technologies to Minimize Adverse Environmental Effects

Brady Wind II will utilize BMPs that minimize impacts to the environment. Current wind turbine technologies, including the equipment and siting tools, optimize the wind and land resources.

## 10.3 Potential for Beneficial Uses of Waste Energy

This factor is not applicable to the proposed Project. No waste energy is created using wind energy.

## 10.4 Unavoidable Adverse Environmental Effects

Unavoidable adverse environmental effects are described for each resource area in Section 7. The proposed Project is expected to impact up to 74 acres of land during operation, which will not be available for other uses. An additional 837 acres of land would be temporarily affected due to turbine pad construction, road construction, collection line trenching, laydown and contractor staging areas, turbine storage, and temporary METs. Additional unavoidable effects include visual effects and increased habitat fragmentation.

## 10.5 Alternatives to the Proposed Site

Brady Wind II believes that the proposed site is the most viable alternative. Brady Wind II is committed to being flexible on the preliminary site layout and will work closely with landowners and to examine all reasonable alternatives to the preliminary site layout.

## 10.6 Irreversible and Irretrievable Commitment of Natural Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. There are few commitments of resources associated with the proposed Project that are irreversible and irretrievable, but these include those resources primarily related to construction.

Labor and natural resources will be used in the fabrication and preparation of construction materials. These materials are usually not retrievable. Construction resources that will be used

include aggregate resources, concrete, steel, and hydrocarbon fuel. Each steel turbine requires the construction of a concrete base 40 to 60 feet across and 7 to 10 feet thick. Access roads will require aggregate resources for their construction and maintenance. During construction, vehicles will be traveling to and from the site, utilizing hydrocarbon fuels. These resources are not in short supply, and their use would not have an adverse effect on the availability of these resources. In addition, the overall anticipated environmental and economic benefits of the proposed Project would balance the irretrievable commitment of resources resulting from the construction of the proposed Project (see **Section 10.7**).

## 10.7 Direct and Indirect Economic Impacts

Economic impacts include impacts associated with the temporary disturbance of up to 911 acres of land during construction; of this, approximately 837 acres would be reclaimed. Permanent impacts would be lower, at approximately 74 acres. In general, agricultural areas surrounding each turbine can still be farmed, and landowner compensation has been established in individual lease agreements.

The remaining direct and indirect economic impacts are primarily positive. Wind energy development removes less total land from agricultural use than other forms of development. The rural economy and energy production in the county and state is diversified. To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Hettinger County and surrounding areas would contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and the state by circulation and recirculation of dollars paid out by the Applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

Long-term beneficial impacts to the county's tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of North Dakota. The development of wind energy in this region would be important in diversifying and strengthening the economic base of western North Dakota. Additional revenues are expected from property and income taxes.

Continuing to establish the central region of North Dakota as an important producer of alternative energy sources may spur the development of wind-related businesses in the area, in turn contributing to economic growth in the region.

## 10.8 Existing Development Plans of the State, Local, Government and Private Entities at or in the Vicinity of the Site

No conflicts are anticipated with existing state and local government and private entities' development plans.

## 10.9 Effect of Site on Cultural Resources

As described in **Section 7.7**, a Class I Literature Review was conducted and a Class III Cultural Resources Inventory for archaeology in the proposed Project footprint was completed in spring 2016. The literature review results identified no previously recorded archaeological sites within the Survey Corridor (the construction easement), and a total of 6 previously recorded archaeological sites and five site leads within a 1-mile buffer around the Survey Corridor (i.e., the Archaeological Study Area).

Avoidance buffers have been created for archaeological sites recorded during the pedestrian survey of the Survey Corridor. Brady Wind II commits to avoid any newly documented sites and the previously-documented cultural resources within the Survey Corridor.

The Class I Literature Review identified no architectural resources. Three historic farmsteads and two cultural resource leads (also farmsteads) were identified within two miles of the proposed Project turbines). An architectural historian completed a survey of architectural resources within two miles of proposed Project turbines in March 2016. A report will be submitted to the SHSND when complete for review and concurrence, and will also be submitted to the PSC. The proposed Project will not directly impact any architectural resources.

## 10.10 Effect of Site on Biological Resources

The impact of the proposed Project on wildlife is expected to be low. Brady Wind II has sited the proposed Project following the voluntary USFWS Wind Energy Guidelines (USFWS 2012a) and designed the proposed Project following suggested APLIC practices (APLIC 2006). There is potential for avian and bat collisions with facility turbines, power lines, and METs, as well as the potential for habitat loss and fragmentation; however, Brady Wind II will implement measures to avoid and minimize potential impacts to biological resources from the proposed Project. Electrocution risk is avoided by using pad-mounted transformers and burying the collection system lines per APLIC 2006 recommendations. Risks of collision would be minimized by siting facilities away from wetlands and burying collection lines. Risks of collision have been reduced because bird diverters are installed on temporary MET tower guy wires. Similarly, risk of impacts to habitat would be avoided and minimized by reseeding or planting temporarily disturbed grassland areas with native material, depending on landowner preference.

The Project is unlikely to affect the black-footed ferret, northern long-eared bat, gray wolf, and Dakota skipper; there is a low likelihood for the Project to affect whooping cranes. Eagles use surveys and raptor nest surveys are underway to evaluate risk of proposed Project activities to bald and golden eagles. Brady Wind II will prepare a Project-specific BBCS documenting all avoidance, minimization, and mitigation commitments.

Detailed discussion of potential impacts and proposed mitigation measures on biological resources is provided in **Section 7.14** (Vegetation), **Section 7.15** (Wildlife), and **Section 7.16** (Rare and Unique Natural Resources).

## 10.11 Cumulative Effects

Activities that currently exist within the Study Area and vicinity are primarily limited to agriculture. The exploitation of oil is an existing industrial component of the landscape in Stark County, with approximately 26 percent of the county covered by oil fields (NDDMR 2015a). Oil production is expected to increase in Stark County (NDDMR 2015b). Oil production in Hettinger County is not significant at this time. In addition to the proposed Project, there are six existing wind farms in the vicinity of the proposed Project, including Sunflower Wind Project northeast of the Study Area near Hebron in Stark/Morton counties, Thunder Spirit Wind Farm south of the Study Area near Hettinger in Adams County, and the four-phased Bison Wind Energy Center northeast of the Study Area near New Salem in Oliver and Morton counties. The proposed Project is located adjacent to the southern boundary of the proposed Brady Wind Energy Center. It is likely that wind energy development would continue in southwestern North Dakota.

Wind energy development is anticipated to have a positive cumulative impact on air quality, and minimal impacts to geology, soils, water, noise, safety and health issues, and cultural resources. Socioeconomic impacts are anticipated to be positive, as the rural economy is stimulated and local energy production is diversified. The potential negative cumulative impacts are anticipated to be primarily on land use, mineral resources, vegetation, and wildlife.

With the increase in the amount of land being used for wind energy generation activities, farming activities may decrease slightly. This potential shift in land use in rural communities that have historically made their living from agricultural activities may lead to a cumulative impact; however, the additional income to farmers from wind development may make it more feasible for them to keep most of their land in agricultural uses rather than being developed for residential, commercial, or industrial uses. By enabling farmers to keep land in agriculture, wind energy development may lead to a net positive cumulative impact as less total land from agricultural use than other forms of development.

With regard to the potential cumulative impacts to wildlife resources, there is potential for the proposed Project to affect local wildlife both directly (mortality) and indirectly (habitat loss and fragmentation). Both direct and indirect potential impacts would be avoided and minimized to the extent practicable, and therefore, are not expected to cause cumulative impacts. Although the wind turbines would contribute to the utility/industrial component of the existing landscape, the area would remain primarily agricultural in nature. As these agricultural lands are of minimal value to wildlife compared to native vegetation, the proposed Project is not expected to result in a cumulative loss of quality wildlife habitat. Based on the existing land use, location of existing and planned facilities, and known impacts from similar wind facilities in the area, it is expected that the proposed Project would have minimal cumulative impacts to wildlife.

## 10.12 Agency Comments

Agency coordination and potential permits/approvals are discussed in **Section 8** and **Section 9**, respectively. A copy of agency response letters is included in **Appendix H.**

# 11. QUALIFICATIONS OF CONTRIBUTORS

| Name<br>Project Role | Education and Professional Experience |
|---|---|
| **MELISSA HOCHMUTH**<br>Project Manager, Development<br>NEER | Ms. Hochmuth joined NEER in August 2008 and serves as NEER's lead developer for North Dakota. Melissa has 7 years of experience in various roles with NEER. She spent 5 years in the environmental compliance and regulatory departments and began her role as lead developer for wind projects in North Dakota in October 2013. Melissa is responsible for managing and coordinating key functions of project development including site prospecting, meteorological tower deployment, financial analysis, land acquisition, contract negotiations including leases and obtaining all state, local, and environmental permits. Melissa holds a BA, Masters of Educational Administration and Law Degree from the University of Florida. |
| **KIMBERLY WELLS, PH.D.**<br>Environmental Services Project Manager<br>NEER | Dr. Wells has 15 years of environmental permitting experience including experience as both a consultant and environmental manager in the renewable industry. Her primary expertise is technically challenging and interdisciplinary projects on private and public land, with a focus on large environmental impact assessment and permitting projects with the National Environmental Policy Act (NEPA) and state equivalents; the ESA, the Clean Water Act, and associated natural resource laws. She is a certified wildlife biologist and wetland delineator, and obtained her BS in Natural Resource Management from the University of Arizona, her MS in Fisheries and Wildlife Ecology from Oklahoma State, and her PhD in Fisheries and Wildlife Sciences from the University of Missouri – Columbia. Dr. Wells is the environmental permitting manager for the Mid-Continent Region that includes North Dakota. |
| **JASON UTTON**<br>Director<br>Development<br>NEER | Mr. Utton currently directs all wind energy development efforts in the Midwest ISO and PJM markets. Jason joined NEER in 2007. While with NEER, he has successfully developed over 500 MW of clean, renewable energy, which reflects a total company investment of over $2.0B. Jason is the lead negotiator for all commercial contracts in North Dakota. |
| **CHRIS WESTRICK**<br>Sr. Project Manager<br>Construction<br>NEER | Mr. Westrick is responsible for the management and oversight of early stage phases of project planning, engineering, and construction of wind projects. Duties also include budget development, contract execution, procurement, logistical planning, and ultimately transition to the construction execution team. Chris has over 10 years of experience in construction and project management. |
| **BRIAN BJELLA**<br>Attorney for Applicants<br>Crowley Fleck PLLP | Applicant's counsel. J.D. and Bachelor's degree, both from University of North Dakota. |
| **ANNE-MARIE GRIGER, AICP**<br>Project Manager<br>Tetra Tech, Inc. | Ms. Griger has 10 years of experience in environmental planning and permitting, including NEPA compliance, for large-scale infrastructure projects including wind energy generating facilities, solar energy facilities, and highways. She serves as Project Manager for wind energy projects in Kansas, North Dakota, South Dakota, and Texas. Master's in Urban and Regional Planning and Bachelor's degree in Environmental Policy and Planning, both from Virginia Tech. |
| **TARA LOW**<br>Environmental Planner<br>Tetra Tech, Inc. | Ms. Low has more than 12 years of experience in environmental planning, policy, and regulation with an emphasis in transmission line, power generation, and pipeline siting and permitting. Ms. Low received her Master of Science degree in the Environmental Sciences from the University of Colorado, and her Bachelor of Science degree in Zoology and Environmental Biology from Michigan State University. |

| Name<br>Project Role | Education and Professional Experience |
|---|---|
| **JAKE ENGELMAN**<br>GIS Analyst<br>Tetra Tech, Inc. | Mr. Engelman prepared the application figures, impact calculations, and other GIS tasks in support of this permit application. He is a GIS specialist with 4 years of experience in environmental resource and utility planning projects. His skills include geographic information systems (GIS), cartographic and graphic design, remote sensing, natural and cultural environmental resource mapping, and global positioning system (GPS) data collection. He uses these skills to produce high-quality graphic products of proposed projects, ranging from generation scale utility projects to single parcel substations. Mr. Engelman received his Bachelors of Science in Geography at Minnesota State University-Mankato. |
| **ADAM HOLVEN**<br>Archaeologist<br>Tetra Tech, Inc. | Mr. Holven led the Class I and Class III Cultural Resources Inventory for archaeology for the Project. He has extensive archaeological field experience, including large-scale multi-square mile cultural resource surveys for wind farms in North Dakota, South Dakota, and Minnesota. Mr. Holven obtained his Master's off Arts in Anthropology at Iowa State University, his Bachelors of Arts in Anthropology at University of Northern Iowa, and his Bachelors of Science in Geology at University of Northern Iowa. |
| **CHRIS ANSARI**<br>Wetlands Biologist<br>Tetra Tech, Inc. | Mr. Ansari led the wetlands delineation surveys for the Project. He is a certified wetland delineator and has 15 years of experience as a biologist and environmental scientist in the environmental consulting field working in both the private and public sectors. Mr. Ansari obtained his Bachelor of Science in Recreation Management at Appalachian State University. |
| **RICH YOUNG**<br>Wildlife Biologist<br>Tetra Tech, Inc. | Mr. Young is a wildlife biologist with over 20 years of experience. He has overseen the avian and eagle surveys for the Project. Mr. Young specializes in biological assessments of sensitive and rare wildlife, inventories and censuses of wildlife populations, habitat restoration and management, and impacts of anthropogenic disturbance. He has managed and supervised a variety of field-intensive projects involving the inventory and assessment of sensitive species and habitats. Mr. Young received his Bachelor of Science in Fisheries and Wildlife Biology at Iowa State University. |

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# 13. DEFINITIONS

| | |
|---|---|
| AADT | Average Annual Daily Traffic |
| BBCS | Bird and Bat Conservation Strategy |
| BGEPA | Bald and Golden Eagle Protection Act |
| BMPs | Best Management Practices; prevents soil erosion and sedimentation |
| capacity | The capability of a system, circuit, or device for storing electronic charge |
| Certificate | Certificate of Site Compatibility |
| CRP | Conservation Reserve Program |
| Distribution | Relatively low-voltage lines that deliver electricity to the retail customer's home or business |
| DoD | Department of Defense |
| Electromechanical | Of, relating to, or being a mechanical process or device actuated or controlled electrically; especially being a transducer for converting electrical energy to mechanical energy |
| EPC | Engineering, procurement, and construction |
| ERC | Emission Rate Credit |
| ESA | Endangered Species Act |
| FAA | Federal Aviation Administration |
| FEMA | Federal Emergency Management Agency |
| GE | General Electric |
| Gearbox | An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly |
| Generator | A machine by which mechanical energy is changed into electrical energy |
| Geotechnical | A science that deals with the application of geology to engineering |
| hub | The central part of a circular object (as a wheel or propeller) |
| interconnection | To be or become mutually connected |
| kV | kilovolt |
| mph | miles per hour |
| MW | megawatt |
| MWh | megawatt-hour |
| MAPP | Mid-Continent Area Power Pool |
| micrositing | The process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities |
| MET | Meteorological Evaluation Tower |
| MISO | Midwest Independent System Operator |
| NDDOT | North Dakota Department of Transportation |
| NDAC | North Dakota Administrative Code |
| NDCC | North Dakota Century Code |
| NDGF | North Dakota Game and Fish Department |
| NDGS | North Dakota Geological Survey |
| NEPA | National Environmental Policy Act |
| NHIA | No Harmful Interference Anticipated |

| | |
|---|---|
| NLCD | National Land Cover Database |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | National Resource Conservation Service |
| NRHP | National Register of Historic Places |
| NTIA | National Telecommunications and Information Administration |
| NWI | National Wetlands Inventory |
| NWP | Nationwide Permit |
| O&M | Operations and Maintenance |
| pitch | The action or a manner of pitching; especially an up-and-down movement |
| PLOTS | Private Lands Open to Sportsmen |
| Project, the | Brady II Wind Energy Center |
| PSC | North Dakota Public Service Commission |
| PTC | Production Tax Credit |
| rotor | The rotor consists of three blades mounted to a rotor hub |
| rpm | Revolutions per minute |
| SCADA | Supervisory Control and Data Acquisitions (communications technology) |
| SHSND | State Historical Society of North Dakota |
| step-up transformer | A transformer that increases voltage |
| substation | A subsidiary station in which electric current is transformed |
| SWPPP | Storm Water Pollution Prevention Plan |
| torque | A force that produces or tends to produce rotation or torsion; also a measure of the effectiveness of such a force that consists of the product of the force and the perpendicular distance from the line of action of the force to the axis of rotation : a turning or twisting force |
| transformer | An electrical device by which alternating current of one voltage is changed to another voltage |
| transmission | An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly |
| USACE | US Army Corps of Engineers |
| USDA | US Department of Agriculture |
| USFWS | US Fish and Wildlife Service |
| USGS | US Geological Survey |
| WoUS | water of the United States |
| WRRS | Wildlife Response and Reporting System |
| yaw | To deviate erratically from a course (as when struck by a heavy sea); especially to move from side to side: to turn by angular motion about the vertical axis |

# Figures

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

- Proposed Project Area (04/12/16)
- Study Area (02/23/16)
- County Boundary
- Collection Lines Only
- Major River
- Municipal Boundary

**Existing Electrical Transmission**
**(Ventyx 2015)**

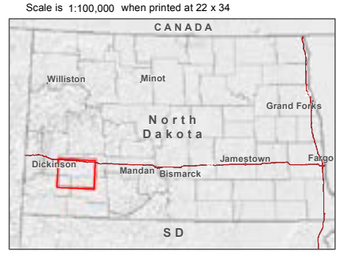
- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line

**Transportation**
**(BTS 2013)**

- Public Airport
- Private Airport
- Interstate Highway
- U.S. Highway
- State Highway
- Rail

0 2 4
Miles

Scale is 1:100,000 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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Figure 1: Project Location

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

- Proposed Project Area (04/12/16)
- Study Area (02/23/16)
- County Boundary
- Collection Lines Only
- Major River

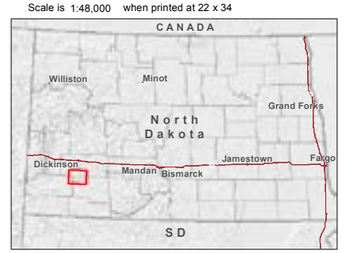
**Transportation**

- State Highway
- County Road

*NAIP 2014 Aerial Imagery

0 1 2
Miles

Scale is 1:48,000 when printed at 22 x 34




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NEXTera ENERGY RESOURCES

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Figure 2: Study Area and Project Area (Aerial)

# Brady II Wind Energy Center

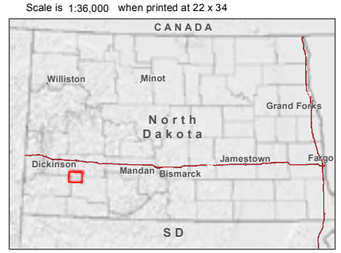
Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

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Miles
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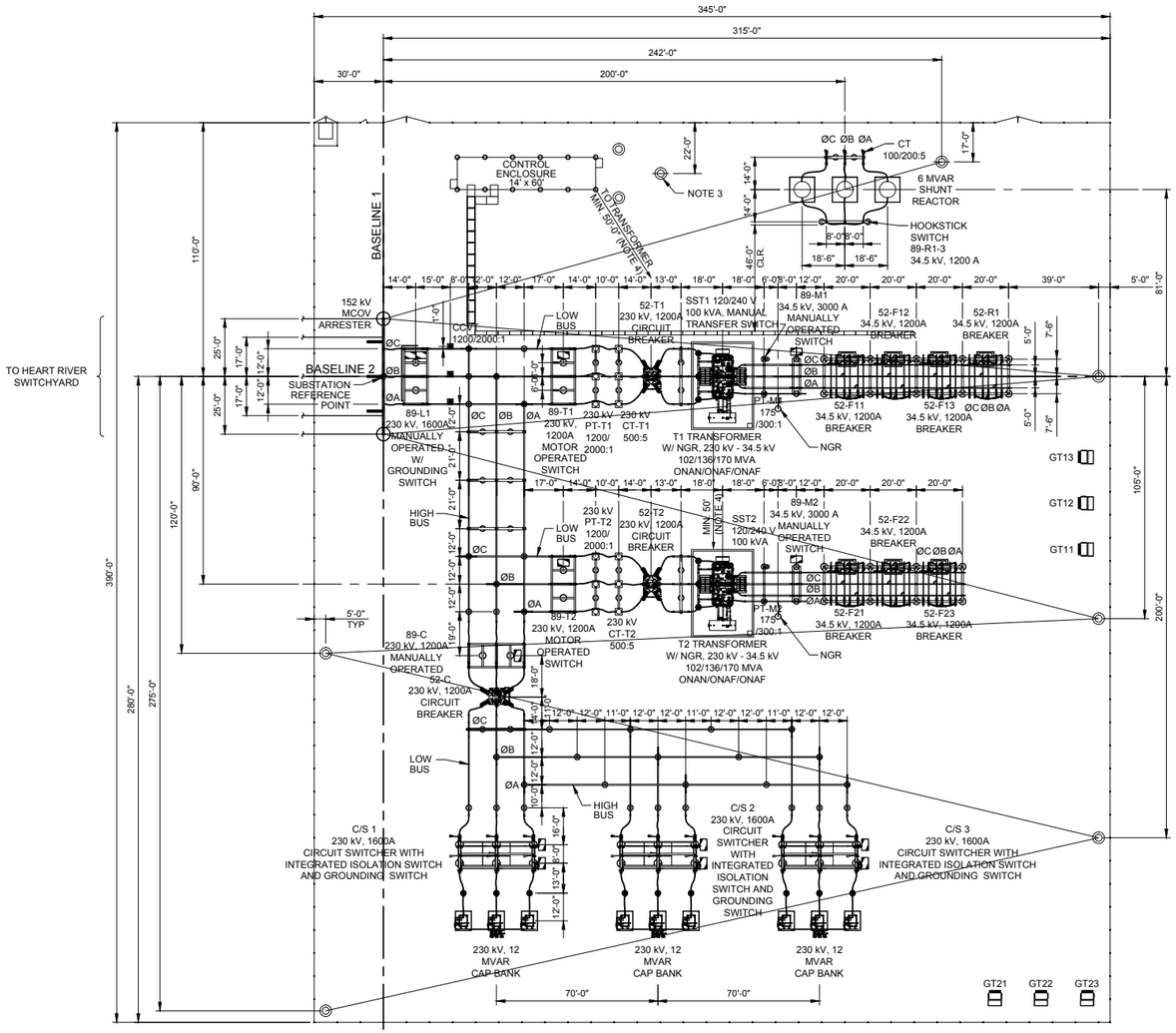

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Figure 3: Study Area and Project Area (Topographical) and Proposed Facilities




## LEGEND

- NEW CONSTRUCTION
- NEW SUBSTATION FENCE
- FUTURE CONSTRUCTION
- FUTURE SUBSTATION FENCE

## NOTES

1. REFERENCE DRAWING G.101 FOR EQUIPMENT RATINGS.
2. REFERENCE DRAWING G.100 FOR DETAIL OF BUSHINGS AND PHASING.
3. COMMUNICATION TOWER PROVIDED BY BASIN ELECTRIC.
4. NFPA 850 RECOMMENDS A MINIMUM SEPARATION DISTANCE BETWEEN ADJACENT TRANSFORMERS AND BETWEEN THE BUILDING AND TRANSFORMER OF 50'-0".

DRAFT

THIS DOCUMENT IS PRELIMINARY IN NATURE AND NOT A FINAL, SIGNED AND SEALED DOCUMENT.

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REVISIONS

| REV | DESCRIPTION | DSN | CHK | DATE |
|---|---|---|---|---|
| | | DWN | APP | |
| A | PRELIMINARY | ADR | SMA | 11/17/14 |
| | | PD | PSF | |
| B | ISSUED FOR REVIEW | ADR | JW | 11/21/14 |
| | | GLJ | PSF | |
| C | REVISED PRELIMINARY | ADR | JW | 12/17/14 |
| | | GLJ | PSF | |
| D | REVISED SUBSTATION CONFIGURATION | ADR | JW | 01/05/15 |
| | | GLJ | PSF | |
| E | ADDED FUTURE LINE BREAKER | ADR | JW | 01/13/15 |
| | | REC | PSF | |
| F | ISSUED REVISED DRAWING PACKAGE FOR REVIEW | ADR | JW | 02/12/15 |
| | | GLJ | PSF | |
| G | ADDED 230 kV CAPACITOR BANK AND 34.5 kV REACTORS | ADR | JW | 02/24/15 |
| | | GLJ | PSF | |
| H | ISSUED FOR DESIGN REVIEW | ADR | JW | 03/06/15 |
| | | REC | PSF | |
| J | ISSUED FOR BID | ADR | JW | 05/04/15 |
| | | GLJ | PSF | |
| K | PRE-CONSTRUCTION, FINAL DESIGN RELEASE | ADR | JW | 06/11/15 |
| | | REC | PSF | |
| L | ISSUED FOR CONCEPTUAL REVIEW | ADR | JW | 10/02/15 |
| | | GLJ | CCG | |
| M | ISSUED FOR REVIEW | ADR | JW | 10/16/15 |
| | | GLJ | CCG | |
| N | ISSUED FOR REVIEW | ADR | JW | 11/09/15 |
| | | GLJ | PSF | |

SCALE VERIFICATION

THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING

0 1"

IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

0 30 60 90

SCALE: 1" = 30' SCALE IN FEET

ORIGINAL DRAWING SIZE IS 24 x 36

**GENERAL ARRANGEMENT**

BRADY SUBSTATION

NEXTera ENERGY RESOURCES

FOR REVIEW

| | |
|---|---|
| PROJECT NO. | 20153420 |
| ISSUE DATE | 10/16/15 |
| CURRENT REVISION | N |
| DESIGNED BY | A. RICHARDSON |
| DRAWN BY | G. JEFFERSON |
| CHECKED BY | J. WENDELBURG |
| APPROVED BY | P. FJELD |

G.102

SHEET of ----

CAD FILE: W:\20153420_NextEra_Brady_Substation\5.0 KLF Drawings\5.1 DWG\G.102 GENERAL ARRANGEMENT.dwg LAYOUT: G.102 GENERAL ARRANGEMENT PLOTTED: 11/9/2015 3:04 PM BY: adam nord

Figure 4: Substation Site Plan

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

**Proposed Impact Assumptions**

- Temporary Turbine Impact Buffer
- Temporary Service Road Impact Buffer
- Temporary Collection Line Buffer*
- Permanent Turbine Impact Buffer
- Permanent Service Road Impact Buffer
- County Road

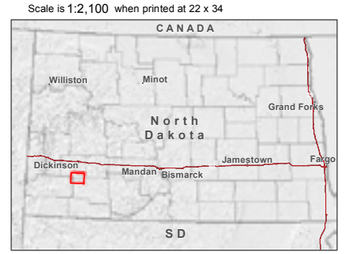
*Permanent impacts from collection lines are limited to junction boxes.

57TH ST

116TH AVE

0 0.5 1 1.5
Miles

Scale is 1:2,100 when printed at 22 x 34




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Path: P:\5476_Brady\I_Wind\GIS\Layouts\PSC_Application\Project_Impact_Assumptions_zoom.mxd Revised: 4/14/2016

Figure 5: Project Impact Assumptions

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

**Exclusion***
**(NRCS SSURGO 2013)**

- Prime Farmland

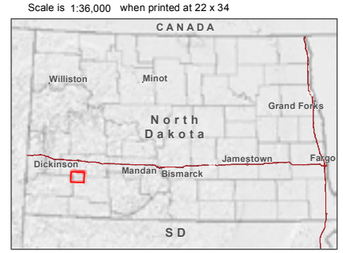
*Archaeological Sites are not shown due to confidentiality.

**Avoidance**
**(NLCD 2011, NWI 2014, FEMA 2014, NDGIS Hub 2014)**

- Historical Resources
- 100-year Floodplain
- NLCD Forest
- NWI Wetland
- North Dakota Game & Fish Conservation PLOTS Recreational Easement (Private Land Open to Sportsmen)
- State Trust Land
  *parcels are open to hunting unless otherwise posted with official North Dakota State Land Department signage

0 0.5 1 1.5
Miles

Scale is 1:36,000 when printed at 22 x 34

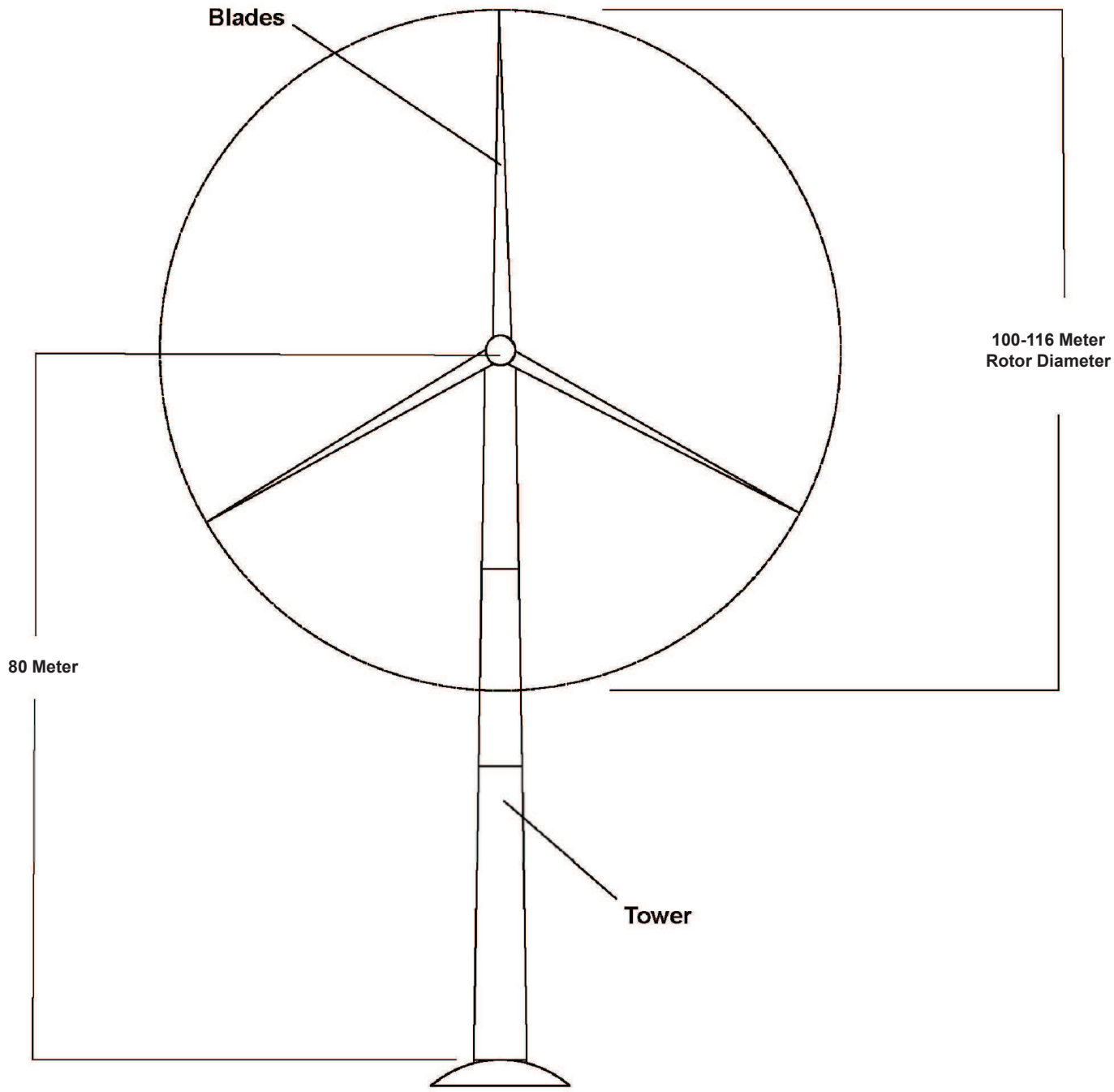



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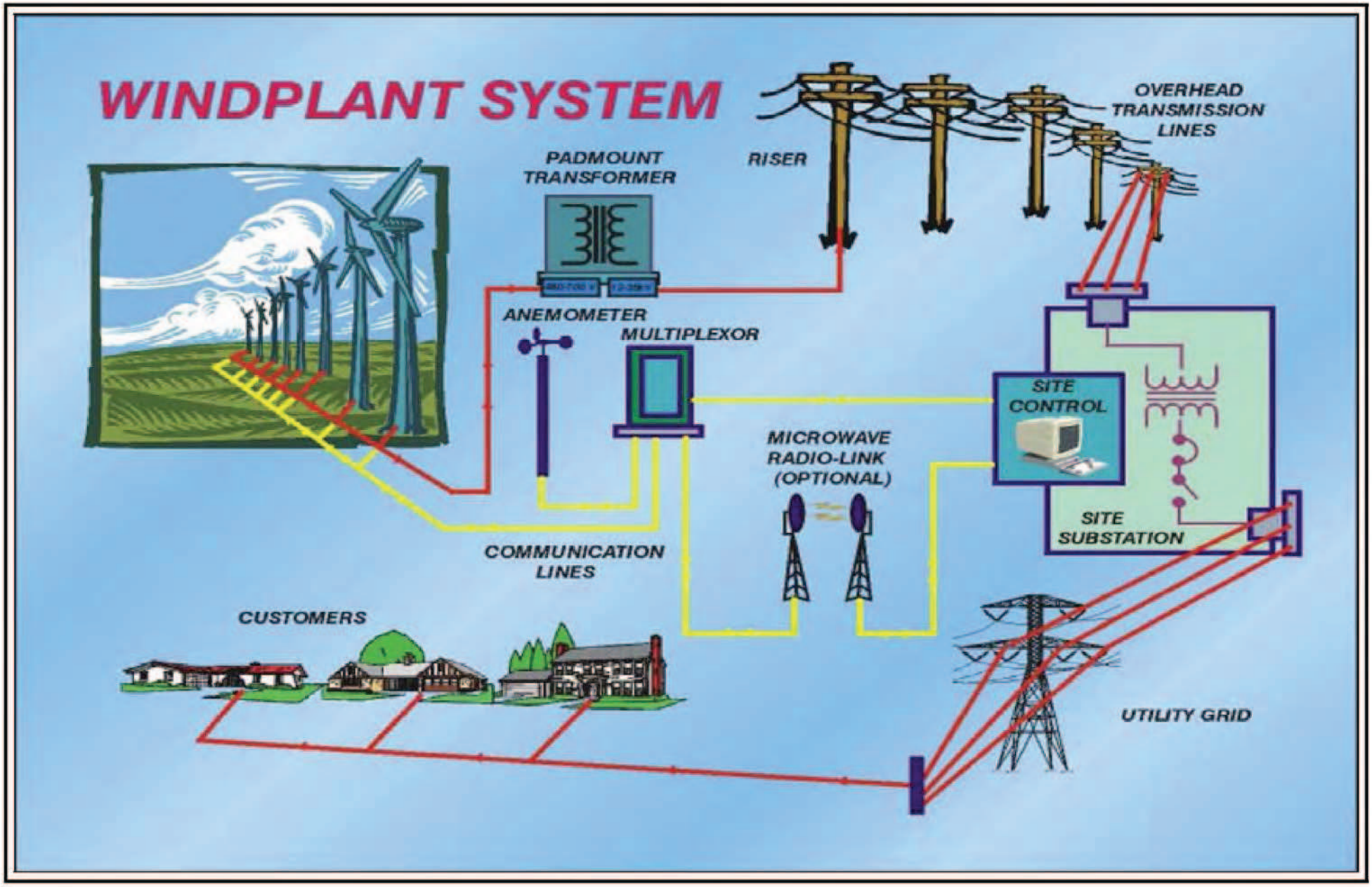
Figure 6: Exclusion and Avoidance Areas




GE 2.1 and 1.79 MW Xle Wind Turbine

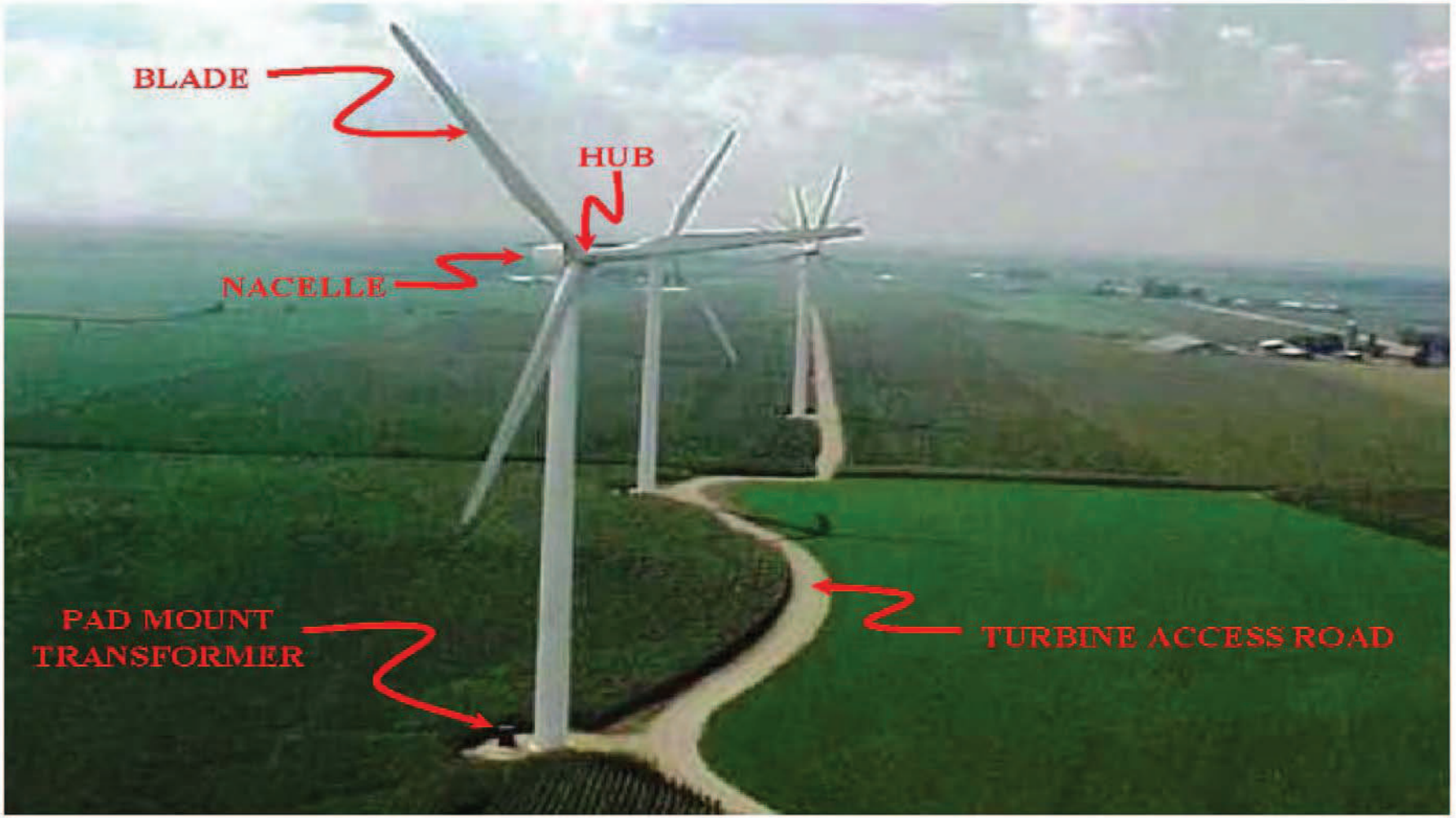
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Figure 7
Wind Turbine Design Features
Brady II Wind Energy Center




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Figure 8
Path of Energy Diagram
Brady II Wind Energy Center




TETRA TECH

Figure 9

Typical Wind Energy Center Layout

Brady II Wind Energy Center

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

### Proposed Project Features

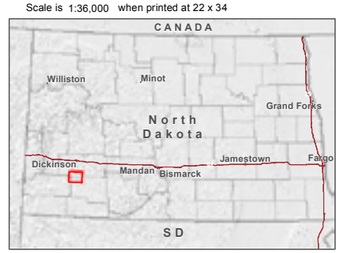
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

### NLCD Land Cover
(NLCD 2011)

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity (24)
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

0 0.5 1 1.5
Miles

Scale is 1:36,000 when printed at 22 x 34




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Path: P:\5476_Brady\II_Wind\GIS\Layouts\PSC_Application\Land_Cover_10_2.mxd Revised: 4/14/2016

Figure 10: Land Cover Map

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

**Proposed Project Features**

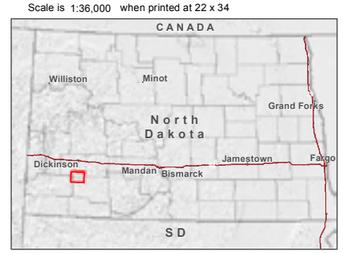
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

**Transportation**
(NDOT 2014, BTS 2013)

- State Highway
- County Road
- 55 Average Daily Traffic Count

0 0.5 1 1.5
Miles

Scale is 1:36,000 when printed at 22 x 34




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Figure 11: Average Daily Traffic Map

Path: P:\5476_Brady\ll_Wind\GIS\Layouts\PSC_Application\Traffic_Counts.mxd Revised: 4/14/2016

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

### Proposed Project Features

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

### Jurisdiction
(ND GIS Hub 2014)

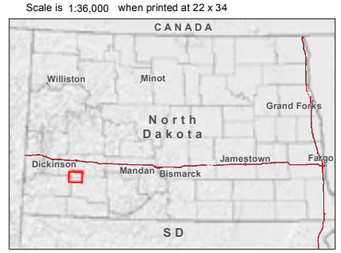
**State**

- State Trust Land

**Other**

- North Dakota Game & Fish Conservation PLOTS Recreational Easement (Private Land Open to Sportsmen)

0 0.5 1 1.5
Miles
Scale is 1:36,000 when printed at 22 x 34




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Path: P:\5476_Brady\II_Wind\GIS\Layouts\PSC_Application\Public_Lands_Easements.mxd Revised: 4/14/2016

Figure 12: Public Lands and Easements



Figure 13: Photo of Typical Landscape

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

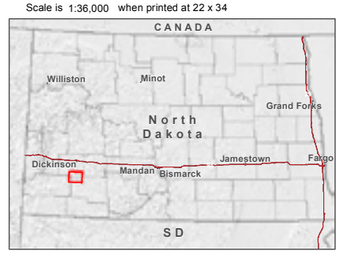
**Proposed Project Features**

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- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

**Prime Farmland**
**(NRCS SSURGO 2013)**

- Prime Farmland

0 0.5 1 1.5
Miles
Scale is 1:36,000 when printed at 22 x 34




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Path: P:\5476_Brady\II_Wind\GIS\Layout\PSC_Application\Prime_Farmland_10_2.mxd Revised: 4/14/2016

Figure 14: Prime Farmland Soil Distribution Map

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)
- Study Area (02/23/16)

**Hydrology**
**(NHD 2014)**

- Perennial Stream
- Intermittent Stream

**Wetlands**
**(NWI 2014)**

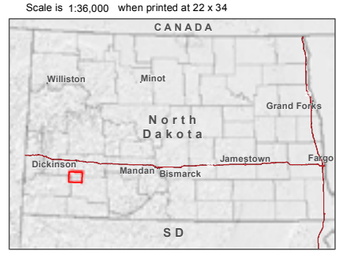
- NWI Wetlands

**FEMA Floodplains**
**(FEMA 2014)**

- 100-year Floodplain

0 0.5 1 1.5
Miles

Scale is 1:36,000 when printed at 22 x 34




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Figure 15: National Wetlands Inventory and Surface Waters Map

# Appendix A:
# Sheetmaps Showing Receptors–
# Topographical Base and
# Receptor Distance to Turbine Table

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 1

### Legend

**Proposed Project Features**

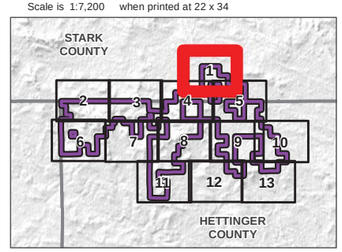
- Permanent Met Tower
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- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

610111

610121

52ND ST

109TH AVE

110TH AVE

108TH AVE

STARK COUNTY

Well

Well

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 2

### Legend

**Proposed Project Features**

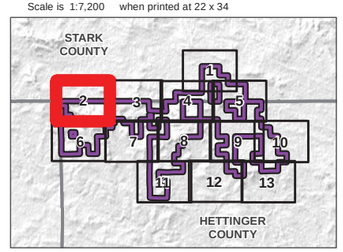
- Permanent Met Tower
- Temporary Met Tower
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- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 3

### Legend

**Proposed Project Features**

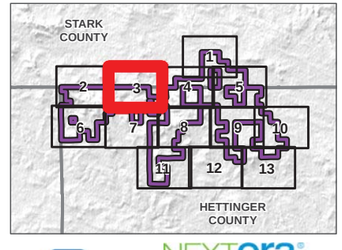
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 4

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

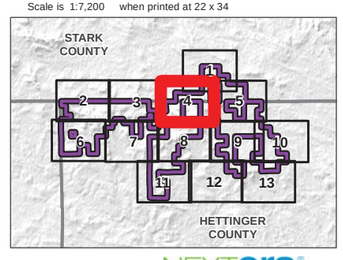
- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

610181
610185
25
26
28
30
43
45

STARK COUNTY
HETTINGER CO
HETTINGER COUNTY
54TH ST
55TH ST
110TH AVE
114TH AVE
R97W
R96W
Radio Tower

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 5

### Legend

**Proposed Project Features**

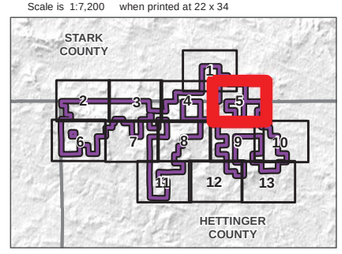
- Permanent Met Tower
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- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 6

### Legend

**Proposed Project Features**

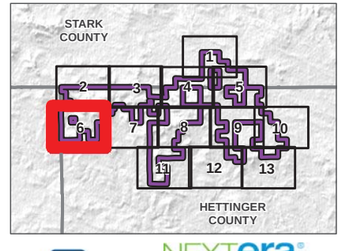
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- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 7

### Legend

**Proposed Project Features**

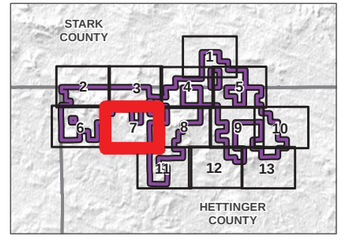
- Permanent Met Tower
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- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

610170
501126
501141
501131
501147
900027
32
Alt9
22
116TH AVE
115TH AVE
56TH ST
57TH ST
HETTINGER COUNTY
K U N Z E
BM

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 8

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

610170

29 36 35 27 34 42 31 41 33 46

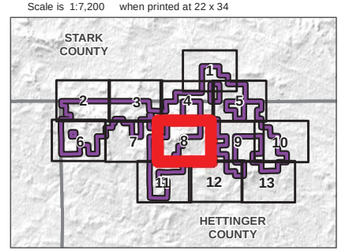
HETTINGER COUNTY

C L A R K

112TH AVE

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 9

### Legend

**Proposed Project Features**

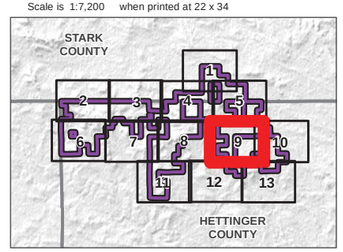
- Permanent Met Tower
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- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 10

### Legend

**Proposed Project Features**

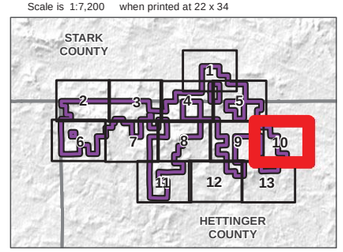
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- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

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- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 11

### Legend

**Proposed Project Features**

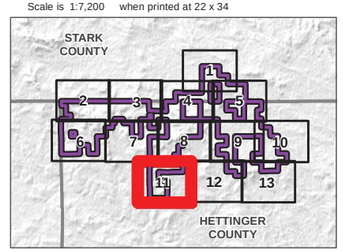
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

Path: P:\5476_Brady\4_WindGIS\Layouts\PSC_ApplicationTopo_Sheetmaps.mxd Revised: 4/15/2016

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 12

### Legend

**Proposed Project Features**

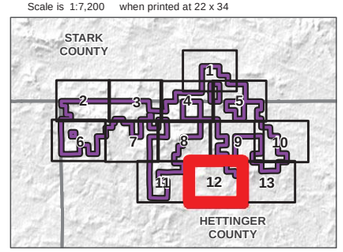
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

Path: P:\5476_Brady\4_Wind\GIS\Layouts\PSC_Application\Topo_Sheetmaps.mxd Revised: 4/15/2016

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 13

### Legend

**Proposed Project Features**

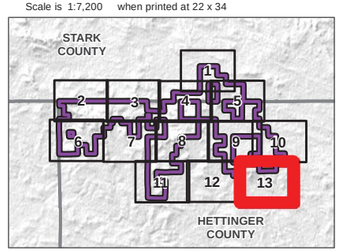
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

**Occupied Receptors**

- Participating (receptor on land signed with project)
- Non-Participating (receptor on land that is not signed with project)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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**Receptor Distance to Nearest Turbine**

| Receptor ID | Receptor is a Brady II Project Participant? | Distance (ft) | Direction | Nearest Turbine (dated 3/14/16) |
|---|---|---|---|---|
| 900002 | Yes | 2,198 | NNW | Alt4 |
| 501138 | Yes | 2,263 | NNW | 16 |
| 501156 | Yes | 2,354 | SSW | 60 |
| 501104 | Yes | 2,384 | ENE | 57 |
| 501099 | Yes | 2,450 | ENE | 57 |
| 800308 | Yes | 2,826 | NNE | 37 |
| 500028 | No | 2,854 | WSW | 58 |
| 501096 | No | 2,951 | SSE | 51 |
| 501085 | No | 2,956 | SSE | 51 |
| 800311 | Yes | 2,963 | NNE | 37 |
| 500022 | No | 3,032 | WSW | 58 |
| 501126 | No | 3,441 | NNW | 15 |
| 610149 | No | 3,446 | ENE | 53 |
| 501118 | No | 3,683 | ENE | 10 |
| 610084 | No | 3,928 | NNW | 24 |
| 500064 | No | 3,979 | WNW | 47 |
| 610098 | No | 4,064 | SSE | 18 |
| 900007 | Yes | 4,069 | NNW | Alt4 |
| 500059 | No | 4,139 | WNW | 47 |
| 501141 | No | 4,535 | NNE | 21 |
| 900019 | No | 4,545 | ENE | Alt2 |
| 900015 | No | 4,636 | ENE | Alt2 |
| 900011 | No | 4,821 | NNW | Alt4 |
| 610181 | Yes | 4,889 | SSW | 26 |
| 610185 | Yes | 4,945 | SSW | 26 |
| 610170 | Yes | 5,337 | ESE | 27 |
| 501108 | No | 5,715 | WNW | 47 |
| 501147 | No | 6,087 | ENE | 32 |
| 900031 | No | 6,132 | ENE | 37 |
| 900035 | No | 6,142 | ENE | 37 |
| 900039 | No | 6,146 | ENE | 37 |
| 610053 | No | 6,181 | SSE | 4 |
| 610057 | No | 6,306 | SSE | 4 |
| 420119 | No | 6,604 | SSE | 4 |
| 501131 | No | 6,728 | NNE | 21 |
| 610031 | No | 7,173 | SSE | 3 |
| 500018 | No | 7,463 | WSW | 61 |
| 610042 | No | 7,645 | SSW | 4 |
| 900059 | No | 7,647 | ESE | 38 |
| 610045 | No | 7,672 | SSW | 4 |

| Receptor ID | Receptor is a Brady II Project Participant? | Distance (ft) | Direction | Nearest Turbine (dated 3/14/16) |
|---|---|---|---|---|
| 610049 | No | 7,816 | SSW | 4 |
| 500035 | No | 8,165 | NNE | 65 |
| 500053 | No | 8,653 | ENE | 65 |
| 610121 | Yes | 8,840 | SSE | 44 |
| 900547 | No | 9,062 | NNE | 37 |
| 404 | No | 9,083 | WSW | 68 |
| 900027 | No | 9,229 | ENE | 32 |
| 401 | No | 9,247 | WSW | 68 |
| 500012 | No | 9,432 | NNW | 72 |
| 500006 | No | 9,602 | NNW | 72 |
| 450548 | No | 9,630 | WNW | 72 |
| 500002 | No | 9,804 | WNW | 72 |
| 610094 | No | 9,973 | SSE | 17 |
| 900548 | No | 10,383 | ENE | 50 |
| 610089 | No | 10,509 | SSE | 25 |
| 500039 | No | 11,011 | WNW | 47 |
| 900053 | No | 11,087 | ESE | 38 |
| 900047 | No | 11,178 | NNW | Alt4 |
| 610108 | No | 11,184 | SSE | 26 |
| 610102 | No | 11,391 | SSE | 26 |
| 610111 | No | 12,236 | SSW | 26 |
| 900542 | No | 12,418 | NNE | 37 |
| 900546 | No | 12,889 | ENE | 37 |
| 610021 | No | 13,346 | SSE | 1 |
| 610025 | No | 13,532 | SSE | 3 |
| 610009 | No | 13,875 | SSE | 1 |
| 501168 | No | 13,901 | SSW | 24 |
| 800317 | No | 13,954 | NNW | Alt4 |
| 610014 | No | 14,009 | SSE | 1 |
| 501175 | No | 14,262 | SSE | 4 |
| 501068 | No | 14,472 | SSW | 54 |
| 420029 | No | 14,980 | SSE | 26 |
| 610139 | No | 15,001 | SSE | 54 |
| 501165 | No | 15,190 | SSE | 26 |
| 420023 | No | 15,630 | SSE | 26 |
| 610001 | No | 16,136 | SSE | 1 |
| 420116 | No | 16,379 | SSE | 17 |
| 420002 | No | 16,512 | SSE | 26 |
| 501162 | No | 16,581 | SSE | 24 |
| 420100 | No | 17,384 | SSW | 4 |
| 420108 | No | 17,442 | SSW | 4 |

| Receptor ID | Receptor is a Brady II Project Participant? | Distance (ft) | Direction | Nearest Turbine (dated 3/14/16) |
|---|---|---|---|---|
| 501176 | No | 17,483 | SSE | 4 |
| 420051 | No | 17,588 | SSE | 18 |
| 420069 | No | 17,711 | SSE | 18 |
| 501065 | No | 17,720 | SSW | 54 |
| 501174 | No | 17,729 | SSW | 4 |
| 501173 | No | 17,790 | SSW | 4 |
| 420076 | No | 17,920 | SSE | 18 |
| 811287 | No | 18,010 | ESE | 1 |
| 420089 | No | 18,018 | SSE | 17 |
| 420065 | No | 18,060 | SSE | 18 |
| 420090 | No | 18,097 | SSE | 17 |
| 501172 | No | 18,216 | SSE | 17 |
| 420047 | No | 18,592 | SSE | 25 |
| 420039 | No | 18,744 | SSE | 25 |
| 501082 | No | 20,284 | SSE | 54 |
| 420117 | No | 21,329 | ESE | 1 |
| 501037 | No | 21,460 | SSW | 54 |
| 900070 | No | 21,468 | SSW | 54 |
| 501081 | No | 21,548 | WSW | 54 |
| 501073 | No | 21,587 | WSW | 54 |
| 501059 | No | 25,879 | SSW | 54 |
| 501040 | No | 25,968 | SSW | 54 |
| 501050 | No | 26,296 | SSW | 54 |
| 880001 | No | 29,694 | SSW | 54 |
| 501012 | No | 30,286 | SSW | 54 |
| 811290 | No | 31,167 | ESE | Alt3 |
| 501030 | No | 31,469 | SSW | 54 |
| 501000 | No | 33,979 | WSW | 54 |
| 501022 | No | 34,842 | SSW | 54 |
| 501019 | No | 35,791 | SSW | 54 |
| 811201 | No | 39,587 | SSW | 54 |
| 811205 | No | 41,907 | SSW | 54 |
| 811210 | No | 44,427 | SSW | 54 |

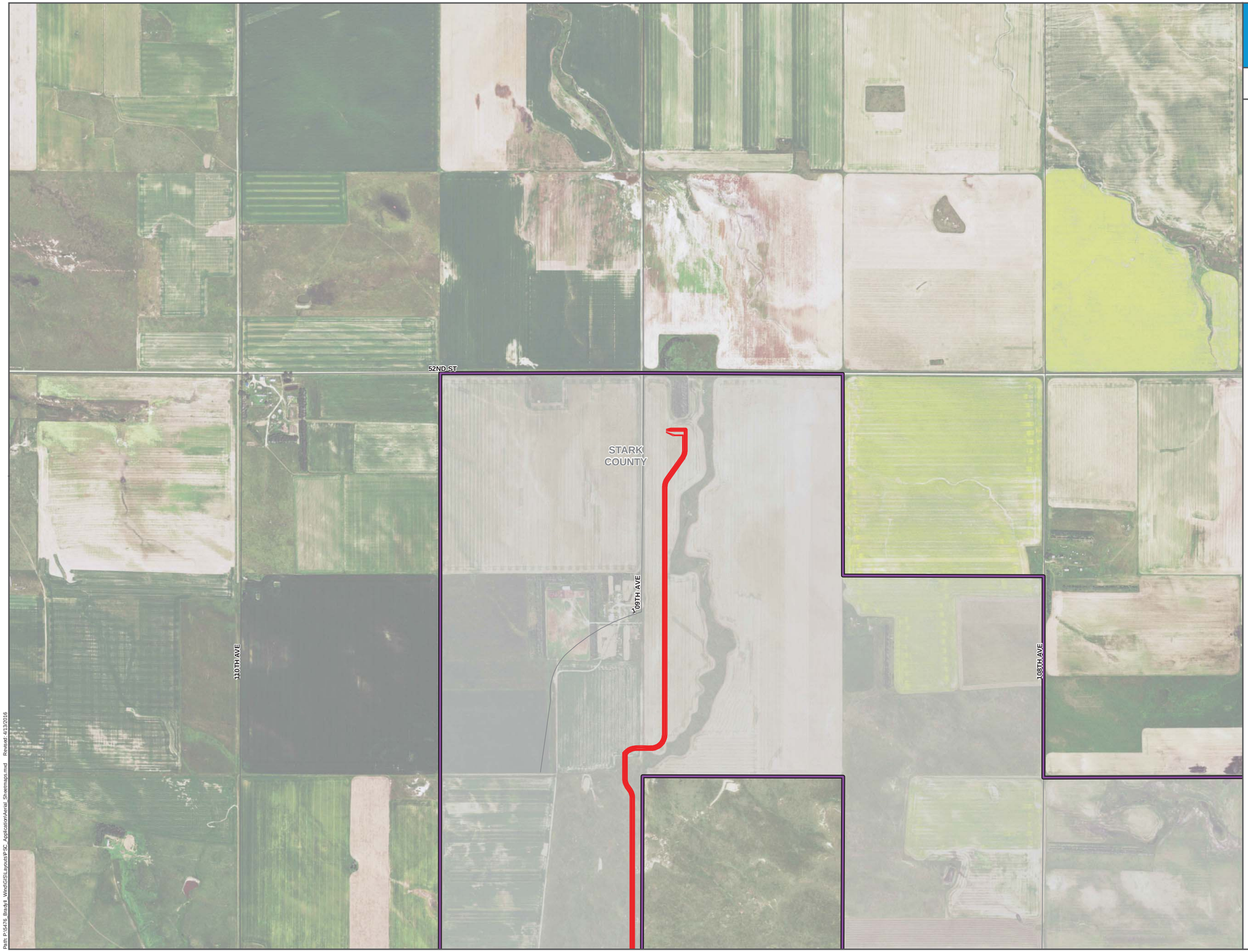
# Appendix B:
# Sheetmaps–Aerial Base

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 1



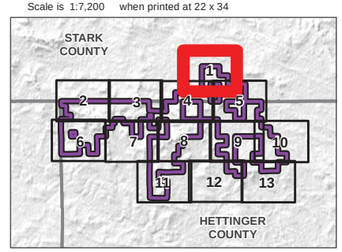

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

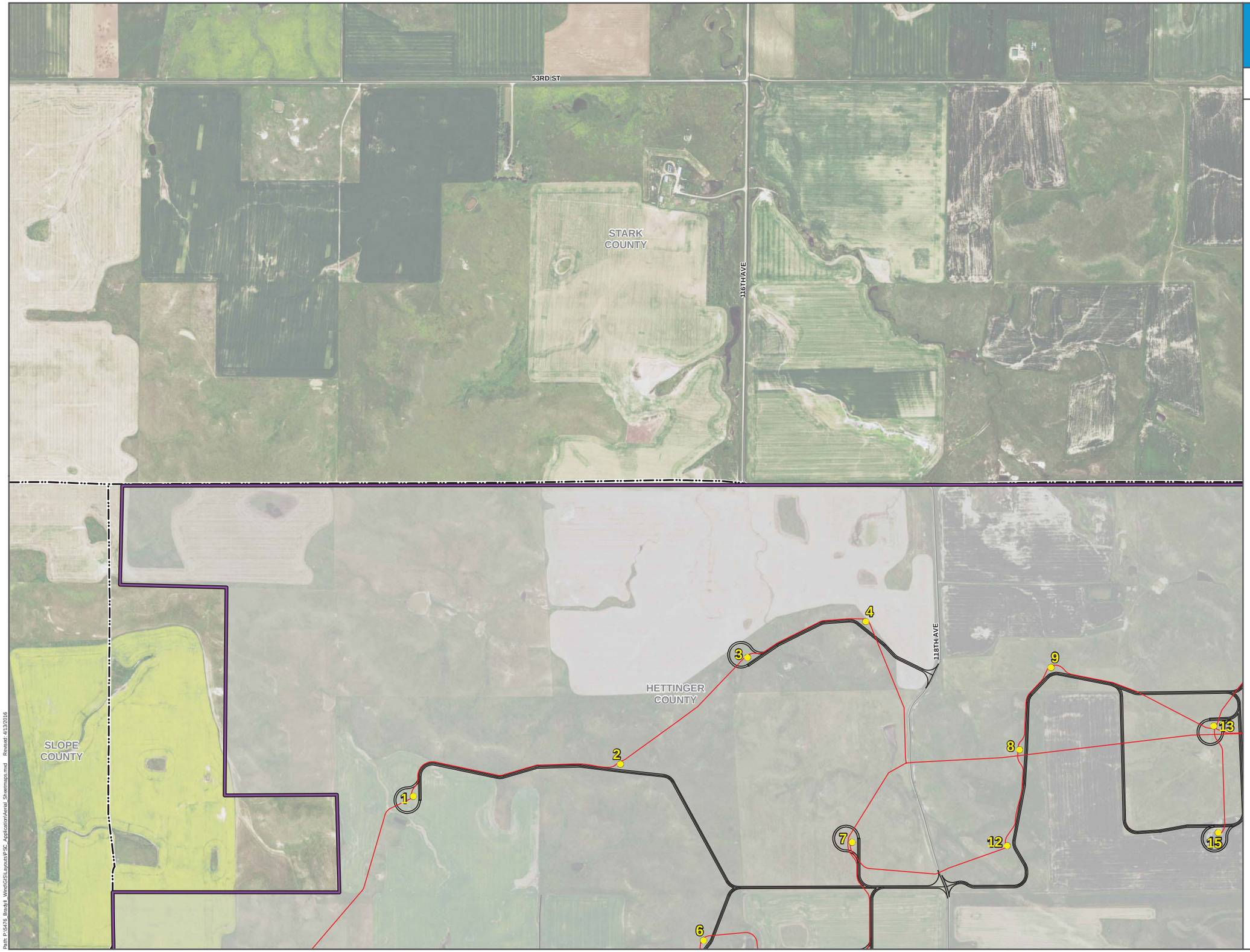
NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 2



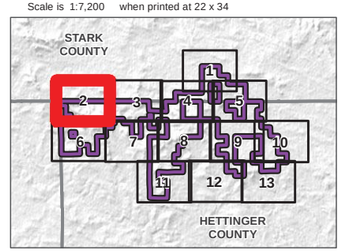

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 3

### Legend

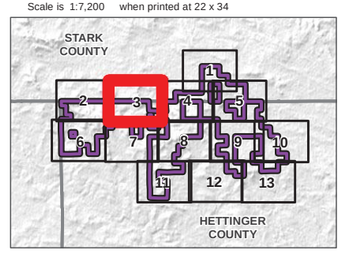
**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

114TH AVE
STARK COUNTY
53 1/2 ST
112TH AVE
116TH AVE
HETTINGER COUNTY
13
14
15
16
17
18
19
20
21
22
24

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

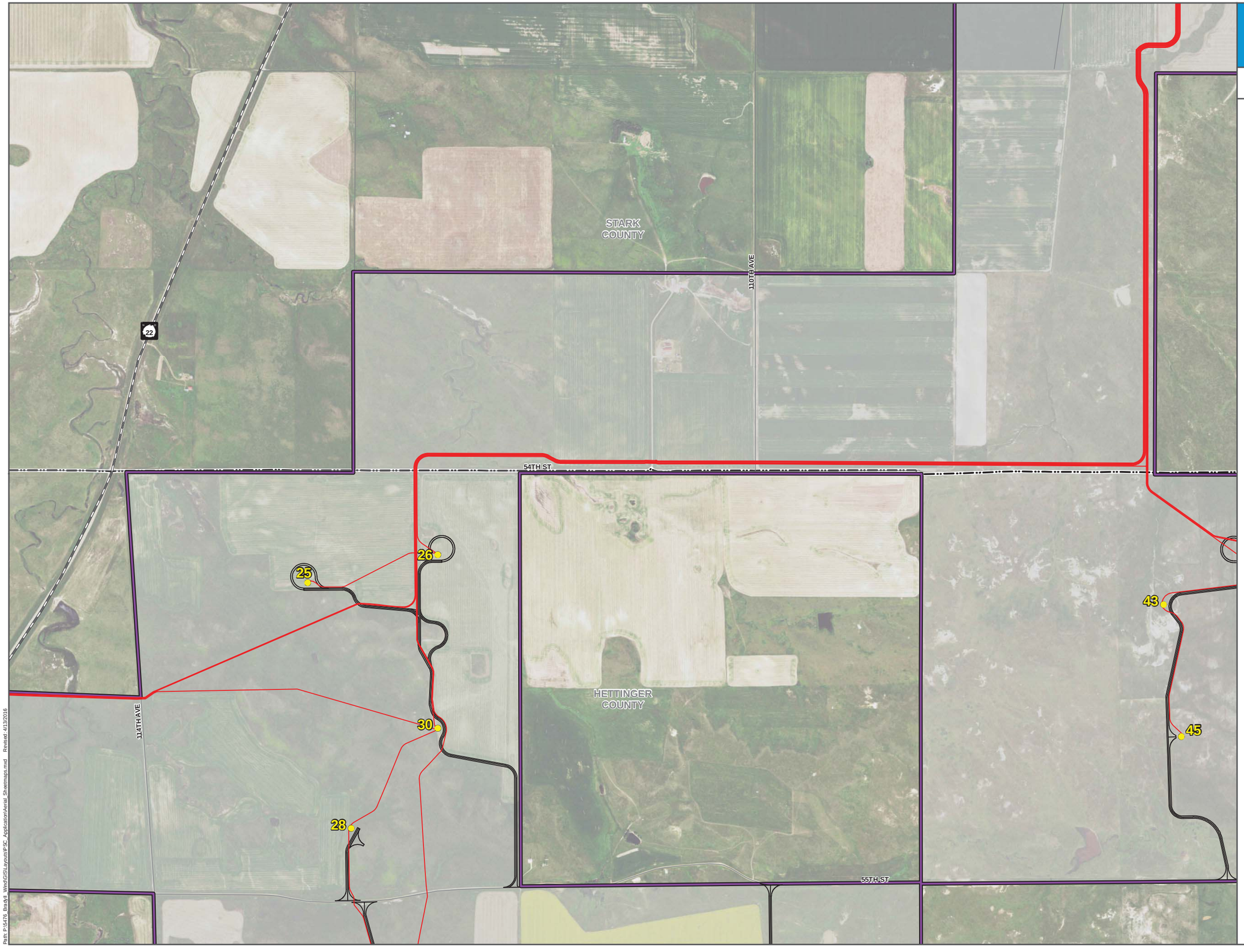
NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 4



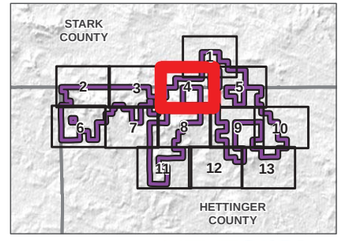

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

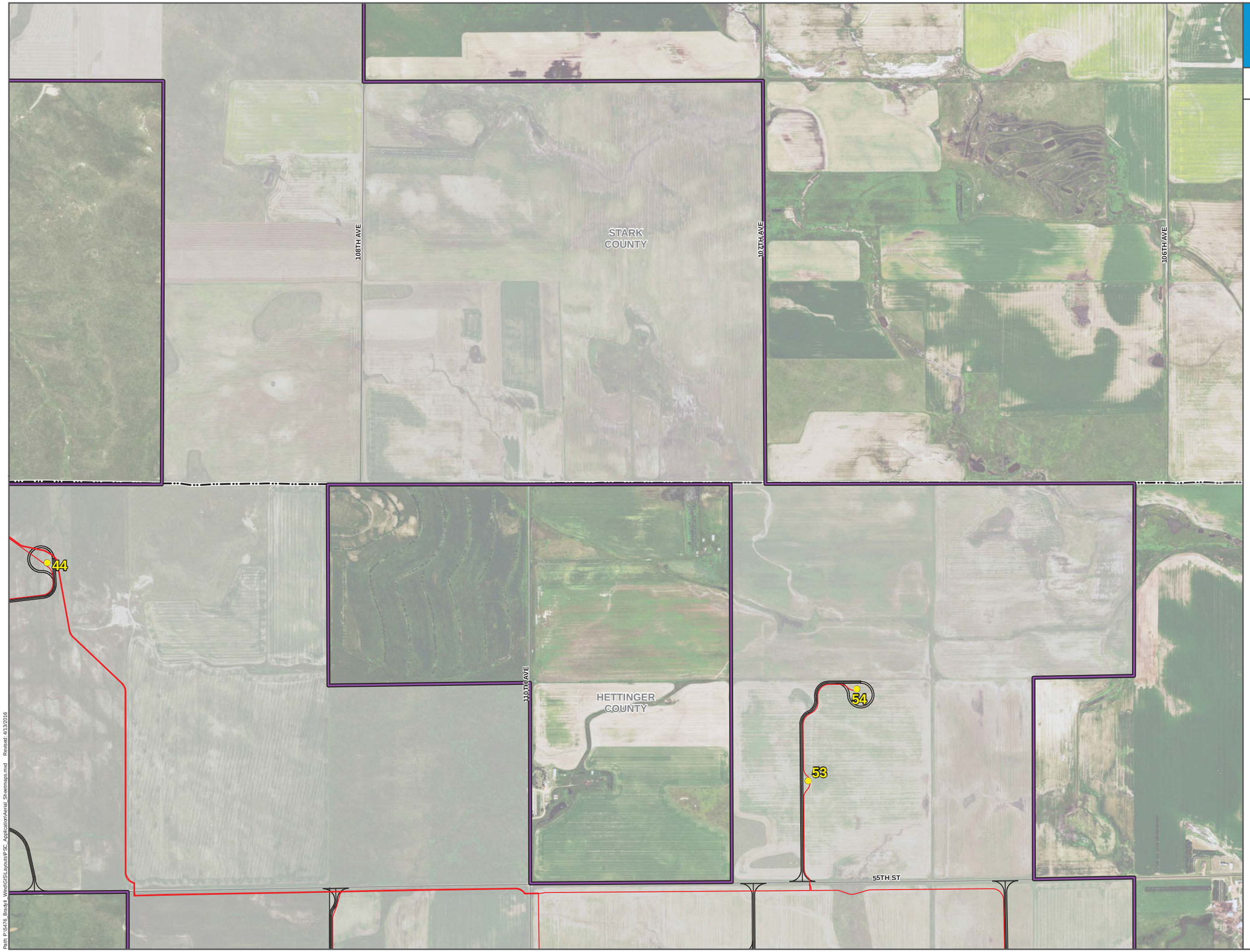
Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 5

### Legend

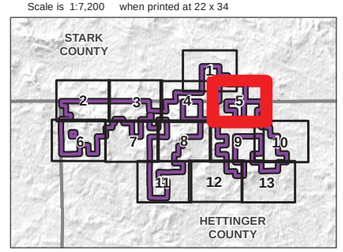
**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)




0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

Path: P:\5476 Brady\4 Wind\GIS\Layouts\PSC_Application\Aerial_Sheetmaps.mxd Revised: 4/13/2016

# Brady II Wind Energy Center

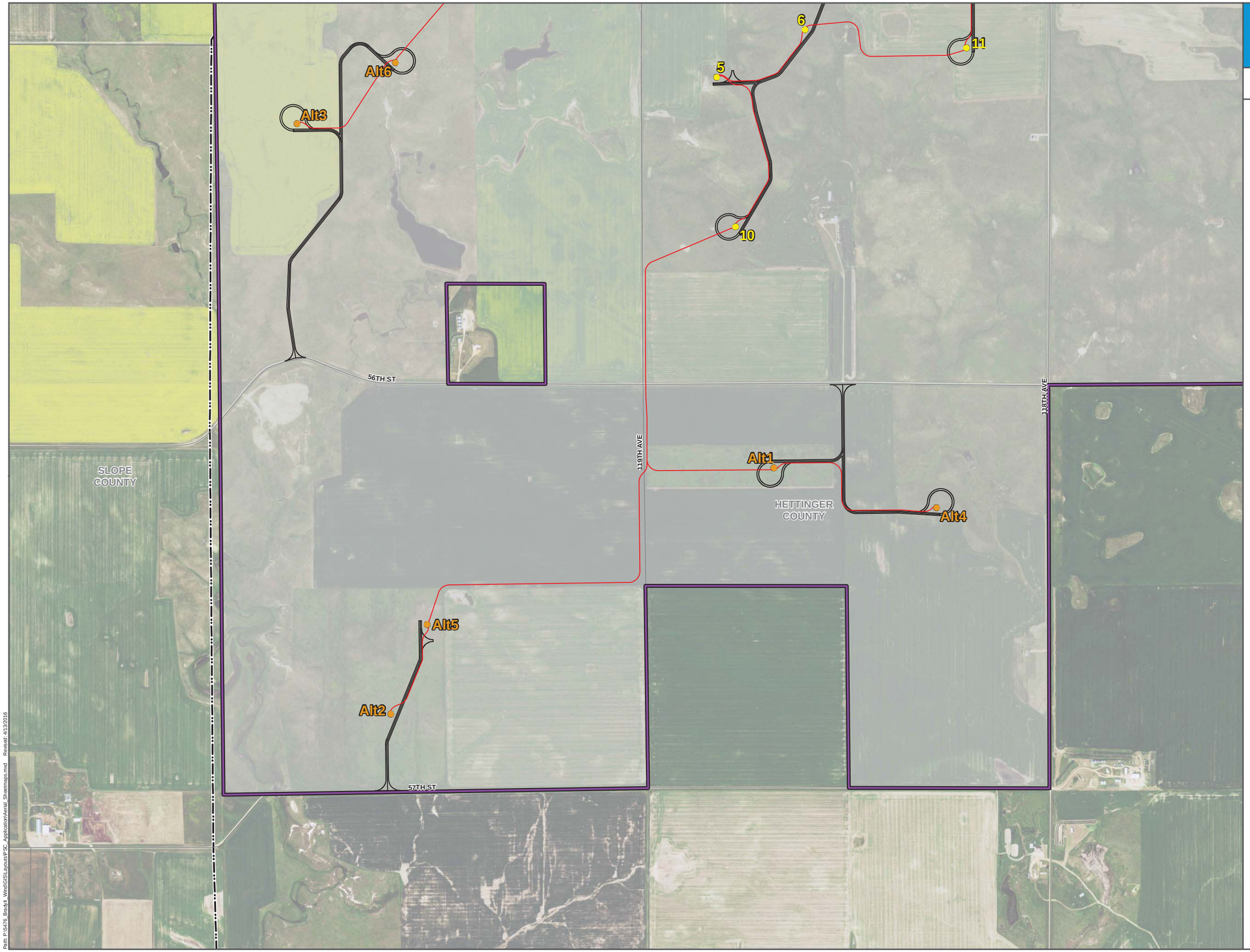
Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 6

### Legend

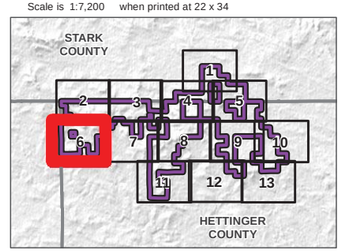
**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)




0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 7

### Legend

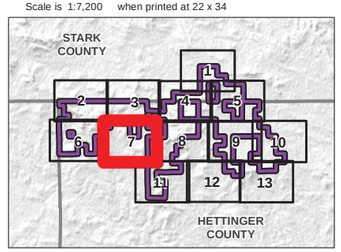
**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

116TH AVE
56TH ST
HETTINGER COUNTY
22
57TH ST
115TH AVE
32
Alt9

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 8

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

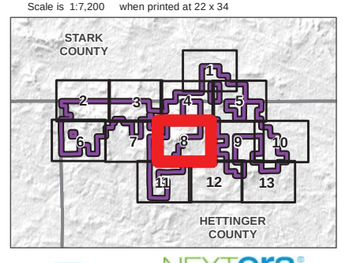
29
36
35
27
42
34
31
41
33
46

HETTINGER COUNTY

127TH AVE

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 9

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

51 52 55 56 57 58 59 60 62 63 66

56TH ST

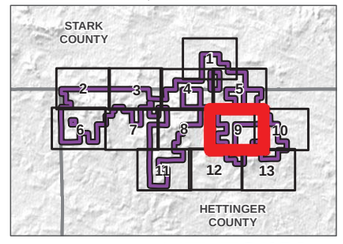
57TH ST

110TH AVE

HETTINGER COUNTY

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 10

### Legend

**Proposed Project Features**

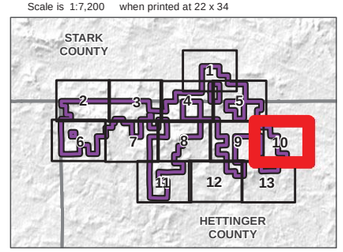
- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

58
61
64
66
68
70
Alt7

108TH AVE
107TH AVE
106TH AVE
56TH ST
57TH ST
HETTINGER COUNTY

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 11

### Legend

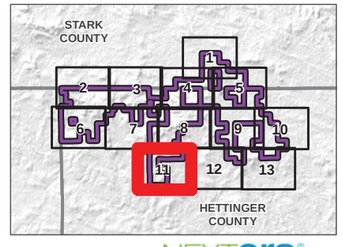
**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

40
48
Alt10
47
39
38
37
49
50
115TH AVE
114TH AVE
113TH AVE
58TH ST
59TH ST
HETTINGER COUNTY

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

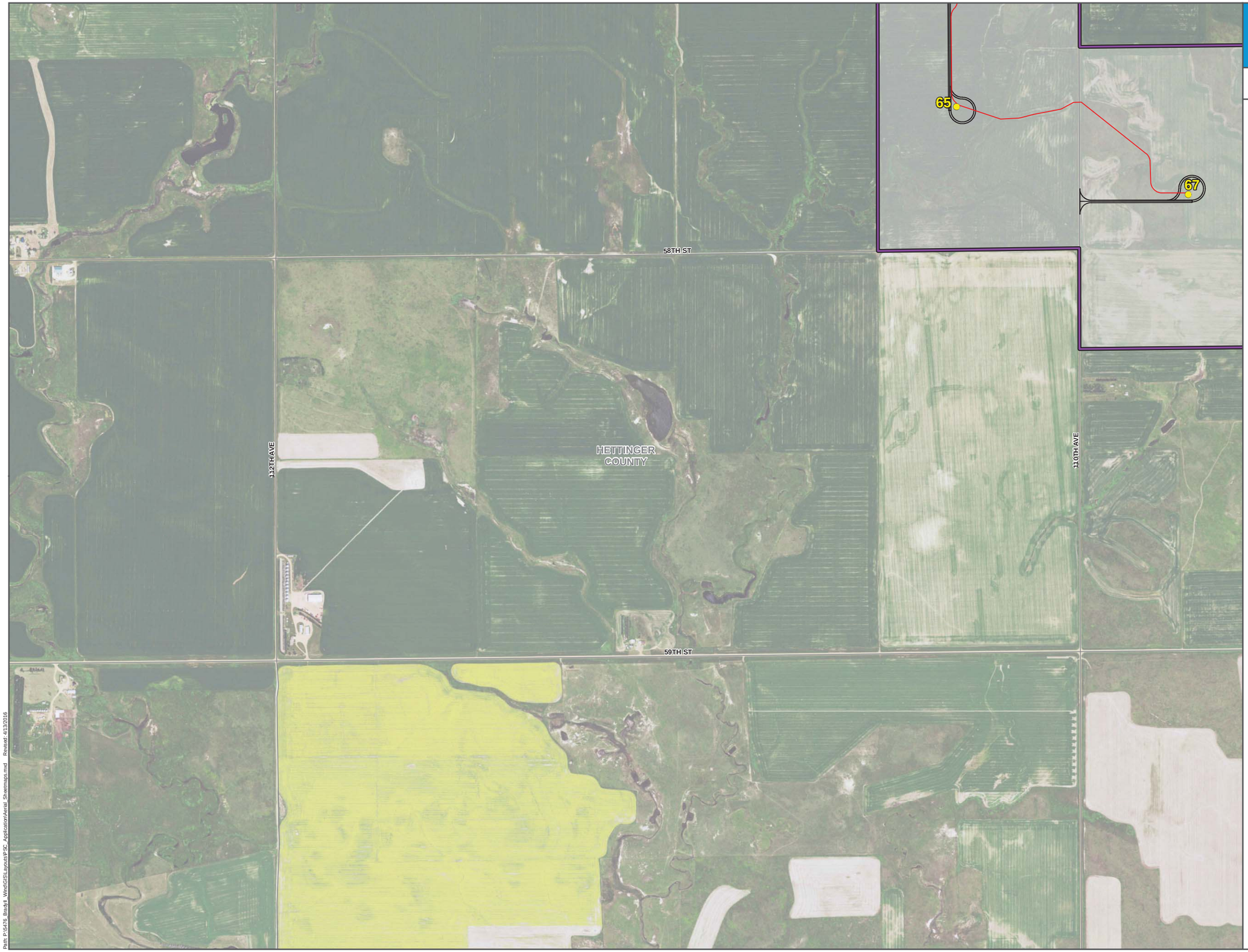
NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 12



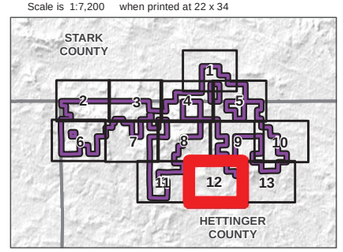

### Legend

**Proposed Project Features**

- Permanent Met Tower
- Temporary Met Tower
- Proposed Turbine (03/14/16)
- Alternative Turbine (03/14/16)
- Collection System (03/18/16)
- Service Roads (03/18/16)
- Proposed Project Area (04/12/16)

0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34




TETRA TECH

NEXTera ENERGY RESOURCES

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# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Sheet Map: 13



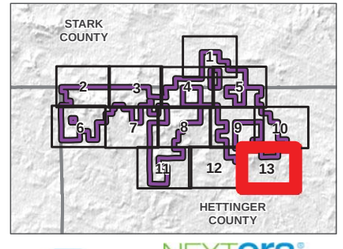

### Legend

**Proposed Project Features**

- Permanent Met Tower
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0 750 1,500
Feet

Scale is 1:7,200 when printed at 22 x 34



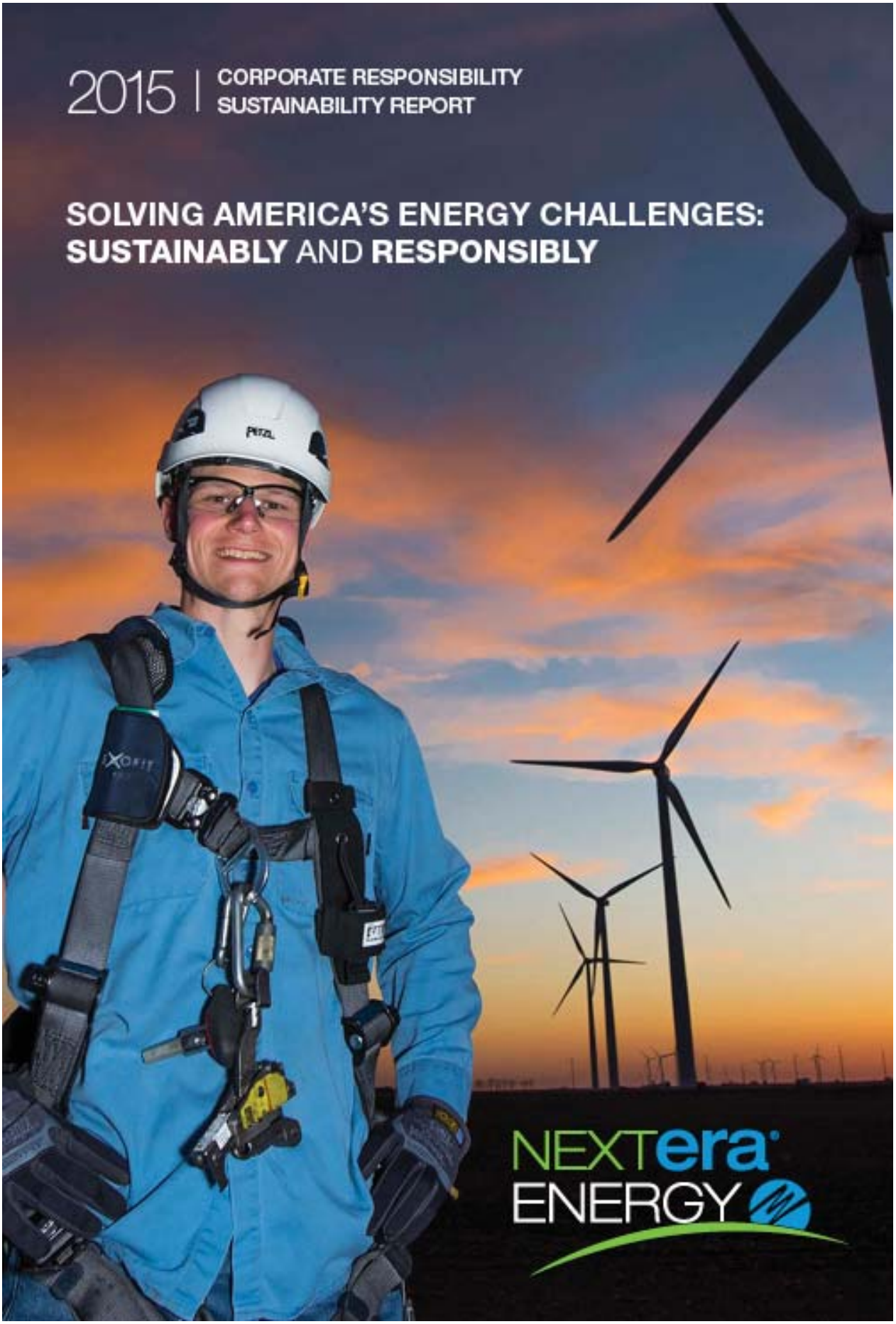

TETRA TECH

NEXTera ENERGY RESOURCES

Path: P:\5476_Brady\4_Wind\GIS\Layouts\PSC_Application\Aerial_Sheetmaps.mxd Revised: 4/13/2016

# Appendix C:
# Excerpt of NextEra, Inc.'s
# 2015 Corporate Responsibility Report

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Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# Our Story

At NextEra Energy, we're proud of the role we're playing in helping solve America's energy challenges and in creating a more affordable clean energy future ... sustainably and responsibly.

To us, being sustainable and responsible means respecting our environment, investing in customer value, sustaining and growing our communities, investing in our team, and growing shareholder value.

As we continue to pursue our vision of becoming America's clean energy leader, we do so with a commitment to ensuring we are providing benefits daily for our environment, our customers, our communities, our employees and our shareholders.

We're pleased you've taken the time to learn about the NextEra Energy story, and we invite you to join us in our journey to create a more affordable clean energy future we can all be proud of.

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# Delivering for OUR ENVIRONMENT

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# Highlights

1. NextEra Energy achieved its lowest-ever emissions rates of SO2, NOx and CO2 in 2014 – rates that were 97-, 79- and 55-percent lower, respectively, than our industry's averages
2. We installed more than 1,600 MW of wind and solar power in 2014
3. We committed to interacting with nature in a positive manner and have developed wildlife protection programs to protect a number of species and their habitats, including eagles, kestrels, sea turtles, crocodiles, and ospreys

# Environmental Stewardship

At NextEra Energy, we're committed to being an industry leader in environmental protection and stewardship. As citizens, we're all stakeholders of our earth's environment. As an energy company, we recognize that environmental protection and stewardship are essential to the way we do business and critical to the value we deliver for our stakeholders.

Our Environmental Policy establishes our core environmental expectations and provides actionable guidance for all employees as we strive to foster a culture of environmental excellence and challenge ourselves to continuously improve. The policy is incorporated in our Code of Business Conduct & Ethics and Supplier Code of Conduct, which apply to our employees and suppliers, respectively. Everyone at NextEra Energy understands that protecting the environment is a collective responsibility. It's why our senior executives are actively involved in our environmental accountability, management and stewardship programs that are intended to:

- Design, construct, operate and maintain our facilities in an environmentally sound and responsible manner;
- Prevent pollution, minimize waste and conserve natural resources;
- Avoid, minimize and/or mitigate impacts to habitat and wildlife; and
- Engage stakeholders to build trust and partner toward common goals for environmental stewardship and protection.

We want to be the first and best source of information for our stakeholders to learn about our environmental performance and programs. That's what it means to be the clean energy leader. And that's how we deliver for the environment.

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.



The protection of our natural environment is a fundamental part of our goal to be America's clean energy leader. We are committed to meeting our energy needs, while protecting the air, water, land and wildlife, and our exceptional environmental performance record and clean energy portfolio demonstrate just how well we are doing. These commitments are important to our employees, customers and communities and are what further enable us to deliver outstanding value to our customers and shareholders.

-Randy LaBauve, vice president of environmental services

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# Toward Cleaner Air

At NextEra Energy, we're committed to being an industry leader in environmental protection and stewardship, and one of the key ways in which we've demonstrated this commitment is by making business decisions to invest in emissions-free and clean generation. This enables us to reduce our impact on the air we all breathe. In fact, NextEra Energy's generation fleet has significantly lower rates of emissions of $CO_2$, $SO_2$ and $NO_x$ compared to the U.S. electric power industry as a whole.

At year-end 2014, NextEra Energy Resources was the world's largest generator of renewable energy from the wind and the sun. We ended 2014 with more than 11,400 megawatts of wind generation capacity and nearly 1,000 megawatts of solar generation capacity.

At FPL, we are continuing to modernize our fossil generation fleet by replacing older, inefficient oil-fired generation with state-of-the-art combined-cycle, natural gas generation. Since 2001, FPL's investments in clean, fuel-efficient power plants have saved customers more than $7.5 billion in fuel costs and helped reduce the company's use of foreign oil by 99 percent. Because of these modernization efforts, FPL has been able to avoid more than 40 million barrels of oil, using less than 1 million barrels of oil for generation in 2014. These investments have also enabled FPL to significantly reduce power plant emissions rates and have prevented more than 85 million tons of carbon emissions to date. FPL now operates one of the most modern, clean, fuel-efficient and low-carbon generation fleets in the nation.

At NextEra Energy, we have positioned our business well to meet the challenges of new federal environmental regulations. We anticipate these new rules will significantly advance the need for low-emitting and zero-emitting electric generation. At NextEra Energy, we've positioned our business to manage the opportunities and risks presented by these new regulations while simultaneously lowering emissions.

## Reducing Our Emissions

### $SO_2$ Emissions Rate

NEXTERA ENERGY VS. INDUSTRY:

**97% lower**

**$SO_2$ emissions rate***

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.




*Source for Electric Sector: U.S. Department of Energy

*The environmental attributes of NextEra Energy's electric generating facilities, such as renewable energy credits, emissions reductions, offsets, allowances and the avoided emission of greenhouse gas pollutants, have been or likely will be sold or transferred to third parties, who are solely entitled to the reporting rights to any federal, state, foreign or voluntary emissions trading program and to ownership of such environmental attributes. 

## $NO_X$ Emissions Rate







*Source for Electric Sector: U.S. Department of Energy

*The environmental attributes of NextEra Energy's electric generating facilities, such as renewable energy credits, emissions reductions, offsets, allowances and the avoided emission of greenhouse gas pollutants, have been or likely will be sold or transferred to third parties, who are solely entitled to the reporting rights to any federal, state, foreign or voluntary emissions trading program and to ownership of such environmental attributes. 

## $CO_2$ Emissions Rate

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

NEXTERA ENERGY VS. INDUSTRY AVERAGE:

# 55% lower

## $CO_2$ emissions rate*

| NextEra Energy: | | U.S. electric sector rate |
|---|---|---|
| 538 LBS / MWh | VS | 1,186 LBS / MWh |

*Source for Electric Sector: U.S. Department of Energy

*The environmental attributes of NextEra Energy's electric generating facilities, such as renewable energy credits, emissions reductions, offsets, allowances and the avoided emission of greenhouse gas pollutants, have been or likely will be sold or transferred to third parties, who are solely entitled to the reporting rights to any federal, state, foreign or voluntary emissions trading program and to ownership of such environmental attributes.



- In 2014, FPL brought into service its Riviera Beach Next Generation Clean Energy Center – one of the cleanest, most energy-efficient plants in the nation. Over its operational lifetime, the new, fuel-efficient plant is expected to provide FPL customers with hundreds of millions of dollars in fuel and other savings. This is part of FPL's focus on modernizing its power plant fleet by replacing oil-fired plants with clean, highly efficient, combined-cycle natural gas plants such as this one. It's also a big reason parent company NextEra Energy in 2014 recorded its lowest-ever air emissions rates.

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

In 2014, 97 percent of the power produced by NextEra Energy facilities was generated from a diverse mix of clean or renewable sources, including wind, solar, combined-cycle natural gas and nuclear. By implementing our strategy to become America's clean energy leader, we have been able to reduce our emissions rates of SO2, NOX and CO2 by 98 percent, 93 percent and 33 percent, respectively, since 1990, while at the same time growing our generation fleet by approximately 274 percent.

# FPL Powers Formula E Electric Race with Clean Solar Energy; Student Focus Garners Statewide Honors

FPL powered the vehicles racing in the country's first-ever electric car race, held in downtown Miami in March 2015. Part of the FIA Formula E Championship, the Miami ePrix featured the highest class of competition for electrically powered racing cars.

"Our partnership with Formula E and the Miami ePrix is another example of our commitment to advancing zero-emissions solar energy and the use of electric vehicles in Florida," said Eric Silagy, president and CEO of FPL. "By the end of 2016, we will triple the energy we are able to produce from the sun, furthering our mission to provide low-cost, reliable and clean energy to our 4.8 million customers."

FPL announced its partnership with Formula E at its Martin Next Generation Solar Energy Center, along with famed race car driver Michael Andretti and drivers in the Miami ePrix. During the announcement event, electric race cars were charged with power generated from the Martin Next Generation Solar Energy Center, one of three solar power plants operated by FPL. Earlier in the year, FPL announced plans to install more than 1 million solar panels at three additional solar power plants by the end of 2016. These new plants, combined with community-based solar installations and other small-scale arrays that FPL is installing, would total more than 225 megawatts of new solar capacity. This would effectively triple FPL's solar capacity, which currently totals approximately 110 megawatts.

"The Formula E Miami ePrix is all about sharing our passion for electric vehicles," said Alejandro Agag, CEO of Formula E Holdings. "The race series is exciting, it's entertaining, and we hope it will turn the world's attention to the potential electric vehicles have to change the way we power transportation. We are pleased to partner with FPL – a company that shares our vision for powering the future with affordable, clean energy."

"It's an honor for us to have been selected as one of the 10 founding Formula E teams for the inaugural season," said Michael Andretti, chairman and CEO of Andretti Sports Marketing.

Formula E hosts races in 10 cities around the world, including London, Beijing, Monaco and Buenos Aires. The Miami ePrix was the first Formula E race in the United States.

## Education tie is applauded

As part of its Formula E partnership, FPL also sponsored a student electric vehicle race. Students from schools throughout FPL's service area who are involved in science, technology, engineering and

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

math (STEM) programs assembled 10 electric kit cars. The student teams competed in the Formula E School Series, racing on the same track as the Miami ePrix. The grand prize was $5,000, second-place $2,500 and third-place $1,500. All prizes support STEM or robotics initiatives of the winning school teams.

The effort was hailed by Miami-Dade County Public Schools Superintendent Alberto M. Carvalho, who chose FPL for the Florida Commissioner of Education's Corporate Business Recognition Award. "Miami-Dade County Public Schools and its students have benefitted tremendously from FPL's support of STEM initiatives," said Superintendent Carvalho. "Their commitment has enriched the learning environment by providing additional resources in our classrooms and giving students invaluable real-life learning experiences."

"We are proud of our long-time partnership with Miami-Dade County Public Schools and of the difference we are making in our classrooms," said Eric Silagy, president and CEO of FPL. "FPL is honored to be recognized for our involvement inside and outside the classroom. Together with the school district, we are making Miami an even better place to work and raise a family."

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# Wildlife and Habitat Preservation

At NextEra Energy, we're committed to being an industry leader in environmental protection and stewardship, and that includes wildlife and habitat protection. We have operations across the U.S. and Canada, so we are keenly aware of the potential impacts that existing and future operations may have to wildlife and their habitat. This is why we have environmental policies and programs in place at both the corporate and local levels to avoid and minimize these impacts and to address any remaining impacts through appropriate mitigation measures. Here's what we do:

- Before we build a power plant or other electric facilities, we work hard to make sure we understand the local ecosystem and what it takes to be a partner in its preservation and to be a good neighbor to all the species that live there.
- As part of that work, we consider the presence of any threatened or endangered species and the proximity to valuable wildlife corridors, wetlands or other ecologically important areas. We make efforts to avoid these areas entirely. If we can't do that, we seek to minimize and mitigate the impact of our developments to affected areas.
- Once a project is operating, we continue to monitor potential impacts to biodiversity that may occur. For example, at wind sites, we implement a voluntary Wildlife Response and Reporting System (WRRS) to monitor long-term avian and bat interactions. We also voluntarily adhere to the FWS Wind Energy Guidelines that were issued in 2012, and conduct a minimum of one year of formal post-construction mortality monitoring at all U.S. wind sites constructed after March 2012.
- In Ontario, our company complies with Ministry of Natural Resources guidance, which requires that we perform a minimum of three years of post-construction mortality monitoring for birds and bats, in addition to other project-specific monitoring conditions.

We have long adhered to numerous policies and programs to protect threatened and endangered species. We follow all federal and state regulations including the Endangered Species Act (ESA), which is administered by the U.S. Fish and Wildlife Service (FWS) and the U.S. National Marine Fisheries Service (NMFS). We also go above and beyond those regulations by making important contributions to protect a number of vulnerable species and habitat areas. Some examples of our wildlife-related programs are featured below.

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.



- FPL has donated 130 concrete power poles to an artificial reef program managed by St. Lucie County, Florida. The poles provide additional habitat for marine life. Area fishing and diving businesses also benefit.

## Eagle Nest Platforms



- For many centuries, eagles have represented strength, courage and power. That's been true not only in the U.S. ? where the bald eagle has been our national symbol since the late 1700s ? but in countries the world over.
- During early construction of NextEra Energy's Summerhaven Wind Energy Centre in Ontario in late 2012, Canada, a pair of eagles began building a new nest within the project area. For three years prior, the area had been monitored and no nest had been found.
- After consulting with the Ontario Ministry of Natural Resources and receiving their approval, we removed the tree and nest in January 2013 to eliminate a potential hazard to the eagles and to give the birds time to build a new nest or find another one prior to their breeding season.
- From early January through late February 2013, a team of experts installed five eagle platforms near the Lake Erie shoreline in the general vicinity of the original nest, but at a safe distance from the turbines, to provide alternative nesting sites for this pair of eagles and other pairs in the local eagle population.
- To our delight, a pair of eagles was documented to have successfully raised young in one of these nests in the summer of 2013. The eagles returned in 2014 and successfully raised two chicks.
- See the following website for more information, including photographs and a video of the eagles.

**Nesting platform success in Florida**



- Bald eagles are found in all 50 U.S. states, including throughout FPL's service territory in Florida.
- In the fall of 2013, a bald eagle built its nest on a 230-kV transmission line in Volusia County, Fla. To protect the nest and the eagles that would be raising their family in it, and because the surrounding area lacked viable nest trees, FPL for the first time ever constructed an independent pole and platform to provide the birds with a nearby nest location. With input from the Florida Fish and Wildlife Conservation Commission and

the U.S. Fish and Wildlife Service, the platform was designed to provide long-term support of the nest. Within 45 days of the nest transfer, a pair of eagles began to add onto and occupy the nest, and in 2014, a baby eaglet hatched in the nest!

## Duette Preserve – Kestrel Boxes



- The colorful Southeastern American Kestrel is the smallest falcon in North America. Unfortunately, its numbers have dwindled so much that researchers cannot say how many of the threatened species still exist in Florida.
- In March 2013, while installing new, more storm-resilient power line poles and replacing old wooden poles in an area of its service territory, FPL identified an opportunity to assist the kestrel. Line workers attached kestrel boxes to four of the new poles - a first for the company - and also preserved the old wooden poles that contained inactive nests.
- In 2015, as FPL continues to upgrade the poles in this area of Kestrel habitat, we've included nest boxes on an additional 20 poles. We're also working with the Audubon Society toward a program to monitor the boxes for nesting success.

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

# We're No. 1 in Wind

At NextEra Energy, we're the No. 1 owner of wind energy in North America. We operate approximately 11,400 MW of emissions-free wind energy, enough to power a city the size of Chicago - the "Windy City." Our wind program helps us deliver reliable and affordable energy to customers with a focus on environmental stewardship. Wind energy is an especially attractive source of electric power because:

- wind farms can be constructed quickly,
- they use no water and produce no solid waste or air emissions,
- there are no fuel costs because wind is free,
- many customers are requesting electricity produced only from renewables such as wind, and
- the price of wind energy is low and competitive with other forms of power generation.

## NORTH AMERICA'S LARGEST GENERATOR OF WIND POWER

**107 wind facilities**

**9,899 individual wind turbines**

**19 U.S. states and 4 Canadian provinces**

**Avoided $CO_2$ emissions of 30 million tons due to wind generation**

In 2012, we set an aggressive goal for additions to our U.S. wind portfolio, and through diligence and hard work, we exceeded it. We commissioned roughly 1,500 MW of wind in the United States, a milestone no other company has ever achieved. In fact, we celebrated the commissioning of our 10,000th MW of wind at our 400-MW Limon Wind Project in Colorado in December 2012. Not only did this record building program result in 1,500 MW of zero-emissions generation, it also helped us

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.

deliver for our communities by creating more than 3,000 construction jobs, 90 full-time jobs, and new tax revenue that state and local governments use to meet pressing community needs.



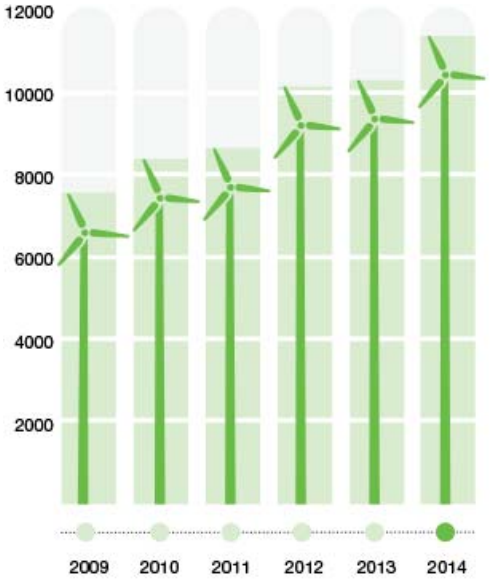

At NextEra Energy Resources, our wind portfolio grew in 2014 by approximately 1,300 MW, including facilities in Oklahoma, Colorado and Texas, as well as four wind sites in Ontario, Canada.

We now have wind projects in 19 states and four Canadian provinces, representing a total capital investment of more than $20.1 billion and a fleet size that is comparable to the generation capacity of a top-15 utility.

## WIND ENERGY PORTFOLIO

CUMULATIVE MW

Project totals for NextEra Energy, Inc. and NextEra Energy Resources, LLC include those in which NextEra Energy Partners, LP holds a minority interest.






- Enough emissions-free wind energy can be generated at our Vasco Wind Energy Center in California to power more than 19,500 homes.

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# Appendix D:
# Department of Defense
# Preliminary Screening Tool Outputs

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Federal Aviation Administration

« OE/AAA

## DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2014.2.0

**Disclaimer:**

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

**Instructions:**

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  -Air Defense and Homeland Security radars(Long Range Radar)
  -Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  -Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

**Screening Type:** Long Range Radar ▼ **Geometry Type:** Polygon ▼

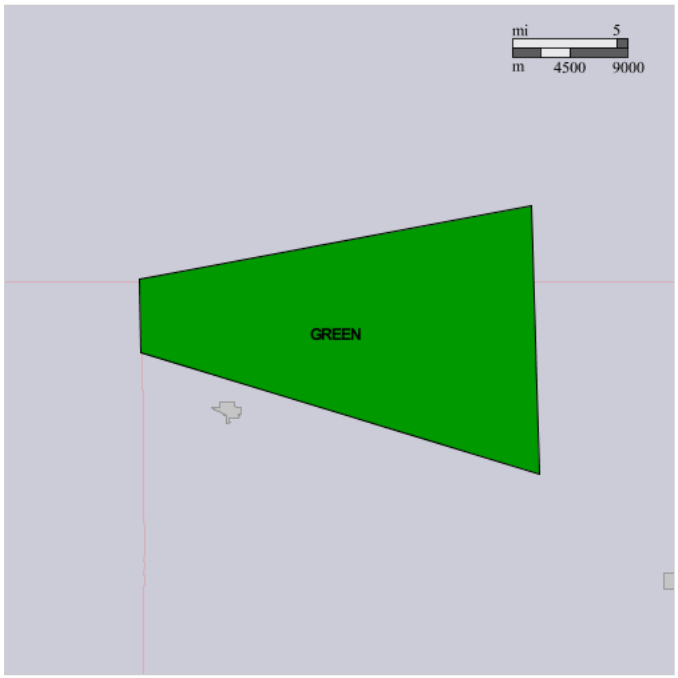
| Point | Latitude | | | | Longitude | | | |
|---|---|---|---|---|---|---|---|---|
| | Deg | Min | Sec | Dir | Deg | Min | Sec | Dir |
| 1 | 46 | 37 | 52.85 | N ▼ | 102 | 55 | 41.88 | W ▼ |
| 2 | 46 | 40 | 55.34 | N ▼ | 102 | 39 | 27.03 | W ▼ |
| 3 | 46 | 29 | 48.18 | N ▼ | 102 | 39 | 07.87 | W ▼ |
| 4 | 46 | 34 | 49.07 | N ▼ | 102 | 55 | 38.01 | W ▼ |

**Horizontal Datum:** NAD83 ▼

**Map Legend:**

- **Green:** No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.
- **Yellow:** Impact likely to Air Defense and Homeland Security radars. Aeronautical study required.
- **Red:** Impact highly likely to Air Defense and Homeland Security radars. Aeronautical study required.

**Note:** Map colors will show as depicted in the map legend when using the 'Polygon' Geometry Type; map colors will be subdued when using the 'Single Point' Geometry Type.



Federal Aviation Administration

« OE/AAA

## DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2014.2.0

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- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

**Screening Type:** NEXRAD ▼ **Geometry Type:** Polygon ▼

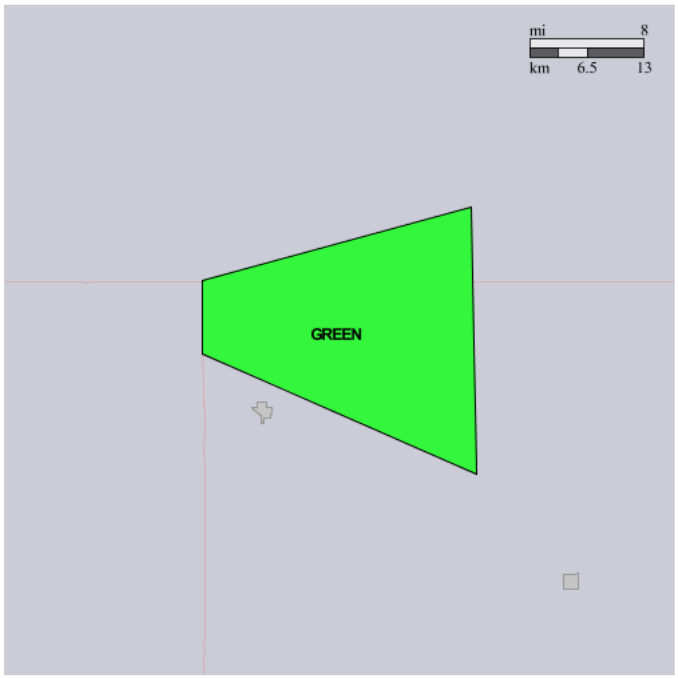
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|---|---|---|---|---|---|---|---|---|
| | Deg | Min | Sec | Dir | Deg | Min | Sec | Dir |
| 1 | 46 | 37 | 52.85 | N ▼ | 102 | 55 | 41.88 | W ▼ |
| 2 | 46 | 40 | 55.34 | N ▼ | 102 | 39 | 27.03 | W ▼ |
| 3 | 46 | 29 | 48.18 | N ▼ | 102 | 39 | 07.87 | W ▼ |
| 4 | 46 | 34 | 49.07 | N ▼ | 102 | 55 | 38.01 | W ▼ |

**Horizontal Datum:** NAD83 ▼

**Map Legend:**

- **Green: No Impact Zone.** Impacts not likely. NOAA will not perform a detailed analysis, but would still like to know about the project.
- **Dk Green: Notification Zone.** Some impacts possible. Consultation with NOAA is optional, but NOAA would still like to know about the project.
- **Yellow: Consultation Zone.** Significant impacts possible. NOAA requests consultation to discuss project details and to perform a detailed impact analysis. NOAA may request mitigation of significant impacts.
- **Orange: Mitigation Zone.** Significant impacts likely. NOAA will likely request mitigation if a detailed analysis indicates that the project will cause significant impacts.
- **Red: No-Build Zone.** Severe impacts likely. NOAA requests developers not build wind turbines within 3 km of the NEXRAD. Detailed impact analysis required.

**Note:** Map colors will show as depicted in the map legend when using the 'Polygon' Geometry Type; map colors will be subdued when using the 'Single Point' Geometry Type.




Because the NEXRAD can detect wind turbines occasionally at great distance, NOAA would like to know the location of all wind farm projects so that corrupted radar data can be flagged. Send project information directly to NOAA at wind.energy.matters@noaa.gov or through the National Telecommunications & Information Administration (NTIA) in the Dept. of Commerce. NOAA protects all wind project information as proprietary and sensitive.

Federal Aviation Administration

« OE/AAA

## DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2014.2.0

**Disclaimer:**

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  -Military Operations
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- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

---

**Screening Type:** Military Operations ▼ **Geometry Type:** Single Point ▼

| Point | Latitude | | | | Longitude | | | |
|---|---|---|---|---|---|---|---|---|
| | Deg | Min | Sec | Dir | Deg | Min | Sec | Dir |
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**Horizontal Datum:** NAD83 ▼

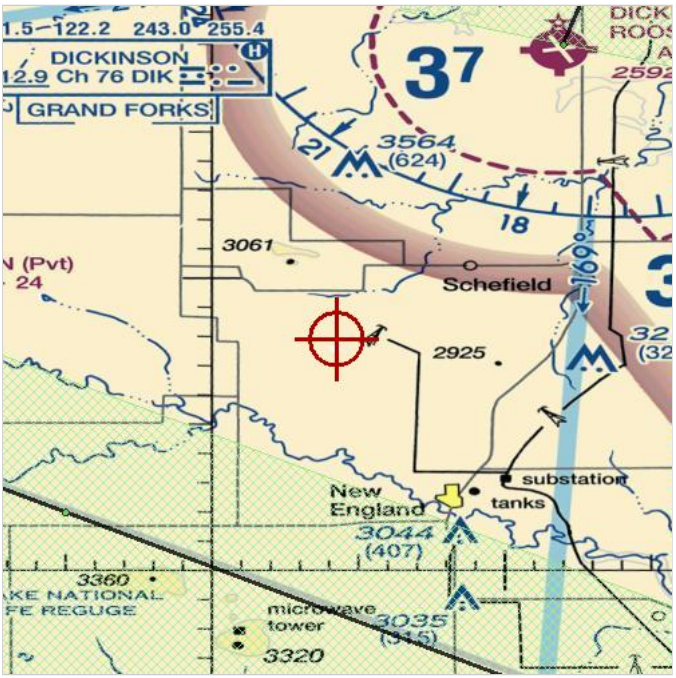
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## DoD Preliminary Screening Tool

DoD Preliminary Screening Tool - Desk Reference Guide V_2014.2.0

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- The largest polygon allowed has a maximum perimeter of 100 miles.

---

**Screening Type:** Military Operations ▼ **Geometry Type:** Single Point ▼

| Point | Latitude | | | | Longitude | | | |
|---|---|---|---|---|---|---|---|---|
| | Deg | Min | Sec | Dir | Deg | Min | Sec | Dir |
| 1 | 46 | 40 | 55.24 | N ▼ | 102 | 39 | 27.03 | W ▼ |

**Horizontal Datum:** NAD83 ▼

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- The largest polygon allowed has a maximum perimeter of 100 miles.

**Screening Type:** Military Operations ▼ **Geometry Type:** Single Point ▼

| Point | Latitude | | | | Longitude | | | |
|---|---|---|---|---|---|---|---|---|
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**Horizontal Datum:** NAD83 ▼

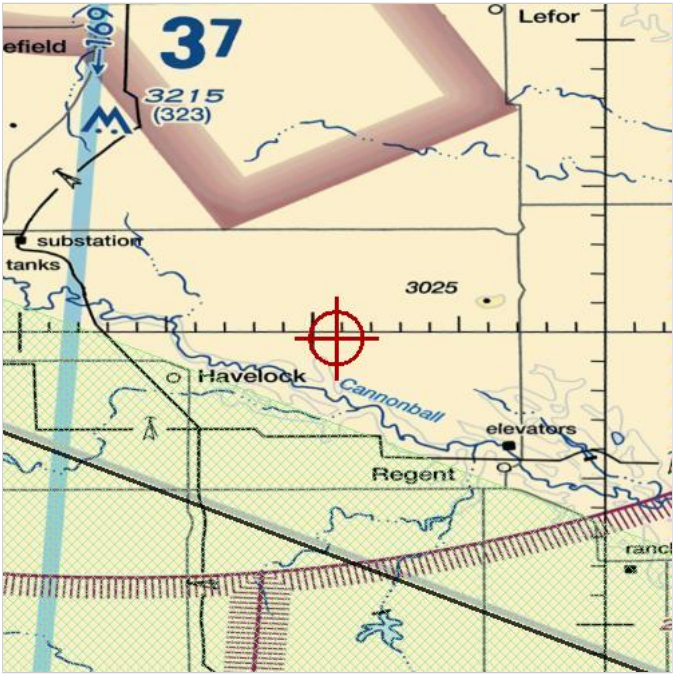
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  -Air Defense and Homeland Security radars(Long Range Radar)
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**Screening Type:** Military Operations ▼ **Geometry Type:** Single Point ▼

| Point | Latitude | | | | Longitude | | | |
|---|---|---|---|---|---|---|---|---|
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**Horizontal Datum:** NAD83 ▼

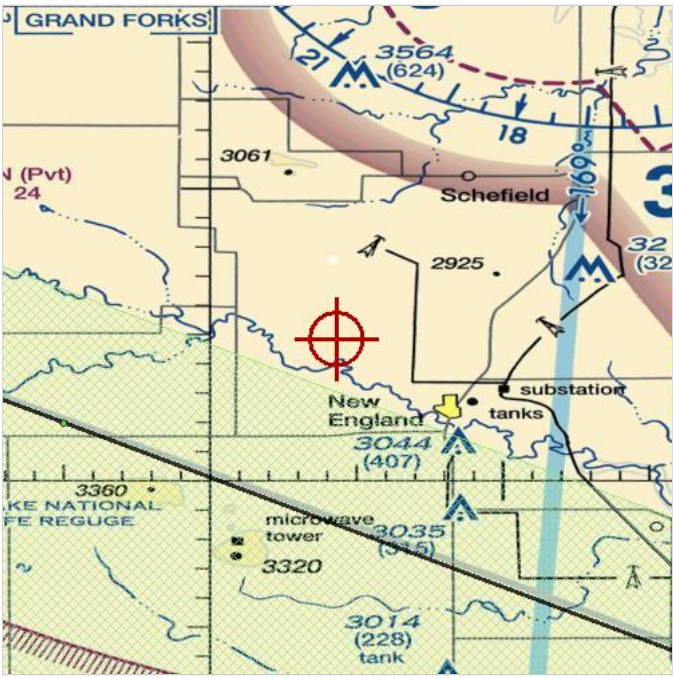
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# Appendix E:
# Beam Path Assessment

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# ND Brady II Non-Federal Beam Path study 2016-04-13

**Brady II**

**Turbine Type**

GE1.79 100RD 80HH

GE2.1 116RD 80HH

Wind Speed 80m (m/s)

9.2

6.1

Brady I - East Rain Butte beam path

**Beam paths**

**LIC_NAME**

- AT&T CORP.
- BASIN ELECTRIC POWER COOPERATIVE
- Basin Electric Power Cooperative
- New Cingular Wireless PCS, LLC
- PRAIRIE PUBLIC BROADCASTING, INC.
- Prairie Public Broadcasting, Inc.




0 0.5 1 2 Kilometers

N W E S

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# Appendix F:
# Shadow Flicker Impact Analysis

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# Shadow Flicker Impact Analysis

**for the**

# Brady II Wind Energy Center

# Hettinger and Stark Counties, North Dakota

*Prepared for*

**Brady Wind II, LLC**
700 Universe Boulevard
Juno Beach, Florida 22408

*Prepared by*

TETRA TECH

160 Federal Street, 3rd Floor
Boston, MA 02110

**March 2016**

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# List of Attachments

Attachment A. Detailed Summary of WindPro Shadow Flicker Analysis Results

# Acronyms and Abbreviations

| | |
|---|---|
| Brady Wind | Brady Wind II, LLC |
| GE | General Electric |
| Hz | Hertz |
| NCDC | National Climatic Data Center |
| Project | Brady II Wind Energy Center Project |
| rpm | rotations per minute |
| UTM | Universal Transverse Mercator |

# 1.0 OVERVIEW

Brady Wind II, LLC (Brady II), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NEER), is proposing to develop the Brady II Wind Energy Center (the Project) in Stark County, North Dakota. The Project includes up to 72 wind turbines with a maximum nameplate capacity of approximately 150 megawatts. Tetra Tech has conducted the following shadow flicker analysis for the Project to support Brady Wind's application for a Certificate of Site Compatibility under the North Dakota Public Service Commission.

# 2.0 PROJECT COMPONENTS

The Project will consist of up to 72 wind turbines. Seven (7) of the turbines will be the GE 1.79-100 turbine model and the rest of turbines will be the General Electric (GE) 2.1-116 turbine model. The two wind turbine models being considered for the Project, and evaluated for potential shadow flicker impacts, have the following characteristics:

- **GE 1.79 100** – 3-blade 100-meter diameter rotor, with a hub height of 80 meters and generating capacity of 1.79 MW. The GE 1.79-100 has a normal high rotor speed of 17.5 rotations per minute (rpm) which translates to a blade pass frequency of 0.87 hertz (Hz) (less than 1 alternation per second). The Project will include up to 7 GE 1.79-100 turbines.

- **GE 2.1-116** – 3-blade 116-meter diameter rotor, with a hub height of 80 meters and generating capacity of 2.1 MW. The GE 2.1-116 has a normal high rotor speed of 15.7 rpm which translates to a blade pass frequency of 0.79 Hz (less than 1 alternation per second). The Project will include up to 65 GE 1.715-100 turbines.

# 3.0 SHADOW FLICKER BACKGROUND

A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker, and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than 3 degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not

operating. In addition, shadow flicker is only an issue when at least 20 percent of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 2,500 meters (8,202 feet) is very low and generally considered imperceptible. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker frequency is related to the wind turbine's rotor blade speed and the number of blades on the rotor. From a health standpoint, the low flicker frequencies associated with wind turbines, are harmless, and public concerns that flickering light from wind turbines can have negative health effects, such as triggering seizures in people with epilepsy are unfounded. Epilepsy Action (working name for the British Epilepsy Foundation) states that there is no evidence that wind turbines can cause seizures (Epilepsy Action 2008). However, they recommend that wind turbine flicker frequency be limited to 3 Hz. (For comparison, strobe lights used in discotheques have frequencies which range from about 3 Hz to 10 Hz (1 Hz = 1 flash per second). Since the proposed Project's wind turbine blade pass frequency is approximately 0.87 Hz (less than 1 alternation per second), no negative health effects to individuals with photosensitive epilepsy are anticipated.

Shadow flicker impacts are not regulated in applicable state or federal law, and there is no permitting threshold with regard to hours per year of anticipated impacts to a receptor from a wind energy project.

# 4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. As described above, the Project will install up to 72 wind turbines (7 GE 1.79-100 and the rest GE 2.1-116 model turbines). While only 72 turbines will be constructed, 83 turbines have been evaluated with WindPro so that the analysis includes assessment of up to 11 alternative turbine locations (layout dated March 14, 2016).

In addition to the assessment of the Brady II Wind Energy Center Project, a cumulative impact assessment with the Brady Wind Energy Center was also conducted. The Brady Wind Energy Center is proposed to be constructed starting in May immediately to the north of Brady II in Stark County, ND and will consist of up to 87 wind turbines (80 GE 1.715 MW and 7 GE 1.79 MW). The GE 1.715 MW turbine has a hub height of 80 meters and a rotor diameter of 103 meters.

The analysis evaluated the following three turbine layout scenarios:

- Scenario A – 72 wind turbines (Brady II primary turbines only)

- Scenario B – 79 wind turbines (Brady II primary plus alternate turbines)
- Scenario C – 159 wind turbines (Brady II plus Brady – primary turbines only)

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

- The elevation and position geometries of the wind turbines and surrounding receptors (inhabited residences). Elevations were determined using U.S. Geological Survey digital elevation model data. Positions geometries were determined using geographic information system and referenced to Universal Transverse Mercator (UTM) Zone 13 (NAD83).

- The position of the sun and the incident sunlight relative to the wind turbine and receptors on a minute-by-minute basis over the course of a year.

- Historical sunshine availability (percent of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center [NOAA 2012] for nearby Bismarck, North Dakota) used in this analysis are as follows:

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 53% | 53% | 58% | 58% | 61% | 64% | 73% | 72% | 65% | 58% | 43% | 47% |

- Estimated wind turbine operations and orientation (based on approximately 5 years of wind data (6/15/2006–10/19/2011), including wind speed/wind direction frequency distribution, measured at a meteorological tower located approximately 50 miles northeast of the Project).

- Receptor viewpoints (i.e., house windows) are assumed to always be directly facing turbine to sun line of sight (“greenhouse mode”).

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

A total of 175 structures were identified within and near the Project Area; of these, 114 were determined to be inhabited or potentially inhabited residences and are considered potential shadow-flicker receptors for the purpose of this analysis. A receptor in the model is defined as a 1 meter squared area (approximate size of a typical window), 3.28 feet (1 meter) above ground level. Approximate eye level is set at 4.94 feet (1.5 meters). Figure 1 shows the locations of all identified structures and the 114 shadow flicker receptors (inhabited residences), along with the 83 potential turbine locations considered.

# 5.0 SHADOW FLICKER ANALYSIS RESULTS

As expected, WindPro predicts that shadow flicker impacts will be greatest at locations nearer to the wind turbines. Figures 2 illustrates the WindPro predicted shadow flicker impact areas for the 72 planned Brady II turbines (Scenario A). Figure 3 illustrates the WindPro predicted shadow flicker impacts for the 72 planned and 11 alternate turbine locations (Scenario B). Figure 4 illustrates the WindPro predicted shadow flicker impacts for the 72 planned Brady II turbines as well as the 87 planned Brady turbine locations (Scenario C). A detailed WindPro shadow flicker analysis summary, for each of the modeled receptor location, is provided in Attachment A.

Tables 1, 2, and 3 present the WindPro predicted shadow flicker impacts for the top ten worst case impacts for the 114 identified receptors (inhabited residences), for the turbine scenarios A, B, and C, respectively. The predicted shadow flicker for all 114 inhabited residential receptors is presented in Appendix A. Because the Project is using a minimum turbine siting setback requirement of 2,000 feet (609.6 meters) to inhabited residences, the most sensitive receptors are generally not located in the high potential shadow flicker impact zones. The maximum predicted shadow flicker impact at any inhabited residence receptor is 24 hours and 2 minutes per year (Receptor 610084) if only the 72 planned turbines are constructed, and 24 hours 2 minutes per year (Receptor 610084), if the alternate turbines are also included in the analysis.

In the cumulative analysis, the maximum predicted cumulative shadow flicker impact at any inhabited residence receptor is 44 hours and 55 minutes per year (Receptor 880001) if the 159 planned turbines for both Brady and Brady II are constructed. The highest predicted shadow flicker impacts, 44 hours and 55 minutes, is approximately 1.0 percent of the potential available daylight hours. There are two receptors with shadow flicker impacts greater than 30 hours per year (Scenario C). Both of these residences are owned by landowners that are participating in the Brady Project, and the shadow flicker predicted for these two receptors are from shadows cast by the Brady turbines rather than Brady II turbines.

| Table 1. WindPro Predicted Shadow Flicker Impacts for Inhabited Receptors – Scenario A | | |
|---|---|---|
| **Receptor ID** | **Shadow Hours per Year (expected) [hh:mm / year]** | **Receptor Type** |
| 610084 | 24:02 | trailer home |
| 501099 | 16:24 | house |
| 501104 | 15:20 | garage |
| 610149 | 13:09 | house |
| 501138 | 12:51 | house |
| 501118 | 10:39 | house |
| 500028 | 9:29 | house |
| 500022 | 7:10 | house |
| 610170 | 5:45 | house |
| 800311 | 5:31 | fema trailer |

| Table 2. WindPro Predicted Shadow Flicker Impacts for Inhabited Receptors – Scenario B | | |
|---|---|---|
| **Receptor ID** | **Shadow Hours per Year (expected) [hh:mm / year]** | **Receptor Type** |
| 610084 | 24:02 | trailer home |
| 501099 | 16:24 | house |
| 501104 | 15:20 | garage |
| 501118 | 13:49 | house |
| 610149 | 13:09 | house |
| 501138 | 12:51 | house |
| 500028 | 9:29 | house |
| 800311 | 9:07 | fema trailer |
| 800308 | 9:05 | fema trailer |
| 500022 | 7:10 | house |

| Table 3. WindPro Predicted Shadow Flicker Impacts for Inhabited Receptors – Scenario C | | |
|---|---|---|
| **Receptor ID** | **Shadow Hours per Year (expected) [hh:mm / year]** | **Receptor Type** |
| 880001 | 44:55 | New house |
| 610121 | 35:08 | house |
| 610053 | 27:40 | house |
| 610084 | 24:02 | trailer home |
| 610181 | 23:24 | house |
| 610057 | 22:25 | future trailer home |
| 501068 | 21:59 | house |
| 610049 | 19:59 | house |
| 610185 | 19:02 | house |
| 501053 | 17:57 | foundation |

The shadow flicker impact prediction statistics are summarized in Tables 4, 5 and 6 below.

| Table 4. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Scenario A | |
|---|---|
| **Cumulative Shadow Flicker Time (expected)** | **Number of Receptors** |
| Total | 114 |
| = 0 Hours | 99 |
| > 0 Hours < 10 Hours | 9 |
| ≥ 10 Hours < 20 Hours | 5 |
| ≥ 20 Hours < 30 Hours | 1 |
| ≥ 30 Hours | 0 |

| Table 5. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Scenario B | |
|---|---|
| **Cumulative Shadow Flicker Time (expected)** | **Number of Receptors** |
| Total | 114 |
| = 0 Hours | 97 |
| > 0 Hours < 10 Hours | 11 |
| ≥ 10 Hours < 20 Hours | 5 |
| ≥ 20 Hours < 30 Hours | 1 |
| ≥ 30 Hours | 0 |

| Table 6. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Scenario C | |
|---|---|
| **Cumulative Shadow Flicker Time (expected)** | **Number of Receptors** |
| Total | 114 |
| = 0 Hours | 71 |
| > 0 Hours < 10 Hours | 21 |
| ≥ 10 Hours < 20 Hours | 15 |
| ≥ 20 Hours < 30 Hours | 5 |
| ≥ 30 Hours | 2 |

# 6.0 CONCLUSION

The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance conditions. Shadow flicker is not expected to be a significant environmental impact.

The analysis was deliberately conservative and actual shadow flicker is expected to occur for less than the modeled durations. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions which may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times. Adding to the analysis' conservatism, Brady II will only construct up to 72 turbines, which is fewer wind turbines than were included in the Scenario B modeled results.

# 7.0 REFERENCES

Epilepsy Action. 2008. Information Web Page on Photosensitive Epilepsy. British Epilepsy Association. http://www.epilepsy.org.uk/info/photo_other.html. Accessed November 2015.

National Oceanic and Atmospheric Administration (NOAA). 2012. Comparative Climatic Data for the United States Through 2012.

# Figures

NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 1
TURBINE AND RECEPTOR
LOCATIONS

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\IGIS\Spatial\MXD\ShadowFlicker\Fig1_Receptors.mxd

NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER COUNTY

NORTH DAKOTA

# FIGURE 2
# EXPECTED SHADOW FLICKER IMPACT AREAS (SCENARIO A – PRIMARY TURBINES ONLY)

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied

**Shadow Flicker (hours per year)**

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\\GIS\Spatial\MXD\ShadowFlicker\Fig2_ShadowFlicker_NoAlts.mxd

NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER COUNTY

NORTH DAKOTA

# FIGURE 3
# EXPECTED SHADOW FLICKER IMPACT AREAS (SCENARIO B – PRIMARY PLUS ALTERNATE TURBINES)

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied

**Shadow Flicker (hours per year)**

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\\GIS\Spatial\MXD\ShadowFlicker\Fig3_ShadowFlicker_Alts.mxd

NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER AND STARK COUNTIES
NORTH DAKOTA

# FIGURE 4
# EXPECTED SHADOW FLICKER IMPACT AREAS (SCENARIO C – BRADY AND BRADY II PRIMARY TURBINES ONLY)

MARCH 2016

**Brady Proposed Turbine Array (11/6/2015)**
- GE Xle 1.715-103 Turbine
- GE Xle 1.715-103 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Brady II Proposed Turbine Array (3/14/2016)**
- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**
- Occupied
- Not Occupied

**Shadow Flicker (hours per year)**
- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_BradyII\GIS\Spatial\MXD\ShadowFlicker\Fig4_ShadowFlicker_Brady_BradyII_NoAlts.mxd

# Attachment A:
# Detailed Summary of WindPro Shadow Flicker Analysis Results

## Detailed Summary of WindPro Shadow Flicker Analysis Results – Scenario A

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 610084 | 666,867 | 5,164,930 | 24:02:00 | trailer home |
| 501099 | 675,017 | 5,163,411 | 16:24:00 | house |
| 501104 | 675,027 | 5,163,439 | 15:20:00 | garage |
| 610149 | 674,773 | 5,165,354 | 13:09:00 | house |
| 501138 | 664,349 | 5,164,755 | 12:51:00 | house |
| 501118 | 659,777 | 5,163,091 | 10:39:00 | house |
| 500028 | 677,401 | 5,165,136 | 9:29:00 | house |
| 500022 | 677,510 | 5,165,047 | 7:10:00 | house |
| 610170 | 667,574 | 5,164,565 | 5:45:00 | house |
| 800311 | 667,332 | 5,158,349 | 5:31:00 | fema trailer |
| 800308 | 667,354 | 5,158,391 | 5:28:00 | fema trailer |
| 501156 | 674,657 | 5,162,748 | 5:00:00 | house |
| 501085 | 672,965 | 5,164,410 | 2:15:00 | trailer house |
| 501096 | 672,947 | 5,164,396 | 2:07:00 | old house |
| 500059 | 669,892 | 5,159,454 | 0:35:00 | house |
| 401 | 681,106 | 5,162,818 | 0:00:00 | house 1 |
| 404 | 681,064 | 5,162,775 | 0:00:00 | house 2 |
| 420002 | 668,875 | 5,171,095 | 0:00:00 | house |
| 420023 | 668,410 | 5,170,735 | 0:00:00 | house |
| 420029 | 668,316 | 5,170,507 | 0:00:00 | house |
| 420039 | 667,891 | 5,171,580 | 0:00:00 | house |
| 420047 | 667,886 | 5,171,532 | 0:00:00 | house |
| 420051 | 664,044 | 5,171,213 | 0:00:00 | house |
| 420065 | 664,088 | 5,171,360 | 0:00:00 | house |
| 420069 | 663,975 | 5,171,244 | 0:00:00 | house |
| 420076 | 663,894 | 5,171,299 | 0:00:00 | house |
| 420089 | 663,065 | 5,171,180 | 0:00:00 | house |
| 420090 | 662,974 | 5,171,187 | 0:00:00 | house |
| 420100 | 662,342 | 5,170,932 | 0:00:00 | house |
| 420108 | 662,543 | 5,170,920 | 0:00:00 | house |
| 420116 | 662,765 | 5,170,601 | 0:00:00 | house |
| 420117 | 654,920 | 5,169,153 | 0:00:00 | house |
| 420119 | 660,825 | 5,167,514 | 0:00:00 | future trailer home |
| 450548 | 681,287 | 5,160,073 | 0:00:00 | 10 ft os |
| 500002 | 680,617 | 5,158,589 | 0:00:00 | house |
| 500006 | 679,633 | 5,157,936 | 0:00:00 | house |
| 500012 | 679,628 | 5,157,991 | 0:00:00 | trailer |
| 500018 | 679,256 | 5,165,366 | 0:00:00 | house |
| 500035 | 673,147 | 5,158,516 | 0:00:00 | house |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 500039 | 671,766 | 5,158,494 | 0:00:00 | house |
| 500053 | 672,221 | 5,159,146 | 0:00:00 | house |
| 500064 | 669,899 | 5,159,550 | 0:00:00 | house |
| 501000 | 684,105 | 5,172,245 | 0:00:00 | trailer hs |
| 501012 | 681,646 | 5,173,097 | 0:00:00 | house |
| 501019 | 680,468 | 5,175,745 | 0:00:00 | house |
| 501022 | 680,563 | 5,175,382 | 0:00:00 | house |
| 501030 | 679,723 | 5,174,632 | 0:00:00 | house |
| 501037 | 679,731 | 5,171,167 | 0:00:00 | house |
| 501040 | 678,406 | 5,173,332 | 0:00:00 | house |
| 501050 | 678,419 | 5,173,433 | 0:00:00 | house |
| 501053 | 678,555 | 5,173,259 | 0:00:00 | foundation |
| 501059 | 678,568 | 5,173,250 | 0:00:00 | portable |
| 501065 | 678,822 | 5,170,399 | 0:00:00 | old hse |
| 501068 | 677,851 | 5,169,797 | 0:00:00 | house |
| 501073 | 681,345 | 5,169,634 | 0:00:00 | house |
| 501081 | 681,279 | 5,169,706 | 0:00:00 | house |
| 501082 | 675,433 | 5,171,946 | 0:00:00 | house |
| 501108 | 670,613 | 5,160,034 | 0:00:00 | house |
| 501126 | 663,477 | 5,163,902 | 0:00:00 | house |
| 501131 | 664,747 | 5,163,175 | 0:00:00 | house |
| 501141 | 665,127 | 5,163,747 | 0:00:00 | house |
| 501147 | 665,442 | 5,161,863 | 0:00:00 | house |
| 501162 | 666,164 | 5,171,091 | 0:00:00 | house |
| 501165 | 668,751 | 5,170,669 | 0:00:00 | house |
| 501168 | 666,562 | 5,170,280 | 0:00:00 | house |
| 501172 | 662,856 | 5,171,199 | 0:00:00 | house |
| 501173 | 661,884 | 5,171,096 | 0:00:00 | house |
| 501174 | 661,893 | 5,171,077 | 0:00:00 | house |
| 501175 | 661,018 | 5,169,979 | 0:00:00 | house |
| 501176 | 660,668 | 5,170,916 | 0:00:00 | house |
| 610001 | 657,943 | 5,169,457 | 0:00:00 | house |
| 610009 | 657,243 | 5,168,249 | 0:00:00 | house |
| 610014 | 657,329 | 5,168,365 | 0:00:00 | porch |
| 610021 | 658,588 | 5,168,791 | 0:00:00 | house |
| 610025 | 659,083 | 5,169,071 | 0:00:00 | house |
| 610031 | 660,171 | 5,167,459 | 0:00:00 | house |
| 610042 | 662,190 | 5,167,946 | 0:00:00 | trailer home |
| 610045 | 662,204 | 5,167,951 | 0:00:00 | travel trailer |
| 610049 | 662,204 | 5,167,996 | 0:00:00 | house |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 610053 | 660,882 | 5,167,398 | 0:00:00 | house |
| 610057 | 660,875 | 5,167,437 | 0:00:00 | future trailer home |
| 610089 | 668,413 | 5,169,125 | 0:00:00 | house |
| 610094 | 663,473 | 5,168,761 | 0:00:00 | no access/approx. |
| 610098 | 664,446 | 5,167,109 | 0:00:00 | house |
| 610102 | 669,505 | 5,169,577 | 0:00:00 | house |
| 610108 | 669,518 | 5,169,514 | 0:00:00 | house |
| 610111 | 670,742 | 5,169,632 | 0:00:00 | house |
| 610121 | 672,258 | 5,168,851 | 0:00:00 | house |
| 610139 | 675,979 | 5,170,362 | 0:00:00 | house |
| 610181 | 670,466 | 5,167,264 | 0:00:00 | house |
| 610185 | 670,516 | 5,167,245 | 0:00:00 | house |
| 800317 | 662,260 | 5,158,285 | 0:00:00 | house |
| 811201 | 680,019 | 5,177,169 | 0:00:00 | house |
| 811205 | 679,691 | 5,178,020 | 0:00:00 | house |
| 811210 | 680,887 | 5,178,421 | 0:00:00 | garage |
| 811287 | 655,467 | 5,168,218 | 0:00:00 | house |
| 811290 | 650,090 | 5,167,200 | 0:00:00 | house |
| 880001 | 680,270 | 5,173,773 | 0:00:00 | New house |
| 900002 | 661,988 | 5,161,930 | 0:00:00 | house |
| 900007 | 662,323 | 5,161,469 | 0:00:00 | house |
| 900011 | 662,065 | 5,161,089 | 0:00:00 | house |
| 900015 | 658,130 | 5,161,120 | 0:00:00 | house&grg |
| 900019 | 658,166 | 5,161,105 | 0:00:00 | house |
| 900027 | 664,500 | 5,161,670 | 0:00:00 | house |
| 900031 | 665,522 | 5,158,935 | 0:00:00 | house |
| 900035 | 665,494 | 5,159,171 | 0:00:00 | house |
| 900039 | 665,496 | 5,159,110 | 0:00:00 | house |
| 900047 | 663,971 | 5,160,025 | 0:00:00 | house |
| 900053 | 664,011 | 5,160,036 | 0:00:00 | house |
| 900059 | 665,090 | 5,160,153 | 0:00:00 | house |
| 900070 | 679,567 | 5,171,280 | 0:00:00 | house |
| 900542 | 664,710 | 5,156,553 | 0:00:00 | middle yard |
| 900546 | 664,516 | 5,156,546 | 0:00:00 | house 1 |
| 900547 | 665,655 | 5,157,082 | 0:00:00 | house |
| 900548 | 665,667 | 5,156,254 | 0:00:00 | 6030 house |

## Detailed Summary of WindPro Shadow Flicker Analysis Results – Scenario B

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 610084 | 666,867 | 5,164,930 | 24:02:00 | trailer home |
| 501099 | 675,017 | 5,163,411 | 16:24:00 | house |
| 501104 | 675,027 | 5,163,439 | 15:20:00 | garage |
| 501118 | 659,777 | 5,163,091 | 13:49:00 | house |
| 610149 | 674,773 | 5,165,354 | 13:09:00 | house |
| 501138 | 664,349 | 5,164,755 | 12:51:00 | house |
| 500028 | 677,401 | 5,165,136 | 9:29:00 | house |
| 800311 | 667,332 | 5,158,349 | 9:07:00 | fema trailer |
| 800308 | 667,354 | 5,158,391 | 9:05:00 | fema trailer |
| 500022 | 677,510 | 5,165,047 | 7:10:00 | house |
| 900019 | 658,166 | 5,161,105 | 7:01:00 | house |
| 900015 | 658,130 | 5,161,120 | 6:43:00 | house&grg |
| 610170 | 667,574 | 5,164,565 | 5:45:00 | house |
| 501156 | 674,657 | 5,162,748 | 5:00:00 | house |
| 501085 | 672,965 | 5,164,410 | 2:15:00 | trailer house |
| 501096 | 672,947 | 5,164,396 | 2:07:00 | old house |
| 500059 | 669,892 | 5,159,454 | 0:35:00 | house |
| 401 | 681,106 | 5,162,818 | 0:00:00 | house 1 |
| 404 | 681,064 | 5,162,775 | 0:00:00 | house 2 |
| 420002 | 668,875 | 5,171,095 | 0:00:00 | house |
| 420023 | 668,410 | 5,170,735 | 0:00:00 | house |
| 420029 | 668,316 | 5,170,507 | 0:00:00 | house |
| 420039 | 667,891 | 5,171,580 | 0:00:00 | house |
| 420047 | 667,886 | 5,171,532 | 0:00:00 | house |
| 420051 | 664,044 | 5,171,213 | 0:00:00 | house |
| 420065 | 664,088 | 5,171,360 | 0:00:00 | house |
| 420069 | 663,975 | 5,171,244 | 0:00:00 | house |
| 420076 | 663,894 | 5,171,299 | 0:00:00 | house |
| 420089 | 663,065 | 5,171,180 | 0:00:00 | house |
| 420090 | 662,974 | 5,171,187 | 0:00:00 | house |
| 420100 | 662,342 | 5,170,932 | 0:00:00 | house |
| 420108 | 662,543 | 5,170,920 | 0:00:00 | house |
| 420116 | 662,765 | 5,170,601 | 0:00:00 | house |
| 420117 | 654,920 | 5,169,153 | 0:00:00 | house |
| 420119 | 660,825 | 5,167,514 | 0:00:00 | future trailer home |
| 450548 | 681,287 | 5,160,073 | 0:00:00 | 10 ft os |
| 500002 | 680,617 | 5,158,589 | 0:00:00 | house |
| 500006 | 679,633 | 5,157,936 | 0:00:00 | house |
| 500012 | 679,628 | 5,157,991 | 0:00:00 | trailer |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 500018 | 679,256 | 5,165,366 | 0:00:00 | house |
| 500035 | 673,147 | 5,158,516 | 0:00:00 | house |
| 500039 | 671,766 | 5,158,494 | 0:00:00 | house |
| 500053 | 672,221 | 5,159,146 | 0:00:00 | house |
| 500064 | 669,899 | 5,159,550 | 0:00:00 | house |
| 501000 | 684,105 | 5,172,245 | 0:00:00 | trailer house |
| 501012 | 681,646 | 5,173,097 | 0:00:00 | house |
| 501019 | 680,468 | 5,175,745 | 0:00:00 | house |
| 501022 | 680,563 | 5,175,382 | 0:00:00 | house |
| 501030 | 679,723 | 5,174,632 | 0:00:00 | house |
| 501037 | 679,731 | 5,171,167 | 0:00:00 | house |
| 501040 | 678,406 | 5,173,332 | 0:00:00 | house |
| 501050 | 678,419 | 5,173,433 | 0:00:00 | house |
| 501053 | 678,555 | 5,173,259 | 0:00:00 | foundation |
| 501059 | 678,568 | 5,173,250 | 0:00:00 | portable |
| 501065 | 678,822 | 5,170,399 | 0:00:00 | old house |
| 501068 | 677,851 | 5,169,797 | 0:00:00 | house |
| 501073 | 681,345 | 5,169,634 | 0:00:00 | house |
| 501081 | 681,279 | 5,169,706 | 0:00:00 | house |
| 501082 | 675,433 | 5,171,946 | 0:00:00 | house |
| 501108 | 670,613 | 5,160,034 | 0:00:00 | house |
| 501126 | 663,477 | 5,163,902 | 0:00:00 | house |
| 501131 | 664,747 | 5,163,175 | 0:00:00 | house |
| 501141 | 665,127 | 5,163,747 | 0:00:00 | house |
| 501147 | 665,442 | 5,161,863 | 0:00:00 | house |
| 501162 | 666,164 | 5,171,091 | 0:00:00 | house |
| 501165 | 668,751 | 5,170,669 | 0:00:00 | house |
| 501168 | 666,562 | 5,170,280 | 0:00:00 | house |
| 501172 | 662,856 | 5,171,199 | 0:00:00 | house |
| 501173 | 661,884 | 5,171,096 | 0:00:00 | house |
| 501174 | 661,893 | 5,171,077 | 0:00:00 | house |
| 501175 | 661,018 | 5,169,979 | 0:00:00 | house |
| 501176 | 660,668 | 5,170,916 | 0:00:00 | house |
| 610001 | 657,943 | 5,169,457 | 0:00:00 | house |
| 610009 | 657,243 | 5,168,249 | 0:00:00 | house |
| 610014 | 657,329 | 5,168,365 | 0:00:00 | porch |
| 610021 | 658,588 | 5,168,791 | 0:00:00 | house |
| 610025 | 659,083 | 5,169,071 | 0:00:00 | house |
| 610031 | 660,171 | 5,167,459 | 0:00:00 | house |
| 610042 | 662,190 | 5,167,946 | 0:00:00 | trailer home |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 610045 | 662,204 | 5,167,951 | 0:00:00 | travel trailer |
| 610049 | 662,204 | 5,167,996 | 0:00:00 | house |
| 610053 | 660,882 | 5,167,398 | 0:00:00 | house |
| 610057 | 660,875 | 5,167,437 | 0:00:00 | future trailer home |
| 610089 | 668,413 | 5,169,125 | 0:00:00 | house |
| 610094 | 663,473 | 5,168,761 | 0:00:00 | no access/approx. |
| 610098 | 664,446 | 5,167,109 | 0:00:00 | house |
| 610102 | 669,505 | 5,169,577 | 0:00:00 | house |
| 610108 | 669,518 | 5,169,514 | 0:00:00 | house |
| 610111 | 670,742 | 5,169,632 | 0:00:00 | house |
| 610121 | 672,258 | 5,168,851 | 0:00:00 | house |
| 610139 | 675,979 | 5,170,362 | 0:00:00 | house |
| 610181 | 670,466 | 5,167,264 | 0:00:00 | house |
| 610185 | 670,516 | 5,167,245 | 0:00:00 | house |
| 800317 | 662,260 | 5,158,285 | 0:00:00 | house |
| 811201 | 680,019 | 5,177,169 | 0:00:00 | house |
| 811205 | 679,691 | 5,178,020 | 0:00:00 | house |
| 811210 | 680,887 | 5,178,421 | 0:00:00 | garage |
| 811287 | 655,467 | 5,168,218 | 0:00:00 | house |
| 811290 | 650,090 | 5,167,200 | 0:00:00 | house |
| 880001 | 680,270 | 5,173,773 | 0:00:00 | New house |
| 900002 | 661,988 | 5,161,930 | 0:00:00 | house |
| 900007 | 662,323 | 5,161,469 | 0:00:00 | house |
| 900011 | 662,065 | 5,161,089 | 0:00:00 | house |
| 900027 | 664,500 | 5,161,670 | 0:00:00 | house |
| 900031 | 665,522 | 5,158,935 | 0:00:00 | house |
| 900035 | 665,494 | 5,159,171 | 0:00:00 | house |
| 900039 | 665,496 | 5,159,110 | 0:00:00 | house |
| 900047 | 663,971 | 5,160,025 | 0:00:00 | house |
| 900053 | 664,011 | 5,160,036 | 0:00:00 | house |
| 900059 | 665,090 | 5,160,153 | 0:00:00 | house |
| 900070 | 679,567 | 5,171,280 | 0:00:00 | house |
| 900542 | 664,710 | 5,156,553 | 0:00:00 | middle yard |
| 900546 | 664,516 | 5,156,546 | 0:00:00 | house 1 |
| 900547 | 665,655 | 5,157,082 | 0:00:00 | house |
| 900548 | 665,667 | 5,156,254 | 0:00:00 | 6030 house |

## Detailed Summary of WindPro Shadow Flicker Analysis Results – Scenario C

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 880001 | 680,270 | 5,173,773 | 44:55:00 | New house |
| 610121 | 672,258 | 5,168,851 | 35:08:00 | house |
| 610053 | 660,882 | 5,167,398 | 27:40:00 | house |
| 610084 | 666,867 | 5,164,930 | 24:02:00 | trailer home |
| 610181 | 670,466 | 5,167,264 | 23:24:00 | house |
| 610057 | 660,875 | 5,167,437 | 22:25:00 | future trailer home |
| 501068 | 677,851 | 5,169,797 | 21:59:00 | house |
| 610049 | 662,204 | 5,167,996 | 19:59:00 | house |
| 610185 | 670,516 | 5,167,245 | 19:02:00 | house |
| 501053 | 678,555 | 5,173,259 | 17:57:00 | foundation |
| 420119 | 660,825 | 5,167,514 | 16:50:00 | future trailer home |
| 501099 | 675,017 | 5,163,411 | 16:24:00 | house |
| 610045 | 662,204 | 5,167,951 | 16:20:00 | travel trailer |
| 610042 | 662,190 | 5,167,946 | 16:07:00 | trailer home |
| 501104 | 675,027 | 5,163,439 | 15:20:00 | garage |
| 900070 | 679,567 | 5,171,280 | 13:22:00 | house |
| 610149 | 674,773 | 5,165,354 | 13:09:00 | house |
| 501012 | 681,646 | 5,173,097 | 13:08:00 | house |
| 501138 | 664,349 | 5,164,755 | 12:51:00 | house |
| 501040 | 678,406 | 5,173,332 | 12:00:00 | house |
| 501118 | 659,777 | 5,163,091 | 10:39:00 | house |
| 610098 | 664,446 | 5,167,109 | 10:38:00 | house |
| 501037 | 679,731 | 5,171,167 | 9:57:00 | house |
| 610009 | 657,243 | 5,168,249 | 9:51:00 | house |
| 500028 | 677,401 | 5,165,136 | 9:29:00 | house |
| 610031 | 660,171 | 5,167,459 | 9:06:00 | house |
| 501050 | 678,419 | 5,173,433 | 7:50:00 | house |
| 500022 | 677,510 | 5,165,047 | 7:10:00 | house |
| 610170 | 667,574 | 5,164,565 | 5:45:00 | house |
| 800311 | 667,332 | 5,158,349 | 5:31:00 | fema trailer |
| 800308 | 667,354 | 5,158,391 | 5:28:00 | fema trailer |
| 501030 | 679,723 | 5,174,632 | 5:19:00 | house |
| 501156 | 674,657 | 5,162,748 | 5:00:00 | house |
| 610111 | 670,742 | 5,169,632 | 4:13:00 | house |
| 610014 | 657,329 | 5,168,365 | 3:56:00 | porch |
| 610021 | 658,588 | 5,168,791 | 3:55:00 | house |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 610139 | 675,979 | 5,170,362 | 3:33:00 | house |
| 610094 | 663,473 | 5,168,761 | 3:26:00 | no access/approx. |
| 501085 | 672,965 | 5,164,410 | 2:15:00 | trailer house |
| 501096 | 672,947 | 5,164,396 | 2:07:00 | old house |
| 610025 | 659,083 | 5,169,071 | 1:20:00 | house |
| 501065 | 678,822 | 5,170,399 | 0:59:00 | old house |
| 500059 | 669,892 | 5,159,454 | 0:35:00 | house |
| 401 | 681,106 | 5,162,818 | 0:00:00 | house 1 |
| 404 | 681,064 | 5,162,775 | 0:00:00 | house 2 |
| 420002 | 668,875 | 5,171,095 | 0:00:00 | house |
| 420023 | 668,410 | 5,170,735 | 0:00:00 | house |
| 420029 | 668,316 | 5,170,507 | 0:00:00 | house |
| 420039 | 667,891 | 5,171,580 | 0:00:00 | house |
| 420047 | 667,886 | 5,171,532 | 0:00:00 | house |
| 420051 | 664,044 | 5,171,213 | 0:00:00 | house |
| 420065 | 664,088 | 5,171,360 | 0:00:00 | house |
| 420069 | 663,975 | 5,171,244 | 0:00:00 | house |
| 420076 | 663,894 | 5,171,299 | 0:00:00 | house |
| 420089 | 663,065 | 5,171,180 | 0:00:00 | house |
| 420090 | 662,974 | 5,171,187 | 0:00:00 | house |
| 420100 | 662,342 | 5,170,932 | 0:00:00 | house |
| 420108 | 662,543 | 5,170,920 | 0:00:00 | house |
| 420116 | 662,765 | 5,170,601 | 0:00:00 | house |
| 420117 | 654,920 | 5,169,153 | 0:00:00 | house |
| 450548 | 681,287 | 5,160,073 | 0:00:00 | 10 ft os |
| 500002 | 680,617 | 5,158,589 | 0:00:00 | house |
| 500006 | 679,633 | 5,157,936 | 0:00:00 | house |
| 500012 | 679,628 | 5,157,991 | 0:00:00 | trailer |
| 500018 | 679,256 | 5,165,366 | 0:00:00 | house |
| 500035 | 673,147 | 5,158,516 | 0:00:00 | house |
| 500039 | 671,766 | 5,158,494 | 0:00:00 | house |
| 500053 | 672,221 | 5,159,146 | 0:00:00 | house |
| 500064 | 669,899 | 5,159,550 | 0:00:00 | house |
| 501000 | 684,105 | 5,172,245 | 0:00:00 | trailer hs |
| 501019 | 680,468 | 5,175,745 | 0:00:00 | house |
| 501022 | 680,563 | 5,175,382 | 0:00:00 | house |
| 501059 | 678,568 | 5,173,250 | 0:00:00 | portable |
| 501073 | 681,345 | 5,169,634 | 0:00:00 | house |
| 501081 | 681,279 | 5,169,706 | 0:00:00 | house |
| 501082 | 675,433 | 5,171,946 | 0:00:00 | house |

| Brady II Receptor ID | UTM-E (m) | UTM-N (m) | WindPro Predicted Expected Shadow Flicker (Hours per Year) | Type |
|---|---|---|---|---|
| 501108 | 670,613 | 5,160,034 | 0:00:00 | house |
| 501126 | 663,477 | 5,163,902 | 0:00:00 | house |
| 501131 | 664,747 | 5,163,175 | 0:00:00 | house |
| 501141 | 665,127 | 5,163,747 | 0:00:00 | house |
| 501147 | 665,442 | 5,161,863 | 0:00:00 | house |
| 501162 | 666,164 | 5,171,091 | 0:00:00 | house |
| 501165 | 668,751 | 5,170,669 | 0:00:00 | house |
| 501168 | 666,562 | 5,170,280 | 0:00:00 | house |
| 501172 | 662,856 | 5,171,199 | 0:00:00 | house |
| 501173 | 661,884 | 5,171,096 | 0:00:00 | house |
| 501174 | 661,893 | 5,171,077 | 0:00:00 | house |
| 501175 | 661,018 | 5,169,979 | 0:00:00 | house |
| 501176 | 660,668 | 5,170,916 | 0:00:00 | house |
| 610001 | 657,943 | 5,169,457 | 0:00:00 | house |
| 610089 | 668,413 | 5,169,125 | 0:00:00 | house |
| 610102 | 669,505 | 5,169,577 | 0:00:00 | house |
| 610108 | 669,518 | 5,169,514 | 0:00:00 | house |
| 800317 | 662,260 | 5,158,285 | 0:00:00 | house |
| 811201 | 680,019 | 5,177,169 | 0:00:00 | house |
| 811205 | 679,691 | 5,178,020 | 0:00:00 | house |
| 811210 | 680,887 | 5,178,421 | 0:00:00 | garage |
| 811287 | 655,467 | 5,168,218 | 0:00:00 | house |
| 811290 | 650,090 | 5,167,200 | 0:00:00 | house |
| 900002 | 661,988 | 5,161,930 | 0:00:00 | house |
| 900007 | 662,323 | 5,161,469 | 0:00:00 | house |
| 900011 | 662,065 | 5,161,089 | 0:00:00 | house |
| 900015 | 658,130 | 5,161,120 | 0:00:00 | hse&grg |
| 900019 | 658,166 | 5,161,105 | 0:00:00 | house |
| 900027 | 664,500 | 5,161,670 | 0:00:00 | house |
| 900031 | 665,522 | 5,158,935 | 0:00:00 | house |
| 900035 | 665,494 | 5,159,171 | 0:00:00 | house |
| 900039 | 665,496 | 5,159,110 | 0:00:00 | house |
| 900047 | 663,971 | 5,160,025 | 0:00:00 | house |
| 900053 | 664,011 | 5,160,036 | 0:00:00 | house |
| 900059 | 665,090 | 5,160,153 | 0:00:00 | house |
| 900542 | 664,710 | 5,156,553 | 0:00:00 | middle yard |
| 900546 | 664,516 | 5,156,546 | 0:00:00 | house 1 |
| 900547 | 665,655 | 5,157,082 | 0:00:00 | house |
| 900548 | 665,667 | 5,156,254 | 0:00:00 | 6030 house |

# Appendix G:
# Acoustic Assessment

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**Brady II Wind Energy Center**

# Acoustic Assessment
# Hettinger County, North Dakota

**March 2016**

**Prepared for**




**Prepared by**




**160 Federal Street**
**Boston, MA 02110**
**617-443-7500**

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AGL | above ground level |
| CadnaA | Computer-Aided Noise Abatement Program |
| dB | decibel |
| dBA | A-weighted decibel |
| dBL | unweighted decibel |
| GE | General Electric |
| HH | hub height |
| Hz | Hertz |
| IEC | International Electrotechnical Commission |
| ISO | International Organization for Standardization |
| kHz | kilohertz |
| $L_{eq}$ | equivalent sound level |
| $L_{max}$ | maximum sound level |
| $L_p$ | sound pressure level |
| $L_w$ | sound power level |
| m/s | meters per second |
| mph | miles per hour |
| MVA | megavolt ampere |
| MW | megawatt |
| NEER | NextEra Energy Resources, LLC |
| NEMA | National Electrical Manufacturers Association |
| Project | Brady II Wind Energy Center |
| PSC | Public Service Commission |
| pW | picowatt |
| RD | rotor diameter |
| Tetra Tech | Tetra Tech, Inc. |
| µPa | microPascal |
| USGS | United States Geological Survey |
| UTM | Universal Transverse Mercator |
| W | watt |
| WTG | wind turbine generator |

## EXECUTIVE SUMMARY

Tetra Tech, Inc. (Tetra Tech) has completed an acoustic assessment for the proposed Brady II Wind Energy Center located in Hettinger County, North Dakota. A screening-level analysis was completed to evaluate the expected sound levels resulting from the Project wind turbine generators (WTGs) and substation. Although the Project would consist of up to 72 WTGs, 11 alternate WTG locations are included in the layout. Two scenarios were analyzed, one referred to as the "With Alternates" scenario and the other referred to as the "No Alternates" scenario. Analysis of the "With Alternates" scenario should be considered conservative, since only 72 WTGs will be built as part of the Project. The overall objective of this study was to determine the feasibility of the Project to operate in compliance with the applicable North Dakota Public Service Commission (PSC) 50 dBA noise limit. Finally, a cumulative impacts scenario was evaluated. This scenario includes both the proposed Project WTGs and the proposed Brady Wind Energy Center WTGs north of this Project.

Wind turbine sound source data was obtained from General Electric (GE), the manufacturer of the GE 2.1-116 (2.1 MW) as documented in the turbine noise specification section (GE 2015). Substation data were obtained Brady Wind II, LLC (Brady Wind II) based on a 170 megavolt ampere (MVA) transformer. It is expected that the GE WTGs and substation equipment installed will have similar sound profiles to what was used in the acoustic modeling analysis; however, it is possible that the final warranty sound power levels may vary slightly. Sound propagation modeling was conducted using the Computer-Aided Noise Abatement (CadnaA) program (version 4.5.153), a comprehensive 3-dimensional acoustic modeling computer simulation software, with calculations made in accordance with the International Organization for Standardization (ISO) standard 9613-2 "Attenuation of Sound during Propagation Outdoors". This acoustic modeling software is widely used by acoustical engineers due to its adaptability to evaluate complex acoustic scenarios.

The results of the acoustic modeling analysis were compared to the North Dakota PSC 50 dBA noise limit within 100 feet of an inhabited (occupied) residence. Acoustic modeling results showed that the Project will not generate exceedances of the North Dakota PSC noise limit at any occupied receptor locations.

# 1.0 INTRODUCTION

Brady Wind II, LLC (Brady Wind II), a wholly-owned, indirect subsidiary of NextEra Resources, LLC (NEER), proposes to construct and operate the Brady II Wind Energy Center (Project) in Stark and Hettinger Counties, North Dakota. Brady Wind II is proposing to construct up to 72 wind turbine generators (WTGs). The site layout dated Macrh 14, 2016 includes 65 GE 2.1-116 WTGs, seven GE 1.79-100 WTGs, and 11 alternate GE 2.1-116 WTG locations. While no more than 72 WTGs will be built, one or more of the alternate WTG locations could be activated in the event that any of the primary WTG locations were eliminated. The rotor diameter of the GE 2.1-116 is 381 feet (116 meters) and it has a hub height (HH) of 262 feet (80 meters). The proposed Project infrastructure also includes a collection substation to enable interconnection to Basin Electric Power Cooperative's transmission system. The substation would be located near the center of the Study Area adjacent to 109th Avenue SW near its intersection with 52nd Street SW. Substation data were obtained from Brady Wind II based on a 170 megavolt ampere (MVA) transformer similar to the HICO 170 MVA transformer in use at other NEER energy facilities.

An acoustic modeling analysis was completed for the Project, evaluating two scenarios, one referred to as the "With Alternates" scenario and the other referred to as the "No Alternates" scenario. Analysis of the "With Alternates" scenario should be considered conservative since only 72 WTGs will be built as part of the Project. A third scenario to analyze cumulative effects of this Project and an adjacent proposed wind energy facility is discussed in Section 4.1. Operational sounds levels resulting from the Project were analyzed at existing noise-sensitive receptors (e.g., residential structures) and compliance was assessed relative to the North Dakota Public Service Commission (PSC) noise limit. The results of this analysis are presented in section 3.1. Noise impacts in association with the proposed Brady Wind Energy Center, which is adjacent to the Project, were also modeled in the "Cumulative" scenario. The results of this analysis are presented in Section 4.1.

## 1.1 Study Area

The Brady II Study Area encompasses approximately 27,264 acres (43 square miles) in northern Hettinger County and southern Stark County, although all WTGs will be located in Hettinger County. County and township (section line) roads characterize the existing roadway infrastructure in and around the Study Area. The StudyArea is accessed via I-94, U.S. Highway 85, State Highway 22, State Highway 8, and other local two-lane paved and gravel county roads. The land within the StudyArea is primarily agricultural with scattered farmstead residences. The turbines will be located on privately-owned land in northern Hettinger County, approximately 15 miles south of Dickinson. This region of North Dakota has topography that can be described as level to rolling plains with isolated sandstone buttes or badlands formations to the west of the StudyArea. Gentle slopes characterize most of the StudyArea and local relief ranges from less than 2,670 to over 2,920 feet. Current land use within the StudyArea is primarily agricultural, supporting both crops and livestock grazing.

Occupied and unoccupied structures are scattered throughout the StudyArea. Potential noise sensitive receptor locations within the StudyArea and in the vicinity of proposed turbine locations

were included in the acoustical analysis. Of these 175 receptors identified, 114 are occupied structures and 61 are unoccupied. Brady Wind II designed the Project using a minimum turbine setback of 2,000 feet from occupied residences, which exceeds Hettinger County's setback requirement of 1,320 feet. Figure 1 presents the proposed Brady II WTGs, as well as the noise sensitive receptor locations.

## 1.2 Existing Acoustic Environment

Northern Hettinger County would generally be considered a rural agricultural area. Existing ambient sound levels are expected to be relatively low, although sound levels would be higher near roadways such as I-94, U.S. Highway 85, State Highway 22, State Highway 8. Other human activity such as agricultural operations would seasonally contribute to sound levels in the area associated with crop harvests. Background sound levels are expected to vary both spatially and temporally depending on proximity to area sound sources such as roadways and natural sounds. Typically, background sound levels are quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may contribute to the soundscape, predominantly in the warmer seasons.

## 1.3 Acoustic Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level ($L_W$), which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts (W). Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level ($L_P$) is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source due to the fact that the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear, and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (µPa). Conversely, sound power is commonly referenced to 1 picowatt (pW), which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency

analysis examines 11 octave (or 33 1/3 octave) bands ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA). Unweighted sound levels are referred to as linear. Linear dB are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear in this report are presented as dBL.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level ($L_{eq}$). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments in the State of North Dakota. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1. Table 2 provides additional reference information on acoustic terminology.

**Table 1. Sound Pressure Levels ($L_P$) and Relative Loudness of Typical Noise Sources and Soundscapes**

| Noise Source or Activity | Sound Level (dBA) | Subjective Impression | Relative Loudness (perception of different sound levels) |
|---|---|---|---|
| Jet aircraft takeoff from carrier (50 ft) | 140 | Threshold of pain | 64 times as loud |
| 50-hp siren (100 ft) | 130 | | 32 times as loud |
| Loud rock concert near stage or Jet takeoff (200 ft) | 120 | Uncomfortably loud | 16 times as loud |
| Float plane takeoff (100 ft) | 110 | | 8 times as loud |
| Jet takeoff (2,000 ft) | 100 | Very loud | 4 times as loud |
| Heavy truck or motorcycle (25 ft) | 90 | | 2 times as loud |
| Garbage disposal, food blender (2 ft), or Pneumatic drill (50 ft) | 80 | Loud | Reference loudness |
| Vacuum cleaner (10 ft) | 70 | Moderate | 1/2 as loud |
| Passenger car at 65 mph (25 ft) | 65 | | |
| Large store air-conditioning unit (20 ft) | 60 | | 1/4 as loud |
| Light auto traffic (100 ft) | 50 | Quiet | 1/8 as loud |
| Quiet rural residential area with no activity | 45 | | |
| Bedroom or quiet living room or Bird calls | 40 | Faint | 1/16 as loud |
| Typical wilderness area | 35 | | |
| Quiet library, soft whisper (15 ft) | 30 | Very quiet | 1/32 as loud |
| Wilderness with no wind or animal activity | 25 | Extremely quiet | |
| High-quality recording studio | 20 | | 1/64 as loud |
| Acoustic test chamber | 10 | Just audible | |
| | 0 | Threshold of hearing | |
| Adapted from: Beranek 1988; EPA 1971 | | | |

**Table 2. Acoustic Terms and Definitions**

| Term | Definition |
|---|---|
| Noise | Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur. |
| Sound Pressure Level ($L_P$) | Pressure fluctuations in a medium. Sound pressure is measured in decibels referenced to 20 microPascals, the approximate threshold of human perception to sound at 1,000 Hz. |
| Sound Power Level ($L_W$) | The total acoustic power of a noise source measured in decibels referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power. |
| A-Weighted Decibel (dBA) | Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report. |
| Unweighted Decibels (dBL) | Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report |
| Propagation and Attenuation | Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions. |
| Octave Bands | The audible range of humans spans from 20 to 20,000 Hz and is typically divided into center frequencies ranging from 31 to 8,000 Hz for noise modeling evaluations. |
| Broadband Sound | Noise which covers a wide range of frequencies within the audible spectrum, i.e., 200 to 2,000 Hz. |
| Masking | Interference in the perception of one sound by the presence of another sound. At elevated wind speeds, leaf rustle and noise made by the wind itself can mask wind turbine sound levels, which remain relatively constant. |
| Frequency (Hz) | The rate of oscillation of a sound, measured in units of Hz or kilohertz (kHz). One hundred Hz is a rate of one hundred times (or cycles) per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate. For comparative purposes, the lowest note on a full range piano is approximately 32 Hz and middle C is 261 Hz. |

Note: Compiled by Tetra Tech from multiple technical and engineering resources.

## 2.0 NOISE REGULATIONS AND GUIDELINES

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. There are no federal environmental noise requirements specific to this Project. At the state level, the PSC has established regulations applicable to wind energy facilities. Hettinger County also provides noise limits applicable to the Project via their land use regulations. The controlling regulation for the Project is the PSC's noise limit, which is more stringent than the requirements prescribed by Hettinger County. Both the State's and County's noise regulations are summarized in the subsections that follow.

### 2.1 State of North Dakota Public Service Commission Noise Regulations

North Dakota adopted noise regulations for wind energy facilities under the PSC Chapter 69-06-08-01(4) as follows:

> *A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or a community building will exceed fifty dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.*

Sound levels resulting from the Project within 100 feet of all identified receptors located in the vicinity of the Project were assessed against the 50 dBA limit to determine whether compliance was achieved. The PSC noise limit is absolute and independent of the existing acoustic environment; therefore, a baseline sound survey is not required to assess conformity.

### 2.2 Hettinger County Zoning Ordinance

The Hettinger County land use regulations include maximum day and night sound level limits in Section 6.7 that are applicable to the Project, specifically:

> *Section 6.7—Sustained noise of over 75 decibels (dB) during the day and 65 dB at night is prohibited.*

The 65 dB nighttime limit prescribed by Hettinger County is less conservative than that prescribed by the PSC, so by achieving compliance with the PSC requirements, compliance with the Hettinger County Land Use Regulations is also obtained.

## 3.0 ACOUSTIC MODELING METHODOLOGY AND RESULTS

Sound generated by an operating WTG is comprised of both aerodynamic and mechanical sound with the dominant sound component from modern utility scale WTGs being largely aerodynamic. Aerodynamic sound refers to the sound produced from air flow and the interaction with the WTG tower structure and moving rotor blades. Mechanical sound is generated at the gearbox, generator, and cooling fan, and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Due to the improved design of WTG mechanical components and the use of improved noise damping materials within the nacelle, including elastomeric elements supporting the generator and gearbox, mechanical noise emissions have been minimized. Sound reduction elements designed as a part of the WTGs include impact noise insulation of the gearbox and generator, sound reduced gearbox, sound reduced nacelle, and rotor blades designed to minimize noise generation.

Wind energy facilities, in comparison to other energy-related facilities, are somewhat unique in that the sound generated by each individual WTG will increase as the wind speed across the site increases. Wind turbine sound is negligible when the rotor is at rest, increases as the rotor tip speed increases, and is generally constant once rated power output and maximum rotational speed are achieved. Under this condition, the WTG maximum sound power level will be reached at approximately 7 meters per second [m/s], according to the GE specifications. It is important to recognize as wind speeds increase, the background ambient sound level will generally increase as well, resulting in acoustic masking effects; however, this trend is also affected by local contributing sound sources. The net result is that during periods of elevated wind speeds when higher WTG sound emissions occur, the sound produced from a WTG operating at maximum rotational speed may be largely or fully masked due to wind generated sound in foliage or vegetation. In practical terms, this means a nearby receptor would tend to hear leaves or vegetation rustling rather than WTG noise. This relationship is expected to further minimize the potential for any adverse noise effects of the Project. Conversely, these acoustic masking effects may be limited during periods of unusually high wind shear or at receiver locations that are sheltered from the prevailing wind direction.

### 3.1 Acoustic Modeling Software and Calculation Methods

The operational acoustic assessment was performed using the proposed Project WTG layout dated March 14, 2016 which includes 65 GE 2.1-116 WTGs, seven GE 1.79-100 WTGs, and 11 alternate GE 2.1-116 WTG locations. Two scenarios were modeled, a “With Alternates” scenario consisting of 83 WTG locations (72 planned WTG locations and an additional 11 alternate locations), and a “No Alternates” scenario consisting of 72 WTG locations. The Project would use the GE 2.1-116 WTG model, which has a rotor diameter of 381 feet (116 meters) and a hub height of 262 feet (80 meters), and the GE 1.79-100 WTG model, which has a rotor diameter of 328 feet (100 meters) and a hub height of 262 feet (80 meters). The Project would also include a collection substation with a 170 MVA transformer. WTG sound source data were obtained from GE (GE 2013, 2014, and 2015) and substation transformer data were obtained from Brady Wind II. WTG data for the proposed Brady Wind Energy center, used in the “Cumulative” scenario, was obtained from Brady Wind. This information is presented in Section 4.1.

The acoustic modeling analysis was conducted using the most recent version of DataKustic GmbH's computer-aided noise abatement program or CadnaA (v 4.5.153). CadnaA is a comprehensive 3-dimensional acoustic software model that conforms to the International Organization for Standardization (ISO) standard ISO 9613-2 "Attenuation of Sound during Propagation Outdoors." The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions. Topographical information was imported into the acoustic model using the official United States Geological Survey (USGS) digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare rock or for sound traveling over water, the absorption coefficient is defined as G=0 to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., G=1.0). A mixed (semi-reflective) ground factor of G=0.5 was used in the Project acoustic modeling analysis. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in the model.

Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 10$^{o}$Celsius (50$^{o}$Fahrenheit) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation. Atmospheric absorption depends on temperature and humidity and is most important at higher frequencies. Over short distances, the effects of atmospheric absorption are minimal. The ISO 9613-2 standard calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground level inversion. Though a physical impracticality, the ISO 9613-2 standard simulates omnidirectional downwind propagation. For receivers located between discrete WTG locations or WTG groupings, the acoustic model may result in over-prediction. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological inhomogeneities that may form when winds change speed or direction, which can interfere with the sound wave propagation path and increase attenuation effects.

Conversely, there may be meteorological conditions from time to time that will aid in the long-range propagation of sound. These anomalous meteorological conditions may include well-

developed moderate ground-based temperature inversions and Low Level Jets (LLJs). While the North Dakota PSC does not specifically require or suggest that these meteorological conditions be explicitly addressed in modeling assessments, ISO 9613-2 includes a methodology to account for effects produced under these conditions and so they were addressed to ensure a conservative assessment. Section 4.4 of this report discusses these metereorological conditions in greater detail.

## 3.2 Acoustic Modeling Input Parameters

In order to assist project developers and acoustical engineers, wind turbine manufacturers report WTG sound power data at integer wind speeds referenced to the effective hub height, ranging from cut-in to full rated power per International Electrotechnical Commission (IEC) standard IEC 61400-11:2006 Wind Turbine Generator Systems—Part 11: Acoustic Noise Measurement Techniques. This accepted IEC standard was developed to ensure consistent and comparable sound emission data of utility-scale WTGs between manufacturers. Tables 3 and 4 present a summary of sound power data for the GE 1.79-100 and GE 2.1-116 WTGs during normal operations correlated to 10 meter height integer wind speeds 10 meter above ground level (AGL) with a stated roughness length[1] of 0.05 meters, which is representative of level grass-covered terrain (GE 2015). The sound power data for the GE 2.1-116 WTG is not yet available, so data for the GE 2.3-116 WTG was used. GE stated that the sound power profile for the GE 2.3-116 WTG is effectively the same as the profile for the GE 2.1-116 WTG, and therefore this data substitution should not impact results.

The specification for the WTGs includes an expected warranty confidence interval, or k-factor, of 2 dB, which was added to the nominal sound power level in the acoustic model. This confidence interval incorporates the uncertainty in independent sound power level measurements conducted, the applied probability level and standard deviation for test measurement reproducibility, and product variability.

**Table 3. Broadband Sound Power Levels (dBA) Correlated with Wind Speed (GE 1.79-100)**

| | **WTG $L_{max}$ Sound Power Level ($L_W$) at Reference Wind Speed** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10-meter AGL Wind Speed | 11.2 mph (5 m/s) | 12.3 mph (5.5 m/s) | 13.4 mph (6 m/s) | 14.5 mph (6.5 m/s) | 15.7 mph (7 m/s) | 17.9 mph (8 m/s) | 20.1 mph (9 m/s) | 22.4 mph (10 m/s) |
| GE 1.79-100 | 98.6 | 101.0 | 103.2 | 105.5 | 107.2 | 107.5 | 107.5 | 107.5 |

[1] The roughness length describes the vertical wind profile per IEC specification in a neutral atmosphere with the wind profile following a logarithmic curve.

**Table 4. Broadband Sound Power Levels (dBA) Correlated with Wind Speed (GE 2.3-116)**

| | WTG $L_{max}$ Sound Power Level ($L_W$) at Reference Wind Speed | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Wind Speed | 8.9 mph (4.0 m/s) | 11.2 mph (5.0 m/s) | 13.4 mph (6.0 m/s) | 15.7 mph (7.0 m/s) | 17.9 mph (8.0 m/s) | 14.5 mph (9.0 m/s) | 20.1 mph (10.0 m/s) | 24.6 mph (11.0 m/s) | 26.7 mph (12.0 m/s) | 29.1 mph (13.0 m/s) |
| GE 2.3-116 | 95.0 | 95.8 | 98.2 | 101.6 | 104.5 | 105.8 | 107.5 | 107.5 | 107.5 | 107.5 |

Wind turbines can be somewhat directional, radiating more sound in some directions than others. The IEC test measurement protocol requires that sound measurements are made for the maximum downwind directional location when reporting apparent sound power levels. Thus, it is assumed that WTG directivity and sound generating efficiencies are inherently incorporated in the sound source data and used in acoustic model development. A summary of sound power data by octave band center frequency for both WTGs operating at maximum rotation are presented in Table 5 (1/1 octave band frequency data provided with stated intended use limited for informational purposes only).

**Table 5. Sound Power Level by Octave Band Center Frequency**

| Frequency (Hz) | Octave Band Sound Power Level (dBA) | | | | | | | | Broadband (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| GE 1.79-100 | 91.0 | 96.1 | 98.0 | 100.8 | 103.3 | 100.0 | 90.3 | 70.6 | 107.5 |
| GE 2.3-116 | 89.0 | 95.1 | 99.6 | 102.8 | 102.5 | 97.6 | 87.4 | 66.8 | 107.5 |

## 3.3 Acoustic Modeling Results

Acoustic modeling was completed for WTG cut-in and maximum rotational operating conditions, thereby describing resultant sound pressure levels over the entire operational range of the Project for both the "With Alternates" and "No Alternates" scenarios. A third scenario to analyze cumulative effects of this Project and an adjacent proposed wind energy facility is discussed in Section 4.1. In addition, sound energy contribution from the Project substation was included in the acoustic modeling analysis. When calculating received sound levels, it was assumed that the Project substation and all WTGs were operating concurrently at the given operating condition. Sound contour plots displaying Project operational sound levels in color-coded isopleths are provided in Figures 2 through 8. Figures 2 and 3 display the broadband operational sound levels under low-level wind speeds sufficient for the WTGs to operate at initial cut-in rotational speeds. Figures 4 and 5 display broadband operational sound levels at wind speeds sufficient to sustain WTG operation at maximum rotational speeds for moderate downwind propagation. Figures 6 and 7 display broadband operational sound levels at wind speeds sufficient to sustain WTG operation at maximum rotational speeds under anomalous meteorological conditions.

Table 6 presents the results of the Brady II Wind Energy Center acoustic modeling analysis and includes the ID, Universal Transverse Mercator (UTM) coordinates, receptor status and the

received sound levels at each receptor for both scenarios. Received sound levels are rounded to the nearest whole decimal for consistency with the State of North Dakota noise limit absolute value of 50 dBA. In addition, a 100-foot buffer was included around the receptors, corresponding to the point of compliance identified in the PSC 50 dBA noise limit.

The acoustic modeling results shown in Table 6 demonstrate that received sound levels are all below the PSC 50 dBA noise limit at all inhabited receptors.

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 400006 | Unoccupied | 680072 | 5176797 | 1 | 13 | 15 | 1 | 13 | 16 |
| 400037 | Unoccupied | 681527 | 5177443 | <1 | 11 | 14 | <1 | 12 | 15 |
| 500002 | Occupied | 680617 | 5158589 | 16 | 29 | 31 | 17 | 30 | 32 |
| 500006 | Occupied | 679633 | 5157936 | 17 | 30 | 32 | 18 | 31 | 33 |
| 500012 | Occupied | 679628 | 5157991 | 18 | 30 | 33 | 19 | 31 | 34 |
| 500016 | Unoccupied | 679508 | 5163376 | 22 | 35 | 36 | 22 | 35 | 36 |
| 500018 | Occupied | 679256 | 5165366 | 21 | 33 | 36 | 21 | 34 | 36 |
| 500022 | Occupied | 677510 | 5165047 | 28 | 41 | 42 | 28 | 41 | 42 |
| 500028 | Occupied | 677401 | 5165136 | 28 | 41 | 42 | 29 | 41 | 42 |
| 500032 | Unoccupied | 677690 | 5161966 | 33 | 45 | 46 | 35 | 47 | 47 |
| 500033 | Unoccupied | 674884 | 5159598 | 28 | 41 | 41 | 28 | 41 | 42 |
| 500035 | Occupied | 673147 | 5158516 | 21 | 33 | 35 | 21 | 33 | 35 |
| 500039 | Occupied | 671766 | 5158494 | 19 | 31 | 33 | 19 | 32 | 34 |
| 500053 | Occupied | 672221 | 5159146 | 21 | 33 | 36 | 22 | 34 | 36 |
| 500054 | Unoccupied | 671612 | 5161365 | 22 | 34 | 36 | 22 | 35 | 36 |
| 500055 | Unoccupied | 670870 | 5158304 | 21 | 33 | 35 | 22 | 34 | 36 |
| 500059 | Occupied | 669892 | 5159454 | 28 | 39 | 40 | 28 | 40 | 41 |
| 500064 | Occupied | 669899 | 5159550 | 28 | 39 | 41 | 29 | 40 | 42 |
| 500068 | Unoccupied | 669196 | 5158847 | 29 | 41 | 42 | 30 | 42 | 42 |
| 500076 | Unoccupied | 666743 | 5158531 | 27 | 40 | 41 | 28 | 41 | 42 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 800308 | Occupied | 667354 | 5158391 | 29 | 41 | 42 | 30 | 42 | 43 |
| 800311 | Occupied | 667332 | 5158349 | 26 | 39 | 40 | 28 | 40 | 41 |
| 501000 | Occupied | 684105 | 5172245 | 2 | 14 | 16 | 2 | 14 | 17 |
| 501012 | Occupied | 681646 | 5173097 | 9 | 20 | 23 | 9 | 21 | 23 |
| 501019 | Occupied | 680468 | 5175745 | 2 | 13 | 16 | 2 | 14 | 16 |
| 501022 | Occupied | 680563 | 5175382 | 2 | 14 | 16 | 2 | 14 | 17 |
| 501030 | Occupied | 679723 | 5174632 | 3 | 15 | 18 | 3 | 15 | 18 |
| 501037 | Occupied | 679731 | 5171167 | 7 | 19 | 22 | 8 | 20 | 22 |
| 501040 | Occupied | 678406 | 5173332 | 5 | 17 | 20 | 6 | 18 | 20 |
| 501050 | Occupied | 678419 | 5173433 | 5 | 17 | 20 | 5 | 18 | 20 |
| 501053 | Occupied | 678555 | 5173259 | 5 | 17 | 20 | 6 | 18 | 20 |
| 501059 | Occupied | 678568 | 5173250 | 5 | 17 | 20 | 6 | 18 | 20 |
| 501065 | Occupied | 678822 | 5170399 | 14 | 26 | 29 | 15 | 27 | 29 |
| 501068 | Occupied | 677851 | 5169797 | 15 | 26 | 29 | 15 | 27 | 29 |
| 501073 | Occupied | 681345 | 5169634 | 7 | 19 | 21 | 7 | 19 | 22 |
| 501081 | Occupied | 681279 | 5169706 | 7 | 19 | 21 | 7 | 19 | 22 |
| 501082 | Occupied | 675433 | 5171946 | 14 | 25 | 28 | 14 | 25 | 28 |
| 501083 | Unoccupied | 666768 | 5166374 | 35 | 47 | 48 | 35 | 48 | 48 |
| 501085 | Occupied | 672965 | 5164410 | 33 | 43 | 44 | 33 | 43 | 44 |
| 501096 | Occupied | 672947 | 5164396 | 33 | 43 | 44 | 33 | 43 | 44 |
| 501097 | Unoccupied | 667485 | 5163313 | 28 | 40 | 42 | 28 | 41 | 42 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 800364 | Unoccupied | 669001 | 5162054 | 39 | 52 | 52 | 39 | 52 | 52 |
| 501099 | Occupied | 675017 | 5163411 | 32 | 44 | 45 | 32 | 44 | 45 |
| 501104 | Occupied | 675027 | 5163439 | 32 | 44 | 45 | 32 | 44 | 45 |
| 501108 | Occupied | 670613 | 5160034 | 25 | 37 | 39 | 26 | 38 | 39 |
| 501118 | Occupied | 659777 | 5163091 | 27 | 39 | 40 | 30 | 43 | 44 |
| 501122 | Unoccupied | 661117 | 5163653 | 38 | 51 | 51 | 39 | 51 | 51 |
| 501126 | Occupied | 663477 | 5163902 | 29 | 42 | 43 | 29 | 42 | 43 |
| 501131 | Occupied | 664747 | 5163175 | 24 | 36 | 39 | 25 | 37 | 39 |
| 501138 | Occupied | 664349 | 5164755 | 33 | 46 | 46 | 33 | 46 | 46 |
| 800288 | Unoccupied | 664145 | 5164372 | 31 | 43 | 45 | 31 | 44 | 45 |
| 800292 | Unoccupied | 664102 | 5164281 | 30 | 43 | 44 | 31 | 43 | 44 |
| 501141 | Occupied | 665127 | 5163747 | 30 | 42 | 43 | 30 | 42 | 43 |
| 501147 | Occupied | 665442 | 5161863 | 22 | 34 | 35 | 23 | 35 | 37 |
| 501156 | Occupied | 674657 | 5162748 | 32 | 44 | 45 | 32 | 44 | 45 |
| 610001 | Occupied | 657943 | 5169457 | 15 | 28 | 30 | 16 | 29 | 31 |
| 811285 | Unoccupied | 657284 | 5169323 | 15 | 27 | 30 | 15 | 29 | 30 |
| 610009 | Occupied | 657243 | 5168249 | 15 | 28 | 30 | 16 | 30 | 31 |
| 610014 | Occupied | 657329 | 5168365 | 15 | 28 | 30 | 16 | 30 | 31 |
| 610018 | Unoccupied | 657481 | 5167671 | 16 | 28 | 31 | 16 | 31 | 31 |
| 610021 | Occupied | 658588 | 5168791 | 12 | 24 | 27 | 13 | 26 | 28 |
| 501175 | Occupied | 661018 | 5169979 | 17 | 30 | 32 | 18 | 31 | 33 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 610025 | Occupied | 659083 | 5169071 | 17 | 30 | 32 | 17 | 31 | 32 |
| 610031 | Occupied | 660171 | 5167459 | 23 | 35 | 37 | 23 | 37 | 37 |
| 610042 | Occupied | 662190 | 5167946 | 20 | 33 | 35 | 21 | 34 | 35 |
| 610045 | Occupied | 662204 | 5167951 | 20 | 33 | 35 | 20 | 33 | 35 |
| 610049 | Occupied | 662204 | 5167996 | 19 | 32 | 34 | 20 | 33 | 35 |
| 610053 | Occupied | 660882 | 5167398 | 24 | 37 | 39 | 25 | 38 | 39 |
| 420119 | Occupied | 660825 | 5167514 | 24 | 36 | 39 | 24 | 37 | 39 |
| 610057 | Occupied | 660875 | 5167437 | 24 | 37 | 39 | 24 | 38 | 39 |
| 610059 | Unoccupied | 662665 | 5165804 | 39 | 51 | 51 | 39 | 51 | 51 |
| 610063 | Unoccupied | 661981 | 5166658 | 30 | 42 | 44 | 30 | 43 | 44 |
| 610079 | Unoccupied | 661962 | 5163992 | 37 | 49 | 50 | 37 | 50 | 50 |
| 610084 | Occupied | 666867 | 5164930 | 30 | 43 | 44 | 30 | 42 | 44 |
| 610089 | Occupied | 668413 | 5169125 | 21 | 33 | 35 | 21 | 33 | 35 |
| 610091 | Unoccupied | 668196 | 5169582 | 19 | 31 | 34 | 19 | 32 | 34 |
| 610094 | Occupied | 663473 | 5168761 | 21 | 34 | 36 | 21 | 34 | 36 |
| 610098 | Occupied | 664446 | 5167109 | 28 | 40 | 42 | 28 | 40 | 42 |
| 610102 | Occupied | 669505 | 5169577 | 18 | 30 | 32 | 18 | 30 | 32 |
| 610108 | Occupied | 669518 | 5169514 | 20 | 32 | 34 | 20 | 32 | 34 |
| 610111 | Occupied | 670742 | 5169632 | 21 | 32 | 35 | 21 | 32 | 35 |
| 610116 | Unoccupied | 671898 | 5169600 | 31 | 43 | 46 | 31 | 43 | 46 |
| 610118 | Unoccupied | 671916 | 5169648 | 30 | 43 | 46 | 30 | 43 | 46 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 610121 | Occupied | 672258 | 5168851 | 27 | 39 | 42 | 27 | 39 | 42 |
| 610125 | Unoccupied | 672486 | 5169786 | 32 | 44 | 47 | 32 | 44 | 47 |
| 610130 | Unoccupied | 673973 | 5169036 | 18 | 30 | 33 | 18 | 30 | 33 |
| 610134 | Unoccupied | 674002 | 5169040 | 18 | 30 | 33 | 18 | 30 | 33 |
| 610139 | Occupied | 675979 | 5170362 | 15 | 26 | 29 | 15 | 26 | 29 |
| 610144 | Unoccupied | 675675 | 5169238 | 19 | 31 | 33 | 20 | 32 | 34 |
| 610145 | Unoccupied | 675358 | 5166322 | 29 | 41 | 42 | 29 | 42 | 42 |
| 610149 | Occupied | 674773 | 5165354 | 31 | 43 | 44 | 32 | 43 | 44 |
| 610155 | Unoccupied | 669944 | 5164888 | 34 | 47 | 47 | 34 | 49 | 47 |
| 610164 | Unoccupied | 669993 | 5164876 | 34 | 47 | 47 | 34 | 49 | 47 |
| 610170 | Occupied | 667574 | 5164565 | 28 | 40 | 42 | 28 | 41 | 42 |
| 610181 | Occupied | 670466 | 5167264 | 24 | 35 | 38 | 24 | 35 | 38 |
| 610185 | Occupied | 670516 | 5167245 | 24 | 35 | 37 | 24 | 35 | 37 |
| 800304 | Unoccupied | 670346 | 5166290 | 30 | 42 | 43 | 30 | 42 | 43 |
| 610188 | Unoccupied | 668519 | 5166787 | 28 | 41 | 42 | 28 | 41 | 42 |
| 610190 | Unoccupied | 669313 | 5167829 | 22 | 35 | 37 | 22 | 35 | 37 |
| 610194 | Unoccupied | 669326 | 5167878 | 22 | 34 | 36 | 22 | 34 | 36 |
| 610197 | Unoccupied | 673253 | 5168730 | 21 | 33 | 36 | 21 | 33 | 36 |
| 610203 | Unoccupied | 670759 | 5168861 | 22 | 33 | 36 | 22 | 33 | 36 |
| 706192 | Unoccupied | 656694 | 5166353 | 17 | 29 | 32 | 18 | 32 | 33 |
| 811069 | Unoccupied | 682736 | 5175254 | <1 | 12 | 15 | <1 | 13 | 16 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 811201 | Occupied | 680019 | 5177169 | <1 | 12 | 15 | <1 | 13 | 15 |
| 811205 | Occupied | 679691 | 5178020 | <1 | 12 | 15 | <1 | 13 | 15 |
| 811210 | Occupied | 680887 | 5178421 | <1 | 11 | 14 | <1 | 12 | 14 |
| 811214 | Unoccupied | 680759 | 5178424 | <1 | 11 | 14 | <1 | 12 | 14 |
| 811217 | Unoccupied | 680753 | 5178482 | <1 | 11 | 14 | <1 | 12 | 14 |
| 811224 | Unoccupied | 680747 | 5178483 | <1 | 11 | 14 | <1 | 12 | 14 |
| 811228 | Unoccupied | 682023 | 5174120 | 2 | 14 | 17 | 2 | 14 | 17 |
| 811231 | Unoccupied | 682042 | 5174165 | 2 | 14 | 17 | 2 | 14 | 17 |
| 811236 | Unoccupied | 682274 | 5174639 | 2 | 13 | 16 | 2 | 14 | 16 |
| 811237 | Unoccupied | 679990 | 5178775 | <1 | 11 | 14 | <1 | 12 | 14 |
| 880001 | Occupied | 680270 | 5173773 | 9 | 20 | 23 | 9 | 21 | 23 |
| 900002 | Occupied | 661988 | 5161930 | 23 | 35 | 37 | 30 | 42 | 43 |
| 900007 | Occupied | 662323 | 5161469 | 21 | 33 | 36 | 25 | 38 | 40 |
| 900011 | Occupied | 662065 | 5161089 | 20 | 32 | 34 | 24 | 36 | 38 |
| 900015 | Occupied | 658130 | 5161120 | 17 | 29 | 32 | 24 | 36 | 38 |
| 900019 | Occupied | 658166 | 5161105 | 17 | 30 | 32 | 24 | 36 | 38 |
| 900025 | Unoccupied | 666717 | 5161478 | 30 | 42 | 43 | 32 | 44 | 45 |
| 900027 | Occupied | 664500 | 5161670 | 23 | 35 | 38 | 24 | 36 | 38 |
| 900031 | Occupied | 665522 | 5158935 | 23 | 35 | 37 | 24 | 36 | 38 |
| 900035 | Occupied | 665494 | 5159171 | 23 | 35 | 37 | 24 | 36 | 38 |
| 900039 | Occupied | 665496 | 5159110 | 23 | 35 | 38 | 24 | 36 | 38 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 900042 | Unoccupied | 666233 | 5158189 | 24 | 36 | 38 | 25 | 37 | 39 |
| 800317 | Occupied | 662260 | 5158285 | 12 | 25 | 27 | 15 | 28 | 30 |
| 900047 | Occupied | 663971 | 5160025 | 16 | 28 | 31 | 17 | 30 | 32 |
| 900053 | Occupied | 664011 | 5160036 | 18 | 30 | 33 | 19 | 32 | 34 |
| 900056 | Unoccupied | 664009 | 5160071 | 18 | 31 | 33 | 20 | 32 | 34 |
| 900059 | Occupied | 665090 | 5160153 | 22 | 35 | 37 | 23 | 36 | 38 |
| 900063 | Unoccupied | 665463 | 5160848 | 23 | 36 | 38 | 25 | 37 | 39 |
| 900068 | Unoccupied | 665093 | 5160747 | 21 | 34 | 36 | 22 | 35 | 37 |
| 800268 | Unoccupied | 670007 | 5160023 | 28 | 39 | 41 | 29 | 40 | 42 |
| 800342 | Unoccupied | 670035 | 5161380 | 29 | 41 | 42 | 29 | 42 | 43 |
| 900070 | Occupied | 679567 | 5171280 | 10 | 22 | 23 | 10 | 23 | 24 |
| 420117 | Occupied | 654920 | 5169153 | 6 | 18 | 21 | 7 | 20 | 22 |
| 811287 | Occupied | 655467 | 5168218 | 7 | 20 | 22 | 9 | 22 | 24 |
| 811290 | Occupied | 650090 | 5167200 | <1 | 13 | 15 | 2 | 14 | 17 |
| 420090 | Occupied | 662974 | 5171187 | 16 | 28 | 29 | 16 | 29 | 29 |
| 420100 | Occupied | 662342 | 5170932 | 16 | 29 | 31 | 17 | 29 | 32 |
| 420108 | Occupied | 662543 | 5170920 | 16 | 29 | 31 | 17 | 29 | 32 |
| 420116 | Occupied | 662765 | 5170601 | 16 | 29 | 31 | 17 | 29 | 32 |
| 501172 | Occupied | 662856 | 5171199 | 16 | 28 | 31 | 16 | 29 | 31 |
| 501173 | Occupied | 661884 | 5171096 | 16 | 28 | 31 | 16 | 29 | 31 |
| 501174 | Occupied | 661893 | 5171077 | 16 | 28 | 31 | 16 | 28 | 31 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 501176 | Occupied | 660668 | 5170916 | 15 | 27 | 30 | 15 | 28 | 30 |
| 420051 | Occupied | 664044 | 5171213 | 17 | 29 | 31 | 17 | 29 | 32 |
| 420069 | Occupied | 663975 | 5171244 | 17 | 29 | 31 | 17 | 29 | 32 |
| 420076 | Occupied | 663894 | 5171299 | 15 | 27 | 30 | 15 | 28 | 30 |
| 420089 | Occupied | 663065 | 5171180 | 16 | 28 | 31 | 16 | 29 | 31 |
| 420039 | Occupied | 667891 | 5171580 | 16 | 28 | 31 | 16 | 29 | 31 |
| 420047 | Occupied | 667886 | 5171532 | 13 | 25 | 27 | 13 | 25 | 27 |
| 420002 | Occupied | 668875 | 5171095 | 17 | 29 | 32 | 17 | 29 | 32 |
| 501165 | Occupied | 668751 | 5170669 | 18 | 30 | 32 | 18 | 30 | 32 |
| 420023 | Occupied | 668410 | 5170735 | 17 | 29 | 32 | 17 | 29 | 32 |
| 420029 | Occupied | 668316 | 5170507 | 17 | 29 | 32 | 17 | 29 | 32 |
| 501162 | Occupied | 666164 | 5171091 | 14 | 26 | 29 | 14 | 26 | 29 |
| 501168 | Occupied | 666562 | 5170280 | 15 | 28 | 30 | 15 | 28 | 30 |
| 420065 | Occupied | 664088 | 5171360 | 16 | 29 | 31 | 17 | 29 | 31 |
| 390009 | Unoccupied | 673486 | 5163982 | 41 | 50 | 51 | 41 | 50 | 51 |
| 900537 | Unoccupied | 662248 | 5160947 | 19 | 32 | 34 | 23 | 36 | 38 |
| 900539 | Unoccupied | 659745 | 5159757 | 14 | 26 | 29 | 20 | 33 | 35 |
| 900542 | Occupied | 664710 | 5156553 | 9 | 21 | 23 | 10 | 22 | 24 |
| 900543 | Unoccupied | 664547 | 5156573 | 11 | 24 | 26 | 12 | 25 | 27 |
| 900546 | Occupied | 664516 | 5156546 | 9 | 21 | 22 | 10 | 22 | 24 |
| 900547 | Occupied | 665655 | 5157082 | 16 | 28 | 30 | 17 | 29 | 32 |

**Table 6. Summary of Acoustic Modeling Results**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Project with No Alternate WTG Locations | | | Project with Alternate WTG Locations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 900548 | Occupied | 665667 | 5156254 | 2 | 14 | 12 | 3 | 15 | 13 |
| 900549 | Unoccupied | 667277 | 5156374 | 4 | 16 | 18 | 5 | 17 | 19 |
| 450548 | Occupied | 681287 | 5160073 | 16 | 28 | 30 | 16 | 29 | 31 |
| 450554 | Unoccupied | 681307 | 5160130 | 16 | 29 | 31 | 18 | 30 | 32 |
| 401 | Occupied | 681106 | 5162818 | 19 | 31 | 34 | 20 | 32 | 35 |
| 404 | Occupied | 681064 | 5162775 | 19 | 31 | 33 | 19 | 32 | 34 |
| 450562 | Unoccupied | 679454 | 5163350 | 23 | 36 | 37 | 24 | 36 | 38 |
| 450563 | Unoccupied | 679450 | 5164236 | 23 | 35 | 37 | 23 | 35 | 37 |

# 4.0 OTHER SOUND CONSIDERATIONS

## 4.1 Cumulative Impacts

An assessment of cumulative environmental impacts considers the potential impact of a proposed Project in the context of past, present, and reasonably foreseeable developments to ensure that any potential environmental impacts are not considered in isolation. The cumulative effects can result from individually minor, but collectively more significant actions taking place over a given period of time. For the purpose of this analysis, cumulative impacts are restricted to noise impacts from wind energy developments. A wind energy facility would need to be located within approximately 2 to 3 km of the Project in order to present a potential cumulative noise impact.

Cumulative wind energy noise impacts from the Project were considered in association the Brady Wind Energy Center, an adjacent facility in southern Stark County that has yet to be built. The Brady Wind Energy Center would have a total of 87 WTGs, consisting of 80 GE 1.7-103 WTGs and 7 GE 1.79-100 WTGs. Table 7 below provides summary sound power data for the GE 1.7-103 WTGs and the GE1.79-100 (GE 2014, 2015). A confidence interval of k=2 was incorporated into the acoustic modeling analysis per the manufacturer specification.

**Table 7. Broadband Sound Power Levels (dBA) Correlated with Wind Speed**

| | WTG $L_{max}$ Sound Power Level ($L_W$) at Reference Wind Speed | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10-meter AGL Wind Speed | 11.2 mph (5 m/s) | 12.3 mph (5.5 m/s) | 13.4 mph (6 m/s) | 14.5 mph (6.5 m/s) | 15.9 mph (7 m/s) | 17.9 mph (8 m/s) | 20.1 mph (9 m/s) | 22.4 mph (10 m/s) |
| GE 1.7-103 | 100.3 | 102.6 | 104.9 | 106.9 | 107.0 | 107.0 | 107.0 | 107.0 |
| GE 1.79-100 | 98.6 | 101.0 | 103.2 | 105.5 | 107.2 | 107.5 | 107.5 | 107.5 |

A summary of sound power data for the GE 1.7-103 WTG and 1.79-100 WTG by octave band center frequency is presented in Table 8.

**Table 8. Sound Power Level by Octave Band Center Frequency**

| Frequency (Hz) | Octave Band Sound Power Level (dBA) | | | | | | | | Broadband (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| GE 1.7-103 | 90.5 | 95.7 | 97.7 | 100.3 | 102.6 | 99.6 | 91.4 | 74.1 | 107.0 |
| GE 1.79-100 | 91.0 | 96.1 | 98.0 | 100.8 | 103.3 | 100.0 | 90.3 | 70.6 | 107.5 |

Brady and Brady II would sometimes operate concurrently; therefore a cumulative wind energy noise impact assessment was completed. Cumulative effects were assessed for all WTGs, assuming the “No Alternates” scenario for both facilities, in conjunction with operation of the on-site substation servicing both of the facilities.

Acoustic modeling these two projects was completed for concurrent WTG cut-in and maximum rotational operating conditions. Table 9 presents the results of the cumulative acoustic modeling analysis and includes the ID, status, UTM coordinates, receptor status and the received sound

levels at each receptor. The receptor status is based on the most recent receptor status information provided by NEER. Sound contour plots displaying Project operational sound levels in color-coded isopleths are provided in Figures 8 through 9 and are also rounded to the nearest whole decimal for consistency with the State of North Dakota noise limit absolute value of 50 dBA. These values reflect all WTGs operating under the cut-in rotational speed, maximum rotational speed, and maximum rotational speed under anomalous meteorological conditions, respectively. A 100-foot buffer was included around the receptors, corresponding to the point of compliance identified in the PSC noise standard. The results of the cumulative analysis are presented in Table 9.

The acoustic modeling results demonstrate that received sound levels are all below the 50 dBA State noise standard at occupied receptors.

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 400006 | Unoccupied | 680072 | 5176797 | 26 | 33 | 35 |
| 400037 | Unoccupied | 681527 | 5177443 | 30 | 36 | 38 |
| 500002 | Occupied | 680617 | 5158589 | 17 | 29 | 31 |
| 500006 | Occupied | 679633 | 5157936 | 18 | 30 | 32 |
| 500012 | Occupied | 679628 | 5157991 | 19 | 30 | 33 |
| 500016 | Unoccupied | 679508 | 5163376 | 25 | 35 | 37 |
| 500018 | Occupied | 679256 | 5165366 | 29 | 38 | 40 |
| 500022 | Occupied | 677510 | 5165047 | 31 | 41 | 43 |
| 500028 | Occupied | 677401 | 5165136 | 31 | 42 | 43 |
| 500032 | Unoccupied | 677690 | 5161966 | 33 | 45 | 46 |
| 500033 | Unoccupied | 674884 | 5159598 | 28 | 41 | 42 |
| 500035 | Occupied | 673147 | 5158516 | 21 | 33 | 35 |
| 500039 | Occupied | 671766 | 5158494 | 19 | 31 | 33 |
| 500053 | Occupied | 672221 | 5159146 | 22 | 33 | 36 |
| 500054 | Unoccupied | 671612 | 5161365 | 23 | 34 | 36 |
| 500055 | Unoccupied | 670870 | 5158304 | 21 | 33 | 35 |
| 500059 | Occupied | 669892 | 5159454 | 28 | 39 | 40 |
| 500064 | Occupied | 669899 | 5159550 | 28 | 39 | 41 |
| 500068 | Unoccupied | 669196 | 5158847 | 29 | 41 | 42 |
| 500076 | Unoccupied | 666743 | 5158531 | 28 | 40 | 41 |

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 800308 | Occupied | 667354 | 5158391 | 29 | 41 | 42 |
| 800311 | Occupied | 667332 | 5158349 | 27 | 39 | 40 |
| 501000 | Occupied | 684105 | 5172245 | 24 | 31 | 33 |
| 501012 | Occupied | 681646 | 5173097 | 38 | 44 | 45 |
| 501019 | Occupied | 680468 | 5175745 | 30 | 37 | 39 |
| 501022 | Occupied | 680563 | 5175382 | 32 | 39 | 40 |
| 501030 | Occupied | 679723 | 5174632 | 32 | 39 | 41 |
| 501037 | Occupied | 679731 | 5171167 | 37 | 44 | 45 |
| 501040 | Occupied | 678406 | 5173332 | 38 | 45 | 45 |
| 501050 | Occupied | 678419 | 5173433 | 37 | 44 | 45 |
| 501053 | Occupied | 678555 | 5173259 | 38 | 45 | 45 |
| 501059 | Occupied | 678568 | 5173250 | 38 | 45 | 45 |
| 501065 | Occupied | 678822 | 5170399 | 37 | 44 | 45 |
| 501068 | Occupied | 677851 | 5169797 | 39 | 47 | 48 |
| 501073 | Occupied | 681345 | 5169634 | 34 | 41 | 42 |
| 501081 | Occupied | 681279 | 5169706 | 34 | 41 | 41 |
| 501082 | Occupied | 675433 | 5171946 | 30 | 37 | 39 |
| 501083 | Unoccupied | 666768 | 5166374 | 36 | 48 | 48 |
| 501085 | Occupied | 672965 | 5164410 | 33 | 43 | 44 |
| 501096 | Occupied | 672947 | 5164396 | 33 | 43 | 44 |
| 501097 | Unoccupied | 667485 | 5163313 | 29 | 40 | 42 |
| 800364 | Unoccupied | 669001 | 5162054 | 39 | 52 | 52 |
| 501099 | Occupied | 675017 | 5163411 | 33 | 44 | 45 |
| 501104 | Occupied | 675027 | 5163439 | 33 | 45 | 45 |
| 501108 | Occupied | 670613 | 5160034 | 25 | 37 | 39 |
| 501118 | Occupied | 659777 | 5163091 | 28 | 39 | 41 |
| 501122 | Unoccupied | 661117 | 5163653 | 38 | 51 | 51 |
| 501126 | Occupied | 663477 | 5163902 | 30 | 42 | 43 |
| 501131 | Occupied | 664747 | 5163175 | 25 | 37 | 39 |
| 501138 | Occupied | 664349 | 5164755 | 34 | 46 | 47 |
| 800288 | Unoccupied | 664145 | 5164372 | 31 | 44 | 45 |

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 800292 | Unoccupied | 664102 | 5164281 | 31 | 43 | 44 |
| 501141 | Occupied | 665127 | 5163747 | 30 | 42 | 43 |
| 501147 | Occupied | 665442 | 5161863 | 23 | 34 | 36 |
| 501156 | Occupied | 674657 | 5162748 | 32 | 44 | 45 |
| 610001 | Occupied | 657943 | 5169457 | 31 | 38 | 40 |
| 811285 | Unoccupied | 657284 | 5169323 | 30 | 37 | 39 |
| 610009 | Occupied | 657243 | 5168249 | 35 | 41 | 43 |
| 610014 | Occupied | 657329 | 5168365 | 34 | 41 | 42 |
| 610018 | Unoccupied | 657481 | 5167671 | 40 | 46 | 47 |
| 610021 | Occupied | 658588 | 5168791 | 37 | 44 | 45 |
| 501175 | Occupied | 661018 | 5169979 | 30 | 38 | 40 |
| 610025 | Occupied | 659083 | 5169071 | 35 | 42 | 43 |
| 610031 | Occupied | 660171 | 5167459 | 39 | 46 | 47 |
| 610042 | Occupied | 662190 | 5167946 | 39 | 46 | 46 |
| 610045 | Occupied | 662204 | 5167951 | 39 | 46 | 46 |
| 610049 | Occupied | 662204 | 5167996 | 39 | 45 | 46 |
| 610053 | Occupied | 660882 | 5167398 | 38 | 45 | 46 |
| 420119 | Occupied | 660825 | 5167514 | 38 | 45 | 46 |
| 610057 | Occupied | 660875 | 5167437 | 38 | 45 | 46 |
| 610059 | Unoccupied | 662665 | 5165804 | 41 | 52 | 52 |
| 610063 | Unoccupied | 661981 | 5166658 | 41 | 49 | 49 |
| 610079 | Unoccupied | 661962 | 5163992 | 37 | 50 | 50 |
| 610084 | Occupied | 666867 | 5164930 | 31 | 43 | 44 |
| 610089 | Occupied | 668413 | 5169125 | 29 | 37 | 39 |
| 610091 | Unoccupied | 668196 | 5169582 | 28 | 36 | 38 |
| 610094 | Occupied | 663473 | 5168761 | 38 | 44 | 45 |
| 610098 | Occupied | 664446 | 5167109 | 39 | 46 | 47 |
| 610102 | Occupied | 669505 | 5169577 | 29 | 36 | 38 |
| 610108 | Occupied | 669518 | 5169514 | 29 | 37 | 39 |
| 610111 | Occupied | 670742 | 5169632 | 33 | 40 | 41 |
| 610116 | Unoccupied | 671898 | 5169600 | 39 | 46 | 48 |

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 610118 | Unoccupied | 671916 | 5169648 | 39 | 46 | 47 |
| 610121 | Occupied | 672258 | 5168851 | 38 | 45 | 46 |
| 610125 | Unoccupied | 672486 | 5169786 | 38 | 45 | 48 |
| 610130 | Unoccupied | 673973 | 5169036 | 35 | 42 | 43 |
| 610134 | Unoccupied | 674002 | 5169040 | 35 | 42 | 43 |
| 610139 | Occupied | 675979 | 5170362 | 33 | 40 | 42 |
| 610144 | Unoccupied | 675675 | 5169238 | 34 | 42 | 43 |
| 610145 | Unoccupied | 675358 | 5166322 | 34 | 43 | 44 |
| 610149 | Occupied | 674773 | 5165354 | 34 | 44 | 45 |
| 610155 | Unoccupied | 669944 | 5164888 | 35 | 47 | 47 |
| 610164 | Unoccupied | 669993 | 5164876 | 35 | 47 | 47 |
| 610170 | Occupied | 667574 | 5164565 | 29 | 41 | 42 |
| 610181 | Occupied | 670466 | 5167264 | 36 | 44 | 44 |
| 610185 | Occupied | 670516 | 5167245 | 37 | 44 | 44 |
| 800304 | Unoccupied | 670346 | 5166290 | 34 | 43 | 44 |
| 610188 | Unoccupied | 668519 | 5166787 | 31 | 41 | 43 |
| 610190 | Unoccupied | 669313 | 5167829 | 30 | 38 | 40 |
| 610194 | Unoccupied | 669326 | 5167878 | 30 | 38 | 40 |
| 610197 | Unoccupied | 673253 | 5168730 | 40 | 47 | 47 |
| 610203 | Unoccupied | 670759 | 5168861 | 37 | 44 | 45 |
| 706192 | Unoccupied | 656694 | 5166353 | 36 | 43 | 44 |
| 811069 | Unoccupied | 682736 | 5175254 | 42 | 49 | 49 |
| 811201 | Occupied | 680019 | 5177169 | 25 | 32 | 34 |
| 811205 | Occupied | 679691 | 5178020 | 21 | 28 | 30 |
| 811210 | Occupied | 680887 | 5178421 | 24 | 31 | 33 |
| 811214 | Unoccupied | 680759 | 5178424 | 24 | 31 | 33 |
| 811217 | Unoccupied | 680753 | 5178482 | 24 | 31 | 33 |
| 811224 | Unoccupied | 680747 | 5178483 | 24 | 31 | 33 |
| 811228 | Unoccupied | 682023 | 5174120 | 48 | 55 | 55 |
| 811231 | Unoccupied | 682042 | 5174165 | 50 | 57 | 57 |
| 811236 | Unoccupied | 682274 | 5174639 | 43 | 49 | 50 |

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 811237 | Unoccupied | 679990 | 5178775 | 21 | 27 | 29 |
| 880001 | Occupied | 680270 | 5173773 | 40 | 47 | 47 |
| 900002 | Occupied | 661988 | 5161930 | 24 | 35 | 38 |
| 900007 | Occupied | 662323 | 5161469 | 23 | 34 | 36 |
| 900011 | Occupied | 662065 | 5161089 | 21 | 33 | 35 |
| 900015 | Occupied | 658130 | 5161120 | 21 | 31 | 34 |
| 900019 | Occupied | 658166 | 5161105 | 21 | 31 | 34 |
| 900025 | Unoccupied | 666717 | 5161478 | 30 | 42 | 43 |
| 900027 | Occupied | 664500 | 5161670 | 24 | 36 | 38 |
| 900031 | Occupied | 665522 | 5158935 | 23 | 35 | 37 |
| 900035 | Occupied | 665494 | 5159171 | 24 | 35 | 38 |
| 900039 | Occupied | 665496 | 5159110 | 24 | 36 | 38 |
| 900042 | Unoccupied | 666233 | 5158189 | 24 | 36 | 38 |
| 800317 | Occupied | 662260 | 5158285 | 15 | 25 | 28 |
| 900047 | Occupied | 663971 | 5160025 | 18 | 29 | 31 |
| 900053 | Occupied | 664011 | 5160036 | 19 | 31 | 33 |
| 900056 | Unoccupied | 664009 | 5160071 | 20 | 31 | 33 |
| 900059 | Occupied | 665090 | 5160153 | 23 | 35 | 37 |
| 900063 | Unoccupied | 665463 | 5160848 | 24 | 36 | 38 |
| 900068 | Unoccupied | 665093 | 5160747 | 23 | 34 | 36 |
| 800268 | Unoccupied | 670007 | 5160023 | 29 | 40 | 41 |
| 800342 | Unoccupied | 670035 | 5161380 | 29 | 41 | 43 |
| 900070 | Occupied | 679567 | 5171280 | 39 | 46 | 46 |
| 420117 | Occupied | 654920 | 5169153 | 20 | 27 | 30 |
| 811287 | Occupied | 655467 | 5168218 | 23 | 30 | 32 |
| 811290 | Occupied | 650090 | 5167200 | 10 | 18 | 21 |
| 420090 | Occupied | 662974 | 5171187 | 27 | 33 | 37 |
| 420100 | Occupied | 662342 | 5170932 | 27 | 35 | 37 |
| 420108 | Occupied | 662543 | 5170920 | 28 | 35 | 37 |
| 420116 | Occupied | 662765 | 5170601 | 28 | 35 | 38 |
| 501172 | Occupied | 662856 | 5171199 | 27 | 34 | 37 |

**Table 9. Summary of Acoustic Modeling Results - Cumulative**

| Receptor ID | Receptor Status | UTM Coordinates (NAD83 UTM Zone 13 meters) | | Received Sound Level | | |
|---|---|---|---|---|---|---|
| | | Easting (m) | Northing (m) | Cut-in Rotation (dBA) | Maximum Rotation (dBA) | Maximum Rotation under Anomalous (dBA) |
| 501173 | Occupied | 661884 | 5171096 | 27 | 34 | 37 |
| 501174 | Occupied | 661893 | 5171077 | 27 | 34 | 37 |
| 501176 | Occupied | 660668 | 5170916 | 27 | 35 | 37 |
| 420051 | Occupied | 664044 | 5171213 | 28 | 35 | 38 |
| 420069 | Occupied | 663975 | 5171244 | 28 | 35 | 37 |
| 420076 | Occupied | 663894 | 5171299 | 25 | 33 | 36 |
| 420089 | Occupied | 663065 | 5171180 | 27 | 35 | 37 |
| 420039 | Occupied | 667891 | 5171580 | 25 | 33 | 36 |
| 420047 | Occupied | 667886 | 5171532 | 25 | 32 | 34 |
| 420002 | Occupied | 668875 | 5171095 | 26 | 34 | 36 |
| 501165 | Occupied | 668751 | 5170669 | 27 | 34 | 37 |
| 420023 | Occupied | 668410 | 5170735 | 26 | 34 | 37 |
| 420029 | Occupied | 668316 | 5170507 | 26 | 34 | 36 |
| 501162 | Occupied | 666164 | 5171091 | 26 | 33 | 35 |
| 501168 | Occupied | 666562 | 5170280 | 31 | 38 | 40 |
| 420065 | Occupied | 664088 | 5171360 | 27 | 35 | 37 |
| 390009 | Unoccupied | 673486 | 5163982 | 41 | 50 | 51 |
| 900537 | Unoccupied | 662248 | 5160947 | 21 | 32 | 35 |
| 900539 | Unoccupied | 659745 | 5159757 | 16 | 27 | 30 |
| 900542 | Occupied | 664710 | 5156553 | 11 | 23 | 25 |
| 900543 | Unoccupied | 664547 | 5156573 | 13 | 24 | 27 |
| 900546 | Occupied | 664516 | 5156546 | 11 | 22 | 23 |
| 900547 | Occupied | 665655 | 5157082 | 17 | 28 | 31 |
| 900548 | Occupied | 665667 | 5156254 | 7 | 16 | 14 |
| 900549 | Unoccupied | 667277 | 5156374 | 8 | 18 | 21 |
| 450548 | Occupied | 681287 | 5160073 | 17 | 28 | 31 |
| 450554 | Unoccupied | 681307 | 5160130 | 17 | 29 | 31 |
| 401 | Occupied | 681106 | 5162818 | 23 | 33 | 36 |
| 404 | Occupied | 681064 | 5162775 | 22 | 32 | 34 |
| 450562 | Unoccupied | 679454 | 5163350 | 26 | 36 | 38 |
| 450563 | Unoccupied | 679450 | 5164236 | 27 | 37 | 39 |

## 4.2 Substation Noise

Substations have switching, protection and control equipment and typically one or more transformers, which generate the sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load. Transformers are designed and catalogued by MVA ratings. Just as horsepower ratings designate the power capacity of an electric motor, a transformer's MVA rating indicates its maximum power output capacity. The National Electrical Manufacturers Association (NEMA) published NEMA Standards TR1-1993 (R2000), which establish the maximum noise level allowed for transformers, voltage regulators, and shunt reactors based on the equipment's method of cooling its dielectric fluid (air-cooled vs. oil-cooled) and the electric power rating.

Transformer noise is generated and will attenuate with distance at different rates depending on the transformer dimensions, voltage rating, and design. The noise produced by substation transformers is primarily caused by the load current in the transformer's conducting coils (or windings) and consequently the main frequency of this sound is twice the supply frequency. The characteristic humming sound consists of tonal components generated at harmonics of 120 Hz. Most of the acoustical energy resides in the fundamental tone (120 Hz) and the first 3 or 4 harmonics (240, 360, 480, 600 Hz). In addition to core vibration noise, transformer cooling fans may generate broadband noise, limited to periods when high heat loads require additional cooling capacity. The resulting audible sound is a combination of core noise and the broadband fan noise. Circuit-breaker operations may also cause audible noise, particularly the operation of air-blast breakers which is characterized as an impulsive sound event of very short duration. This is expected to occur only a few times throughout the year, and was therefore not considered in this analysis.

The proposed electrical substation would be located approximately 600 feet (183 meters) south of 52nd Street SW and immediately adjacent to 109th Avenue SW (Figure 1). The transformer at this substation location was modeled using the latest version of CadnaA implementing ISO 9613-2. Transformer sound source levels for the Brady substation were provided based on a 170 MVA transformer similar to the HICO 170 MVA transformer in use at other NEER energy facilities. Table 10 presents the transformer sound source data by octave band center frequency calculated based on the estimated transformer NEMA and MVA ratings using standardized engineering guidelines.

**Table 10. Transformer Sound Power Level**

| | Octave Band Sound Power Level (dB) | | | | | | | | Broadband (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| **Frequency (Hz)** | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| 170 MVA Transformer | 93 | 99 | 101 | 94 | 90 | 85 | 80 | 73 | 97 |

Transformers the size of the one proposed for the Project can present a noise concern if the separation distance is less than a few hundred feet between the transformer and noise-sensitive receptors. The proposed transformer location is approximately 1,050 feet (320 meters) from the nearest noise sensitive receptor and poses little concern from a noise perspective. That being said, transformer noise may be periodically audible at nearby receptors on occasions when background sound levels are very low.

### 4.3 Construction Noise

The development of Brady II Wind Energy Center will involve construction to establish access roads, excavate and form WTG foundations, prepare the site for crane-lifting and assemble and commission the WTGs. Work on large-scale wind projects such as Brady II Wind Energy Center is generally divided into four phases consisting of the following:

1. *Site Clearing*: The initial site mobilization phase includes the establishment of temporary site offices, workshops, stores, and other on-site facilities. Installation of erosion and sedimentation control measures will be completed as well as the preparation of initial haulage routes.

2. *Grading*: This phase would begin with the grading and formation of access roads and preparation of laydown areas. Excavation for the concrete turbine foundations would also be completed.

3. *Foundation Work*: Construction of the reinforced concrete turbine foundations would take place in addition to installation of the internal transmission network.

4. *WTG Installation*: Delivery of the turbine components would occur followed by their installation and commissioning.

Work on these construction activities is expected to overlap. It is likely that the WTGs will be erected in small groupings. Each grouping may undergo periodic testing and commissioning prior to commencement of full commercial operation. Other construction activities include those for the supporting infrastructure such as the substation, maintenance building, and the overhead transmission line.

The construction of the Project may cause short-term but unavoidable noise impacts. The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. The list of construction equipment that may be used on the Project and estimates of near and far sound source levels are presented in Table 11.

**Table 11. Estimated $L_{max}$ Sound Pressure Levels from Construction Equipment**

| Equipment* | Estimated Sound Pressure Level at 50 feet (dBA) | Estimated Sound Pressure Level at 2000 feet (dBA) |
|---|---|---|
| Crane | 85 | 53 |
| Forklift | 80 | 48 |
| Backhoe | 80 | 48 |
| Grader | 85 | 53 |
| Man basket | 85 | 53 |
| Dozer | 83–88 | 51–56 |
| Loader | 83–88 | 51–56 |
| Scissor Lift | 85 | 53 |
| Truck | 84 | 52 |
| Welder | 73 | 41 |
| Compressor | 80 | 48 |
| Concrete Pump | 77 | 45 |

Source: FHWA 2006; Bolt et al. 1977

Sounds generated by construction activities are typically exempt from state and local noise oversight provided that they occur within weekday, daytime periods as may be specified under local zoning or legal codes. All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. As the design of the Project progresses and construction scheduling is finalized, the construction engineer normally notifies the community via public notice or alternative method of the expected Project construction commencement and duration to help minimize the effects of construction noise. In addition, the location of stationary equipment and the siting of construction laydown areas will be carefully selected to be as far removed from existing noise-sensitive receptors as is practical. Candidate construction noise mitigation measures include scheduling louder construction activities during daytime hours and equipping internal combustion engines with appropriate sized muffler systems to minimize noise excessive emissions.

Construction activity will generate traffic having potential noise effects, such as trucks travelling to and from the site on public roads. At the early stage of the construction phase, equipment and materials will be delivered to the site, such as hydraulic excavators and associated spreading and compacting equipment needed to form access roads and foundation platforms for each turbine. Once the access roads are constructed, equipment for lifting the towers and turbine components will arrive. Traffic noise is categorized into two categories: (1) the noise that will occur during the initial temporary traffic movements related to turbine delivery, haulage of components and remaining construction; and (2) maintenance and ongoing traffic from staff and contractors, which is expected to be minor.

## 5.0 CONCLUSIONS

Project operational sound has been calculated and compared to the 50 dBA PSC noise limit. Acoustic modeling analysis per ISO 9613-2 and inclusive of a number of conservative assumptions under operational conditions demonstrates the Project will not generate exceedances of the PSC noise limit at any occupied receptor location under either the "With Alternates" or "No Alternates" scenarios. In addition, predicted noise impacts associated with the "With Alternates" scenario should be considered conservative since only 72 WTGs will actually be built as part of the Project.

It is expected that received sound levels at noise-sensitive receptors will be consistent with sound generated at similar wind energy projects successfully sited throughout the state of North Dakota employing the same or similar criteria. However, while the Project has demonstrated compliance with the requirements, the Project may result in periodically audible sound within adjacent areas under certain operational and meteorological conditions.

## 6.0 TECHNICAL REFERENCES

Bolt, Beranek and Newman, Inc., Power Plant Construction Noise Guide, prepared for the Empire State Electric Energy Research Corporation, Report No. 3321, 1977.

Bonner, W. Climatology of the Low Level Jet. Monthly Weather Review, Volume 96, Number 12, December 1968.

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EPA (U.S. Environmental Protection Agency). 1971. Community Noise. NTID300.3 (N-96-01 IIA-231). Prepared by Wylie Laboratories.

FHWA (Federal Highway Administration). 2006. FHWA Roadway Construction Noise Model User's Guide, FHWA-HEP-05-054, January.

IEC (International Electromechanical Commission). 61400-11:2002(E) Wind Turbine Generator Systems—Part 11: Acoustic Noise Measurement Techniques, Third Edition 2006-12.

ISO (International Organization for Standardization). 1989. Standard ISO 9613-2 Acoustics—Attenuation of Sound During Propagation Outdoors. Part 2 General Method of Calculation. Geneva, Switzerland.

Technical Documentation: Wind Turbine Generator Systems GE 1.79-100—50Hz and 60Hz, Noise emission characteristics Normal operation according to IEC, GE Wind Energy GmbH, 2013.

Technical Documentation: Wind Turbine Generator Systems GE 1.7-103—50Hz and 60Hz, Noise emission characteristics Normal operation according to IEC, GE Wind Energy GmbH, 2014.

Technical Documentation: Wind Turbine Generator Systems GE 2.3-116 1-2 MW, Noise emission characteristics Normal operation according to IEC, GE Wind Energy GmbH, 2015.

# Figures

NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 1
PROJECT LAYOUT

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\IIGIS\Spatial\MXD\AcousticAssessment\Fig1_ProjectLayout.mxd

NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 2
WITH ALTERNATES:
RECEIVED SOUND LEVELS -
WIND TURBINES AT CUT-IN
WIND SPEED

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP



NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 3
NO ALTERNATES:
RECEIVED SOUND LEVELS -
WIND TURBINES AT CUT-IN
WIND SPEED

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




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NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 4
WITH ALTERNATES:
RECEIVED SOUND LEVELS -
WIND TURBINES AT MAXIMUM
ROTATIONAL WIND SPEED

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\IIGIS\Spatial\MXD\AcousticAssessment\Fig4_MaxRotational.mxd

NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 5
NO ALTERNATES:
RECEIVED SOUND LEVELS -
WIND TURBINES AT MAXIMUM
ROTATIONAL WIND SPEED

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




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NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 6
WITH ALTERNATES:
RECEIVED SOUND LEVELS -
WIND TURBINES AT MAXIMUM
ROTATIONAL WIND SPEED
ANOMALOUS METEROLOGICAL
CONDITIONS

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 2.1-116 Turbine (Alt)
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

0 0.5 1 1.5 2 MILES

N

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\GIS\Spatial\MXD\AcousticAssessment\Fig6_MaxRotational_AMC.mxd

NEXTERA ENERGY
RESOURCES, LLC
BRADY II WIND PROJECT
HETTINGER COUNTY
NORTH DAKOTA

FIGURE 7
NO ALTERNATES
RECEIVED SOUND LEVELS -
WIND TURBINES AT MAXIMUM
ROTATIONAL WIND SPEED
ANOMALOUS METEROLOGICAL
CONDITIONS

MARCH 2016

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\IN\GIS\Spatial\MXD\AcousticAssessment\Fig7_MaxRotational_AMC_NoAlts.mxd

NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER COUNTY

NORTH DAKOTA

# FIGURE 8
# CUMULATIVE EFFECTS (NO ALTS): RECEIVED SOUND LEVELS - WIND TURBINES AT CUT-IN WIND SPEED

MARCH 2016

**Brady I Proposed Turbine Array (11/6/2015)**

- GE 1.7 MW Turbine
- GE 1.79 MW Turbine

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




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NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER COUNTY

NORTH DAKOTA

# FIGURE 9
# CUMULATIVE EFFECTS (NO ALTS): RECEIVED SOUND LEVELS - WIND TURBINES AT MAXIMUM ROTATIONAL WIND SPEED

MARCH 2016

**Brady I Proposed Turbine Array (11/6/2015)**

- GE 1.7 MW Turbine
- GE 1.79 MW Turbine

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




Document Path: P:\GIS\NextEra_Brady\MXD\AcousticAssessment\Fig9_Cumulative_Max_NoAlts.mxd

NEXTERA ENERGY RESOURCES, LLC

BRADY II WIND PROJECT

HETTINGER COUNTY

NORTH DAKOTA

# FIGURE 10
# CUMULATIVE EFFECTS (NO ALTS): RECEIVED SOUND LEVELS - WIND TURBINES AT MAXIMUM ROTATIONAL WIND SPEED ANOMALOUS METEROLOGICAL CONDITIONS

MARCH 2016

**Brady I Proposed Turbine Array (11/6/2015)**

- GE 1.7 MW Turbine
- GE 1.79 MW Turbine

**Brady II Proposed Turbine Array (3/14/2016)**

- GE Xle 2.1-116 Turbine
- GE Xle 1.79-100 Turbine

**Receptors**

- Occupied
- Not Occupied
- Substation

**Sound Level Contour Ranges (dBA)**

- 35-40
- >40-45
- >45-50
- >50
- Interstate Highway
- Major Road

N

0 0.5 1 1.5 2 MILES

REFERENCE MAP




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# Appendix H:
# Agency Correspondence

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# Copy of Sample Letters sent to Agencies

## November 2015 correspondence

## January 2016 correspondence

## April 2016 correspondence

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TETRA TECH

November 12, 2015

Mr. Kevin Shelley
Acting ND Field Supervisor
USFWS North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

**Subject:** **Information Request for the Proposed Brady II Wind Energy Center in Hettinger County, ND**

Dear Mr. Shelley:

Tetra Tech has been contracted by Brady Wind II, LLC, an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC, to prepare an application for a Certificate of Site Compatibility for the proposed Brady II Wind Energy Center (the Project), in accordance with North Dakota Century Code (NDCC) Section 49-22-07. As part of that application, we are conducting an investigation of property in Hettinger County north of the city of New England. This proposed Project would consist of approximately 150 megawatts (MW). The Project area shown in the attached figure is the primary focus of our investigation.

Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting your agency for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office.

| Township | Range | Sections |
|---|---|---|
| 136 N | 96 W | 1-29 |
| 136 N | 97 W | 1-13 |
| 136 N | 95 W | 6,7, 18, 19, 30 |

This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable. We have sent similar query letters to other agencies including, but not limited to, the U.S. Army Corps of Engineers and North Dakota Game and Fish Department.

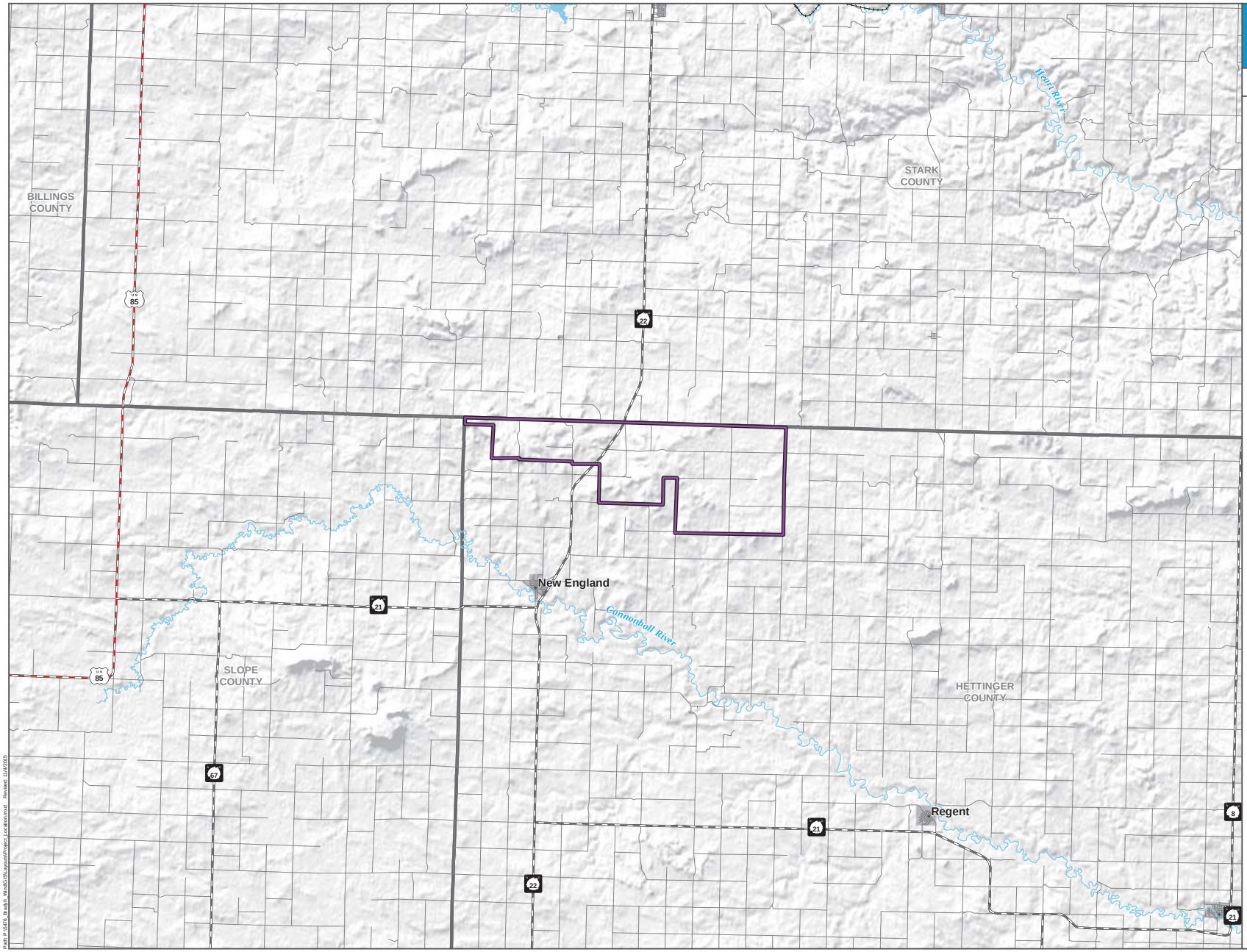
NextEra Energy is developing the Project following the voluntary Final Land-Based Wind Energy Guidelines. Desktop habitat analyses for bats and whooping crane are underway as part of Tier 1 and Tier 2 assessments for the Project. Tier 3 assessments that are currently planned or underway for the Project include native prairie identification, fall and spring avian migration surveys, biweekly eagle use surveys, raptor nest and grouse lek surveys, and bat acoustic monitoring.

We would appreciate a response by December 31, 2015. Please contact me at (512) 213-8501 if you have any questions. Thank you for your assistance.

Respectfully submitted,



Anne-Marie Griger, AICP
Tetra Tech, Inc
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759




# Brady II Wind Energy Center

Hettinger County, ND

## Project Location

### Legend

- Project Area
- County Boundary
- Major River
- Municipal Boundary

**Transportation**

- U.S. Highway
- State Highway
- Rail

0 2.5 5

Miles

Scale is 1:108,000 when printed at 22 x 34




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TETRA TECH

January 27, 2016

Mr. Kevin Shelley
Acting ND Field Supervisor
USFWS North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

**Subject:** **Information Request for the Proposed Brady II Wind Energy Center in Hettinger and Stark Counties, ND – Revised Project Area**

Dear Mr. Shelley:

This letter is to update the Project area discussed in a letter to you dated November 18, 2015. Tetra Tech has been contracted by Brady Wind II, LLC, an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC, to prepare an application for a Certificate of Site Compatibility for the proposed Brady II Wind Energy Center (the Project), in accordance with North Dakota Century Code (NDCC) Section 49-22-07. As part of that application, we are conducting an investigation of property in Hettinger and Stark counties north of the city of New England. This proposed Project would consist of approximately 150 megawatts (MW). The Project area shown in the attached figure is the primary focus of our investigation.

Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting your agency for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office.

| County | Township | Range | Sections |
|---|---|---|---|
| Hettinger | 136 N | 96 W | 1-15, 18, 19, 22-24, 26, 27 |
| | 136 N | 97 W | 1-6, 8-14, 24 |
| Stark | 137 N | 95 W | 31 |
| | 137 N | 96 W | 25, 26, 31-36 |
| | 137 N | 97 W | 36 |

This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable. We have sent similar query letters to other agencies including, but not limited to, the U.S. Army Corps of Engineers and North Dakota Game and Fish Department.

NextEra Energy is developing the Project following the voluntary Final Land-Based Wind Energy Guidelines. Desktop habitat analyses for bats and whooping crane are underway as part of Tier 1 and Tier 2 assessments for the Project. Tier 3 assessments that are currently planned or underway for the Project include native prairie identification, spring avian migration surveys, biweekly eagle use surveys, raptor nest and grouse lek surveys, and bat acoustic monitoring.

We would appreciate a response by February 29, 2016. Please contact me at (512) 213-8501 if you have any questions. Thank you for your assistance.

Respectfully submitted,



Anne-Marie Griger, AICP
Tetra Tech, Inc
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

## Legend

- Proposed Project Area (01/06/16)
- County Boundary
- Major River
- Municipal Boundary

**Existing Electrical Transmission**
(Ventyx 2015)

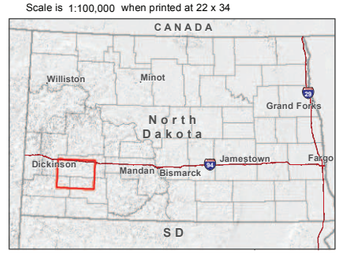
- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line

**Transportation**
(BTS 2013)

- Public Airport
- Private Airport
- Interstate Highway
- U.S. Highway
- State Highway
- Rail

0 2 4
Miles

Scale is 1:100,000 when printed at 22 x 34




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Figure 1: Project Location

TETRA TECH

April 14, 2016

Mr. Kevin Shelley
Acting ND Field Supervisor
USFWS North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

**Subject: Boundary Area Revision #2 - Information Request for the Proposed Brady II Wind Energy Center in Hettinger and Stark Counties, North Dakota**

Dear Mr. Shelley:

The purpose of this letter is to provide Revision #2 of the project boundary for the proposed Brady II Wind Energy Center (the Project). The Project area was first discussed in a letter to you dated November 18, 2015. A second letter was sent to you dated January 29, 2016, which identified revisions to the original boundary. The attached Figure 1 and Table 1 below identifies changes made to the Project area boundary since January 29, 2016. No additional changes to the Project boundary are anticipated at this time.

It should be noted that the Project maps and Project boundary definitions are have been updated as a result of clarifications requested by the North Dakota Public Service Commission (PSC). Specifically, the proposed Project boundary identified on Figure 1 has been further refined to identify a "Study Area" and a "Proposed Project Area." The Study Area applies to all areas investigated as part of the proposed Project and includes participating and non-participating landowners. The Proposed Project Area is defined as the locations within the Study Area for which Brady Wind II has negotiated easements with landowners and where proposed Project facilities are proposed to be located. Figure 2 shows the Study Area versus the Proposed Study Area and Table 2 identifies the differences between these two recently defined boundaries.

Tetra Tech has been contracted by Brady Wind II, LLC, an indirect, wholly owned subsidiary of NextEra Energy Resources, LLC, to prepare an application for a Certificate of Site Compatibility for the proposed Brady II Wind Energy Center (the Project), in accordance with North Dakota Century Code (NDCC) Section 49-22-07. As part of that application, we are conducting an investigation of property in Hettinger and Stark counties north of the city of New England. This proposed Project would consist of approximately 150 megawatts (MW). The revised Project boundaries shown in the attached maps are the primary focus of our investigation.

Per Section 69-06-01-05 of the North Dakota PSC's administrative rules, we are consulting your agency for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as identify applicable permits that may be required from your office.

Table 1 identifies the revised Project boundaries. Changes in the Project location that have been made since January 29, 2016 are noted in the column to the right to facilitate your review of the new Project boundary.

TETRA TECH

**Table 1**

| County | Township | Range | Sections Within Project Boundary (March 2016) | Changes since 1/29/16 |
|---|---|---|---|---|
| Hettinger | 136 N | 95 W | 18, 19 | Sections 18, 19 added |
| | 136 N | 96 W | 1-8, 10-13, 15, 18, 19, 22-24, 26, 27 | Sections 9, 14 removed |
| | 136 N | 97 W | 1-14, 17, 18, 24, 25, 36 | Sections 7, 17, 18, 25, 36 added |
| Stark | 137 N | 95 W | 31, 32 | Section 32 added |
| | 137 N | 96 W | 25, 26, 31-36 | No change |
| | 137 N | 97 W | None | Section 36 removed |

Table 2 identifies the locational differences between the Study Area and the Proposed Project Area. It should be noted that the Study Area matches the Project Boundary identified in Table 1.

**Table 2**

| County | Township | Range | Sections Within Proposed Project Area (April 2016) | Additional Sections in the Study Area (March 2016) |
|---|---|---|---|---|
| Hettinger | 136 N | 95 W | 18, 19 | 18, 19 |
| | 136 N | 96 W | 1-13, 15, 17, 18, 24, 25, 36 | 1-8, 10-13, 15, 18, 19, 22-24, 26, 27 |
| | 136 N | 97 W | 1-4, 6-8, 10-13, 15, 18, 19, 22-24 | 1-14, 17, 18, 24, 25, 36 |
| Stark | 137 N | 95 W | 31 | 31, 32 |
| | 137 N | 96 W | 25, 26, 34-36 | 25, 26, 31-36 |

Any information received will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable. We have sent similar query letters to other agencies including, but not limited to, the U.S. Army Corps of Engineers and North Dakota Game and Fish Department.

NextEra Energy is developing the Project following the voluntary Final Land-Based Wind Energy Guidelines. Desktop habitat analyses for bats and whooping cranes are underway as part of Tier 1 and Tier 2 assessments for the Project. Tier 3 assessments that are currently planned or underway for the Project include native prairie identification, spring avian migration surveys, biweekly eagle use surveys, and raptor nest and grouse lek surveys.

We would appreciate a response by May 15, 2016. Please contact me at 303-980-3502 if you have any questions. Thank you for your assistance.

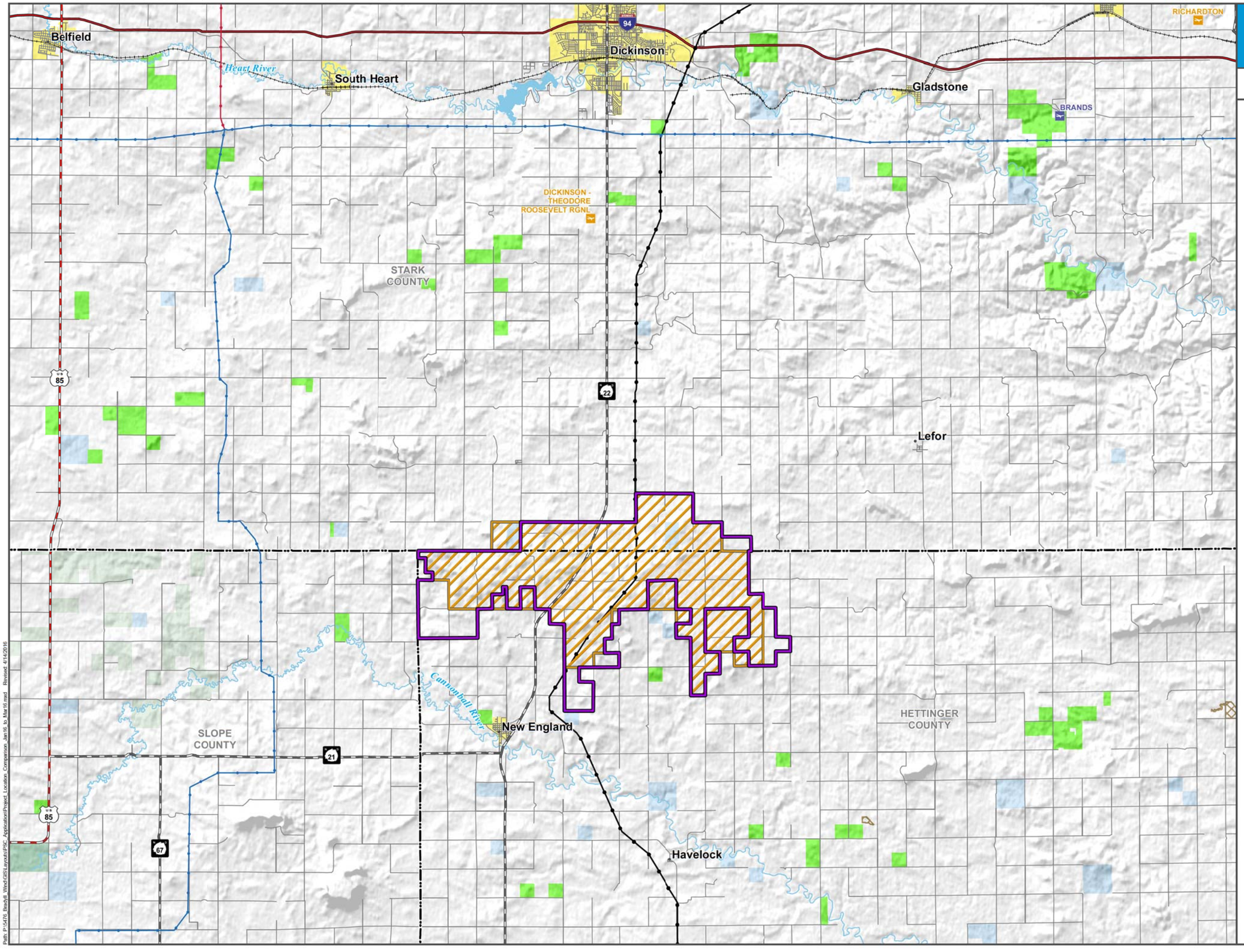
Respectfully submitted,



Tara H. Low
Tetra Tech, Inc.
350 Indiana Street Suite 500
Golden, CO 80401

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)




## Legend

- Expanded Project Boundary (March 2016)
- Project Boundary (January 2016)
- County Boundary
- Major River
- Municipal Boundary

**Existing Electrical Transmission**
(Ventyx 2015)

- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line

**Transportation**
(BTS 2013)

- Public Airport
- Private Airport
- Interstate Highway
- U.S. Highway
- State Highway
- Rail

**Jurisdiction**
(ND GIS Hub 2014)

**State**

- State Trust Land
- National Wildlife Refuges
- National Grasslands

**Other**

- North Dakota Game & Fish Conservation PLOTS Recreational Easement (Private Land Open to Sportsmen)
- National Conservation Easement (Federal or State)

0 2 4
Miles

Scale is 1:100,000 when printed at 22 x 34




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Figure 1: March 2016 Project Boundary

# Brady II Wind Energy Center

Hettinger County, ND
(Ancillary Facilities in Stark County)

Belfield
Heart River
South Heart
Dickinson
Gladstone
RICHARDTON
BRANDS
DICKINSON - THEODORE ROOSEVELT RGNL
STARK COUNTY
Lefor
SLOPE COUNTY
Cannonball River
New England
HETTINGER COUNTY
Havelock
94
85
22
21
67

## Legend

- Proposed Project Area (April 2016)
- Study Area (March 2016)
- County Boundary
- Major River
- Municipal Boundary

**Existing Electrical Transmission**
(Ventyx 2015)

- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line

**Transportation**
(BTS 2013)

- Public Airport
- Private Airport
- Interstate Highway
- U.S. Highway
- State Highway
- Rail

**Jurisdiction**
(ND GIS Hub 2014)

**State**

- State Trust Land
- National Wildlife Refuges
- National Grasslands

**Other**

- North Dakota Game & Fish Conservation PLOTS Recreational Easement (Private Land Open to Sportsmen)
- National Conservation Easement (Federal or State)

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Miles

Scale is 1:100,000 when printed at 22 x 34




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Figure 2: Study Area and Proposed Project Area

# List of Agencies Contacted

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**Agency List for Brady II PSC Application Inquiry Letters**

Mr. Kyle C. Wanner
Director
North Dakota Aeronautics Commission
P. O. Box 5020
Bismarck, North Dakota 58502-5020

Mr. Doug Goehring
Agriculture Commissioner
North Dakota Department of Agriculture
600 East Boulevard Avenue, Department 602
Bismarck, North Dakota 58505-0020

Dr. Terry Dwelle, M.D., M.P.H.T.M.
State Health Officer
North Dakota Department of Health
600 East Boulevard Avenue
Bismarck, North Dakota 58505-0200

Mr. Larry Gangl
District Engineer
North Dakota Department of Transportation, Dickinson District
1700 Third Avenue West, Suite 101
Dickinson, ND 58601-3009

Mr. Lance D. Gaebe
Commissioner
North Dakota Department of Trust Lands
P. O. Box 5523
Bismarck, North Dakota 58506-5523

Mr. Todd Sando
State Engineer
North Dakota State Water Commission
900 East Boulevard, Dept. 770
Bismarck, North Dakota 58505-0850

Mr. Edward C. Murphy
State Geologist
North Dakota Geological Survey
600 East Boulevard Avenue
Bismarck ND 58505-0840

Mr. Scott Davis
Executive Director
North Dakota Indian Affairs Commission
600 East Boulevard Avenue
1st Floor – Judicial Wing, Room #117
Bismarck, North Dakota 58505

Mr. Mark Zimmerman
Director
North Dakota Parks and Recreation Department
1600 E. Century Ave, Suite 3
Bismarck, North Dakota 58503

Ms. Julie Hoff
Central Stark & Western Soil Conservation District
2948 4th Ave. West, Room "C"
Dickinson, ND 58601

Claudia J. Berg
Director
State Historical Society of North Dakota
612 East Boulevard Avenue
Bismarck, ND 58505

Mr. Daniel Cimarosti
Regulatory Program Manager
U.S. Army Corps of Engineers Omaha District, North Dakota Regulatory Office
1513 South 12th Street
Bismarck, ND 58504

Mr. Kevin Shelley
Acting ND Field Supervisor
USFWS North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

Mr. Terry Steinwand
Director
North Dakota Game and Fish Department
100 N. Bismarck Expressway
Bismarck, ND 58501-5095

# Agency Responses

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## U.S. Army Corps of Engineers

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**DEPARTMENT OF THE ARMY**
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
1513 SOUTH 12TH STREET
BISMARCK ND 58504-6640

November 24, 2015

North Dakota Regulatory Office [NWO-2015-2207-BIS]

Ms. Anne-Marie Griger
Tetra Tech, Inc.
8911 N. Capital of Texas Highway
Building 2, Suite # 2310
Austin, Texas 78759

Dear Ms. Griger:

This is in response to your letter dated November 24, 2015 requesting comments on the proposed Brady II Wind Energy Center. The project is located in several sections of Township 136 North, Ranges 95, 96, and 97 West, Hettinger County, North Dakota.

U. S. Army Corps of Engineers Regulatory Offices administer Section 10 of the Rivers and Harbors Act (Section 10) and Section 404 of the Clean Water Act (Section 404). A Section 10 permit would be required for work impacting navigable waters, this includes work over, through, or under Section 10 waters. Section 10 waters in North Dakota are the Missouri River (including Lake Sakakawea and Lake Oahe), Yellowstone River, James River (south of the railroad tracks in Jamestown, North Dakota), Bois de Sioux River, Red River of the North, and Upper Des Lacs Lake. A Section 404 permit would be required for the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States.

Complete the enclosed application and mail it to the letterhead address if the project requires a Section 10/404 permit.

If we can be of further assistance or should you have any questions regarding our program, please do not hesitate to contact this office by letter or phone at (701) 255-0015.

Sincerely,

Daniel E. Cimarosti

Daniel E. Cimarosti
Regulatory Program Manager
North Dakota

Enclosure

Printed on Recycled Paper

**Instructions for Preparing a**
**Department of the Army Permit Application**

**Blocks 1 through 4.** To be completed by Corps of Engineers.

**Block 5. Applicant's Name.** Enter the name and the E-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

**Block 6. Address of Applicant.** Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

**Block 7. Applicant Telephone Number(s).** Please provide the number where you can usually be reached during normal business hours.

**Blocks 8 through 11.** To be completed, if you choose to have an agent.

**Block 8. Authorized Agent's Name and Title.** Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is not required.

**Blocks 9 and 10. Agent's Address and Telephone Number.** Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

**Block 11. Statement of Authorization.** To be completed by applicant, if an agent is to be employed.

**Block 12. Proposed Project Name or Title.** Please provide name identifying the proposed project, e.g., Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

**Block 13. Name of Waterbody.** Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

**Block 14. Proposed Project Street Address.** If the proposed project is located at a site having a street address (not a box number), please enter it here.

**Block 15. Location of Proposed Project.** Enter the latitude and longitude of where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

**Block 16. Other Location Descriptions.** If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality that the site is located in.

**Block 17. Directions to the Site.** Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known

**Block 18. Nature of Activity.** Describe the overall activity or project. Give appropriate dimensions of structures such as wing walls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

**Block 19. Proposed Project Purpose.** Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

**Block 20. Reasons for Discharge.** If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

**Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards.** Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

**Block 22. Surface Areas of Wetlands or Other Waters Filled.** Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

**Block 23. Description of Avoidance, Minimization, and Compensation.** Provide a brief explanation describing how impacts to waters of the United States are being avoided and minimized on the project site. Also provide a brief description of how impacts to waters of the United States will be compensated for, or a brief statement explaining why compensatory mitigation should not be required for those impacts.

**Block 24. Is Any Portion of the Work Already Complete?** Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identity the authorization, if possible.

**Block 25. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site.** List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

**Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.**

**Block 26. Information about Approvals or Denials by Other Agencies.** You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

**Block 27. Signature of Applicant or Agent.** The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

## DRAWINGS AND ILLUSTRATIONS

**General Information.**

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross-Section Map. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.**

U.S. ARMY CORPS OF ENGINEERS

# APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

*Form Approved -*
*OMB No. 0710-0003*
*Expires: 31-AUGUST-2013*

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

**(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)**

| 1. APPLICATION NO. | 2. FIELD OFFICE CODE | 3. DATE RECEIVED | 4. DATE APPLICATION COMPLETE |
|---|---|---|---|
| | | | |

***(ITEMS BELOW TO BE FILLED BY APPLICANT)***

| 5. APPLICANT'S NAME | 8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required) |
|---|---|
| First - Middle - Last - | First - Middle - Last - |
| Company - | Company - |
| E-mail Address - | E-mail Address - |
| 6. APPLICANT'S ADDRESS: | 9. AGENT'S ADDRESS: |
| Address- | Address- |
| City - State.- Zip - Country - | City - State - Zip - Country - |
| 7. APPLICANT'S PHONE NOs. w/AREA CODE | 10. AGENTS PHONE NOs. w/AREA CODE |
| a. Residence b. Business c. Fax | a. Residence b. Business c. Fax |

**STATEMENT OF AUTHORIZATION**

11. I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ _____
SIGNATURE OF APPLICANT DATE

**NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY**

12. PROJECT NAME OR TITLE (see instructions)

| 13. NAME OF WATERBODY, IF KNOWN (if applicable) | 14. PROJECT STREET ADDRESS (if applicable) |
|---|---|
| | Address |
| 15. LOCATION OF PROJECT<br>Latitude: °N Longitude: °W | City - State- Zip- |

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

**USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

| Type<br>Amount in Cubic Yards | Type<br>Amount in Cubic Yards | Type<br>Amount in Cubic Yards |
|---|---|---|
| | | |

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

24. Is Any Portion of the Work Already Complete? ☐ Yes ☐ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address-

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

| AGENCY | TYPE APPROVAL* | IDENTIFICATION NUMBER | DATE APPLIED | DATE APPROVED | DATE DENIED |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

**DEPARTMENT OF THE ARMY**
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
1513 SOUTH 12TH STREET
BISMARCK ND 58504-6640

February 2, 2016

North Dakota Regulatory Office [NWO-2015-2207-BIS]

Ms. Anne-Marie Griger
Tetra Tech, Inc.
8911 N. Capital of Texas Highway
Building 2, Suite # 2310
Austin, Texas 78759

Dear Ms. Griger:

This is in response to your letter dated January 29, 2016, requesting comments on the proposed Brady II Wind Energy Center with a revised project area. The revised project is located in multiple sections, townships and ranges of Hettinger and Stark counties, North Dakota.

U. S. Army Corps of Engineers Regulatory Offices administer Section 10 of the Rivers and Harbors Act (Section 10) and Section 404 of the Clean Water Act (Section 404). A Section 10 permit would be required for work impacting navigable waters, this includes work over, through, or under Section 10 waters. Section 10 waters in North Dakota are the Missouri River (including Lake Sakakawea and Lake Oahe), Yellowstone River, James River (south of the railroad tracks in Jamestown, North Dakota), Bois de Sioux River, Red River of the North, and Upper Des Lacs Lake. A Section 404 permit would be required for the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States.

If the project requires a Section 10/404 permit, a permit application and instructions for completion may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/ObtainaPermit.aspx. If you do not have access to a computer, you may call this office and request a copy of the permit application and instructions be sent to you.

If we can be of further assistance or should you have any questions regarding our program, please do not hesitate to contact this office by letter or phone at (701) 255-0015.

Sincerely,

Patricia L. McQueary
Regulatory Program Manager
North Dakota

Printed on Recycled Paper

## U.S. Department of Commerce–National Telecommunications Information Administration (NTIA)

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**Griger, Anne Marie**

**From:** Ananthanarayanan, Sriganesh <Sriganesh.Ananthanarayanan@fpl.com>
**Sent:** Thursday, December 17, 2015 2:18 PM
**To:** Hochmuth, Melissa
**Cc:** Griger, Anne Marie
**Subject:** FW: **WindMill Response Letter** Brady I and II Projects: Stark & Hettinger Counties, ND
**Attachments:** Bradyl &II_R.pdf

Melissa/Anne-Marie,

Please see below and attached.
Anne-Marie – can you use this as well for the PSC application?

Thanks,
Sriganesh

---

**From:** Henry, Joyce [mailto:JHenry@ntia.doc.gov]
**Sent:** Thursday, December 17, 2015 2:59 PM
**To:** Ananthanarayanan, Sriganesh
**Subject:** **WindMill Response Letter** Brady I and II Projects: Stark & Hettinger Counties, ND

This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.

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Dear Sriganesh:

Please see attached the NTIA Response Letter for the Brady I and II Wind Projects, located in Stark and Hettinger Counties, North Dakota.

After a 45+ day period of review, we received responses from DOA (Agriculture), DOC (Commerce), DOJ (Justice) and DON (Navy), stating No Harmful Interference Anticipated (NHIA).

In the event that an agency has expressed concerns, we encourage you to work with the agency representatives directly to resolve all issues. If issues cannot be resolved, you may contact our office via phone or e-mail for resolution.

*Joyce Countee Henry*
*Admin Assistant*
*Department of Commerce (DOC)*
*National Telecommunications*
*Information Administration (NTIA)*
*Office of Spectrum Management (OSM HQ)*
*Wk: 202-482-1850*

*202-482-2215 (private line)*
*Fax: 202-482-4396*

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Telecommunications and Information Administration**
Washington, D.C. 20230

DEC 17 2015

Mr. Sriganesh Ananthanarayanan
Resource Modeling Analyst
WindLogics
700 Universe Blvd.
Juno Beach, FL 33408

Re: Brady I and II Projects: Stark & Hettinger Counties, ND

Dear Mr. Ananthanarayanan:

In response to your request on October 23, 2015, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Brady I and II Wind Projects, located in Stark and Hettinger Counties, North Dakota.

After a 45+ day period of review, no agencies had issues with turbine placement in this area.

While the IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review this proposal.

Sincerely,

Peter A. Tenhula
Deputy Associate Administrator
Office of Spectrum Management

## U.S. Fish and Wildlife Service

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## Griger, Anne Marie

**From:** Sue Kvas <sue_kvas@fws.gov>
**Sent:** Wednesday, January 20, 2016 8:10 AM
**To:** Griger, Anne Marie
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

Hey Anne-Marie,

I reviewed your project area and there are no USFWS interests in the areas you provided.

Thanks,

Sue

Susan Kvas
Supervisory Fish and Wildlife Biologist
US Fish & Wildlife Service
Habitat and Population Evaluation Team – HAPET
3425 Miriam Ave.
Bismarck, ND 58503
Office : 701-355-8541

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Tuesday, January 19, 2016 11:14 AM
**To:** sue_kvas@fws.gov
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

Hello Sue,

Can you please let me know if you received this email from last week, or if you need me to re-send? I sent unzipped shapefiles.

Thank you,

Anne-Marie

---

**From:** Griger, Anne Marie
**Sent:** Monday, January 11, 2016 4:43 PM
**To:** 'sue_kvas@fws.gov' <sue_kvas@fws.gov>
**Cc:** Farmer, Chris <Chris.Farmer@tetratech.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; 'laura.nagy@dnvgl.com' <laura.nagy@dnvgl.com>; McCall, Sarah <Sarah.McCall@tetratech.com>
**Subject:** Project shapefiles for Brady, Brady II, and Oliver III

Hello Sue,

Can you please confirm there are no easements or fee-title lands within or near the Brady, Brady II, and Oliver III project areas? Shapefiles of each are attached. I believe that there are no easements west of the Missouri River in North Dakota, but wanted to confirm.

Thank you,

Anne-Marie
**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

## Griger, Anne Marie

**From:** Sue Kvas <sue_kvas@fws.gov>
**Sent:** Thursday, January 21, 2016 10:55 AM
**To:** Griger, Anne Marie
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

No, there are no grassland easements west river. There are 3 wetland easements in Mercer County and several FSA easements scattered throughout, but no grassland easements. Hillsview (Hettinger WPA) is the only WPA west river, it was a donation. I looked at the other area in Oliver and nothing within 10 miles.

Thanks,

Sue

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Thursday, January 21, 2016 9:04 AM
**To:** Sue Kvas
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

Thank you! Can you please let me know if there is anything within 10 miles? I see that the Hettinger County WPA is within 10 miles of Brady II. I can provide shapefiles of a 10-mile buffer around these sites if that is helpful.

I thought I remembered you telling me last year that there were no easements in ND west of the Missouri River, but Kevin Shelley told us he thought there may be grassland easements near the Hettinger County WPA.

---

**From:** Sue Kvas [mailto:sue_kvas@fws.gov]
**Sent:** Wednesday, January 20, 2016 8:10 AM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

Hey Anne-Marie,

I reviewed your project area and there are no USFWS interests in the areas you provided.

Thanks,

Sue

Susan Kvas
Supervisory Fish and Wildlife Biologist
US Fish & Wildlife Service
Habitat and Population Evaluation Team – HAPET
3425 Miriam Ave.
Bismarck, ND 58503
Office : 701-355-8541

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Tuesday, January 19, 2016 11:14 AM

**To:** sue_kvas@fws.gov
**Subject:** RE: Project shapefiles for Brady, Brady II, and Oliver III

Hello Sue,

Can you please let me know if you received this email from last week, or if you need me to re-send? I sent unzipped shapefiles.

Thank you,

Anne-Marie

---

**From:** Griger, Anne Marie
**Sent:** Monday, January 11, 2016 4:43 PM
**To:** 'sue_kvas@fws.gov' <sue_kvas@fws.gov>
**Cc:** Farmer, Chris <Chris.Farmer@tetratech.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; 'laura.nagy@dnvgl.com' <laura.nagy@dnvgl.com>; McCall, Sarah <Sarah.McCall@tetratech.com>
**Subject:** Project shapefiles for Brady, Brady II, and Oliver III

Hello Sue,

Can you please confirm there are no easements or fee-title lands within or near the Brady, Brady II, and Oliver III project areas? Shapefiles of each are attached. I believe that there are no easements west of the Missouri River in North Dakota, but wanted to confirm.

Thank you,

Anne-Marie

**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

## Griger, Anne Marie

**From:** Wells, Kimberly <Kimberly.Wells@nexteraenergy.com>
**Sent:** Tuesday, January 26, 2016 9:02 AM
**To:** Kevin Shelley (kevin_shelley@fws.gov) (kevin_shelley@fws.gov); Schumacher, John D.
**Cc:** Farmer, Chris; Griger, Anne Marie; McCall, Sarah; Nagy, Laura; Hochmuth, Melissa; Trumbauer, Mark; Wells, Kimberly
**Subject:** NextEra ND Wind Projects Meeting: Summary and Status Update

Kevin and John,

Happy New Year! Hope you both had a nice holiday break.

As a follow up to our meeting in December in Kevin's office, I am providing the following attachments per your suggestion:

- Draft meeting minutes for your review (Word document)
- Updated habitat maps for each of the three projects (Brady I/II combined and Oliver III) showing native prairie and forest cover (PDF files)
- Brief summary of methodology used for the desktop native prairie assessment followed by a field verification to support what is shown in maps (Word document)
- Updated shape files sets for each project for cross checking against your internal databases for skippers, whooping cranes, and Sprague's pipit occurrences (zipped shape files)

Note our minutes summarize the status of your suggestions including inquiries with your respective offices that have been completed or in progress. Our hearing with the PSC for Brady I has been scheduled for 3/2, so we would greatly appreciate receiving the results of your internal data base queries using these shape files as soon as possible. Chris Farmer with Tetra Tech will follow up with within the week to check in on that and discuss some of our questions regarding BBCS format and organization to address your suggestions.

Could you please confirm receipt of this email?

Thanks!

Kim

Kimberly Wells, Ph.D.
Environmental Services Project Manager
NEXTera Energy Resources, LLC
601 Travis Street, Suite 1900
Houston, TX 77002
713.951.5372 (office)
832.538.7935 (mobile)
Kimberly.Wells@NEE.com

NextEra North Dakota Projects – Brady I, Brady II, Oliver III
Meeting Summary
16 December, 2015

---

**In attendance:**

- Kevin Shelley, US Fish and Wildlife Service (USFWS)
- John Schumacher, ND Game and Fish (NDGF)
- Kim Wells, NextEra
- Melissa Hochmuth, NextEra
- Chris Farmer, Tetra Tech
- Laura Nagy, DNV GL

**Handouts provided during meeting and via email:**

- NEER ND Wind wildlife summary diligence 12112015.docx
- NEER Brady I map 12112015.pdf
- NEER Brady II map 12112015.pdf
- NEER Oliver III map 12112015.pdf

**Attachments to the meeting summary:**

- NEER Brady Wind I and II native prairie map
- NEER Oliver III native prairie map

**Introductions:**

The group gave introductions and then Kim and Melissa provided an overview of the Projects by walking through the NEER ND Wind Wildlife summary diligence document, which summarizes the due diligence completed, planned, and in progress for the Brady I, Brady II, and Oliver III Projects.

**Brady I and II:**

- Melissa provided a description of Brady and Brady II. These projects are adjacent (Brady I in Stark County and Brady II primarily in Hettinger County) approximately 15 miles south of the city of Dickinson.
- Each project is 150 MW.
    - Brady I ~ 87 turbines.
    - Brady II ~ 72 turbines.
    - Projects will share a 19 mile, above-ground transmission (gen-tie) line.
    - Brady I
        - PPA with Basin Electric
        - Stark County Conditional Use Permit received on December 22, 2015
        - Submitted the PUC application for the wind farm and transmission line in December 2015.

- Brady II also has a PPA with Basin electric.
- Both Brady I and Brady II are expected to be operational by the end of 2016.

**Oliver III:**

- The existing Oliver complex has two operating sites, Oliver I and Oliver II.
- Oliver III is the third phase of this project, proposed to construct an additional 100 MW approximately 10 miles southeast of the existing complex.
- Oliver III is currently negotiating a PPA and was previously permitted through the Public Service Commission in 2011, so there is a larger amount of due diligence for this site.

**Brady I and II Discussion**

Eagles:

- The group reviewed the location of the eagle nests within 10 miles of the project boundaries. Kevin identified that this is an area with wintering golden eagles.
- Kevin asked John if the state collects wintering eagle data. John responded that they do not.
- Chris identified that winter eagle data collection is ongoing.

Dakota Skipper:

- Kevin identified that the presence/absence county-level information in the listing decision may not capture the current understanding of skipper presence.
- Kevin said that USFWS has assembled a skipper database that contains data through 2013. This database is not currently publically available, but Kevin offered to assess the nearest skipper locations if NextEra would provide him with shapefile of the project.
- Kim agreed to provide these files and asked if he was aware of any skippers within the project counties. He said he did not believe they had skippers documented in these counties.
- Kevin suggested that NextEra take a landscape look at potential skipper habitat, including potential connectivity. He recommended that the analysis use a minimum patch size of ¼ acres, which is equivalent to 1/10 hectare. He suggested evaluation of potential skipper habitat as starting with a desktop analysis, then evaluate the vegetation present in the potential locations followed by skipper surveys, as appropriate.

PLOTS (Private Lands Open to Sportsmen):

- John explained that PLOTS is an access easement and that if a landowner enters into an agreement he or she needs to contact the department and identify the acreages being removed from the agreement. He said that most PLOTS were usually in place for one year; however, if they were paid access, there would be a pro-rated amount that would need to be paid back. The state keeps an accurate list of PLOTS areas on their website.

Site Visit

- Kim offered that NextEra would be happy to provide a tour of their existing facilities located ~20-25 min north of Bismarck.

Prairie Dogs and Black-footed Ferrets:

- Kevin asked if prairie dog towns were mapped and Kim responded that there haven't been systematic surveys to date.
- John said that the state maintains a GIS layer of prairie dog towns and that Sandra would be the point-of-contact for those data. The state historically kept an atlas of prairie dog towns, but this has not been as well maintained in the last 10 years.
- Kevin said that he was aware of some significant prairie-dog towns in the New England area, up to several thousand acres, that might come into play for foraging golden eagles. At one point, this area was considered for black-footed ferret reintroduction, but there were not enough land owners to get the acreage.
- Kevin said that there was an unconfirmed report of black-footed ferrets in 2012 close to Dickinson; however, they were not confirmed during follow up surveys by the USFWS.
- NDGF provided shapefiles of documented prairie dog colonies and burrowing owls in and near the projects. There is a 43-acre prairie dog colony in the northeast portion of the Brady project area that was observed as unoccupied in 2011 and an 18-ac colony north of the Brady project area that was also observed as unoccupied in 2011. All documented occupied prairie dog colonies and burrowing owls were located over 5 miles to the west of both Brady and Brady II (none were located in the vicinity of Oliver III).

Easements:

- Kevin asked if the maps addressed all of the existing easements held by the USFWS for grassland easements, particularly in the vicinity of Hettinger County Waterfowl Production Area (WPA).
- NextEra and Tetra Tech received confirmation from Sue Kvas at USFWS that there are no USFWS interests (easements or WPA) within the boundary of the three projects or within 10 miles, with the exception of the Hettinger County WPA within 10 miles of Brady II.

Sage grouse:

- Kevin identified that the projects are on the edge of the sage grouse range and would most likely be an issue for Brady I. He believed that the 10-mile buffer was likely within the historic, but not the current range.
- Kevin suggested that NextEra query Aaron Robinson of NDGF regarding current sage grouse locations.

Northern long-eared bats:

- Kevin asked if the group had Dr. Erin Gillam's report on northern long-eared bats because her studies confirmed northern long-eared bats in western North Dakota. Kim asked if Kevin could share her report. Kevin emailed the report to the group during the meeting.

Brady I and II as separate projects vs. a singular project:

- Kevin said that he didn't see differences in environmental issues between the two Brady projects and that he would find the review easier if it was all done as part of one analysis.

- Kim explained that the projects were separated because of the separate permitting and financing processes but that she would discuss the idea with her legal team to evaluate that option.

**Oliver III Discussion:**

Whooping crane:

- The group discussed that this project is closer to the center of the whooping crane corridor than the Brady projects.
- Kevin offered to review the project with respect to the whooping crane locations once he has the project shapefiles.

Northern long-eared bat:

- Kevin mentioned that because of the Mississippi River, the Oliver III project may have a higher probability of having northern long-eared bats than the other projects.

Sprague's pipet:

- Kevin said that USFWS has the listing decision for the Sprague's pipet and anticipates publishing a batch finding in the 1st quarter on 2016. He stated that USFWS will emphasize pre-listing considerations to avoid lethal or demographic consequences to unlisted species to avoid the need for additional listings.

**BBCS Considerations**

Items identified by Kevin as those that should be considered in the BBCS are as follows:

- Prairie obligate species
- Birds of conservation concern
- Northern long-eared bats
- Species found in post-construction mortality monitoring surveys
- Voluntary mitigation

**Voluntary Considerations**

- Kevin mentioned that if there appear to be potential impacts to species like prairie obligates; NextEra could consider a voluntary donation as compensatory mitigation.
- Options include USFWS conservation easements or potentially conservation banks, although these are in the early development. Kevin offered to put NextEra in touch with the person in charge of the easement program.
- Kim stated that she would be interested in talking with her to understand the cost and process so that NextEra could consider this for these or future projects.

**Action Items (Current Status)**

NextEra:

- Provide shapefiles of each project boundary and 10-mile buffer to USFWS and NDGFD (complete; sent on 01/11/16).
- Contact Sandra to get the prairie dog database and then evaluate prairie dog use in the vicinity of the project (complete; contacted on 01/11/16 and shapefiles received 01/20/16).
- Check to see if there are other easements near Hettinger WPA through NextEra's easement point person (complete; there are none, according to Sue Kvas at USFWS)
- Query Aaron Robinson regarding sage grouse locations (query sent on 01/11/16)
- Generate and share depiction of the grassland maps and forested areas for each project for landscape evaluation (transmitted with meeting summary)
- Have an internal discussion about the potential of separate or tiered BBCSs (discussions in progress as of 01/11/16)

USFWS:

- Share Erin Gillam's report on northern long-eared bats – (completed)
- Review the project shape files for locations of whooping cranes and Sprague's pipits (pending)
- Provide contact for USFWS' easement program manager to NextEra (pending)

**Native Prairie and Forest Cover Methods**

**January 26, 2016**

The attached maps illustrate the forested areas in each project area, based on National Land Cover Database (NLCD) 2011 land cover, per U.S. Fish and Wildlife Service (USFWS) request. The maps also show the results of a native prairie habitat assessment prepared by Tetra Tech. The methodology of the assessment is described below.

NextEra Energy Resources, LLC (NextEra) contracted Tetra Tech, Inc. (Tetra Tech) to map potential habitat for the Dakota skipper (*Hesperia dacotae*) and Sprague's pipit (*Anthus spragueii*) at the proposed Brady Wind and Brady II Wind Energy Center project areas (project areas) in Stark and Hettinger counties, North Dakota. Potential habitat mapping consisted of two phases: desktop native prairie assessment and field verification surveys.

An initial desktop native prairie assessment of the proposed project areas was conducted in July of 2015. Areas that appeared to contain native prairie vegetation based on NLCD 2011 land cover, USDA cropland, and aerial imagery data were delineated.

A field verification survey of the proposed project areas was conducted on August 19, 2015 by a Tetra Tech biologist who visually assessed areas delineated as potential native prairie during the desktop habitat assessment. The survey was conducted from public rights of way and was intended to confirm the presence of native prairie and to classify the quality of potential Dakota skipper and/or Sprague's pipit habitat.

Classification of potential habitat for the Dakota skipper was based on several criteria described by USFWS (2014). Areas of native prairie were considered excellent or good potential Dakota skipper habitat if they:

- Contained a moderate or high diversity of native plant grass and forb species
- Included key plant species such as:
    - Little bluestem grass (*Schizachyrium scoparium*)
    - Sideoats grama (*Bouteloua curtipendula*)
    - Needlegrasses (e.g., *Hesperostipa* spp.)
    - Purple coneflower (*Echinacea angustifolia*)
    - upright prairie coneflower (*Ratibida columnifera*)
    - common gaillardia (*Gaillardia aristata*)
- Exhibited only moderate or light grazing
- Had relatively moderate or little encroachment by woody plant species

The main difference between areas classified as excellent versus good habitat for Dakota skipper was the relative diversity of native plant species (excellent habitat contained a high diversity of native plant species; good habitat contained a moderate diversity of native plant species); the presence of key plant species (excellent habitat contained key plant species; whereas, good quality habitat typically contained key plant species, but not in the abundance of excellent quality habitat); and grazing intensity (excellent habitat exhibited light or no grazing; whereas good quality habitat exhibited light to moderate grazing intensity).

Classification of potential Sprague's pipit habitat was based on criteria compiled from Ranchers Stewardship Alliance, Inc. (2014) and Western USFWS (2015). During the field verification surveys, areas of native prairie were considered potential Sprague's pipit habitat for if they:

- Included a predominance of native vegetation and/or a mix of native and non-native grasses and forbs of medium height (10-30 cm)
- Had low cover of trees or shrubs (<20 percent cover)
- Contained a medium density of vegetation (bare ground <30 percent)
- Did not contain high cover of litter
- Were not fragmented with cropland or linear features such as roads (Ranchers Stewardship Alliance, Inc. 2014)
- Were equal to or greater than 65 hectares (160 acres) in size; this characteristic was determined using GIS following field verification surveys (Western and USFWS 2015).

The main difference between areas classified as unlikely and potential Sprague's pipit habitat was the polygon size (potential habitat included grassland areas equal to or greater than 65 hectares [160 acres]) (Western and USFWS 2015); as well as the vegetation structure and composition (potential habitat had low tree and shrub cover, little bare ground and was not dominated by invasive plant species).

Key differences between Dakota skipper and Sprague's pipit habitat include:

- Polygon size: Sprague's pipit requires larger areas of intact grassland
- Presence of key plant species: Dakota skipper habitat typically require the presence of key plant species

Due to revisions in the proposed project areas following field verification surveys, not all portions of the proposed project areas were assessed via desktop in July. A desktop native prairie assessment was conducted in October and December 2015 for the expanded portions of the proposed project areas.

The attached figure displays the areas of excellent, good and potential habitat for Dakota skipper and Sprague's pipit within the proposed project areas based on desktop assessment and field verification surveys. Areas on the figures classified "Not Surveyed" include:

- Areas that could not be classified during field verification surveys due to lack of access or visibility
- Areas added to the Project Area after the field verification surveys took place that could not be classified based on desktop assessment only

References

Ranchers Stewardship Alliance, Inc. 2014. Vegetation Heterogeneity Indicators for Sprague's Pipit (Anthus spragueii) Habitat on Native Prairie Managed by Livestock Grazing, Preliminary. Prepared by Renny W. Grilz, P.Ag., Prairie Conservation Services. Aberdeen, SK.

USFWS. 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for Dakota Skipper and Endangered Species Status for Poweshiek Skipperling. Final Rule. October 24, 2014.

Western and USFWS. 2015. Programmatic Biological Assessment for the Upper Great Plains Region Wind Energy Program. Western Area Power Administration and the U.S. Fish and Wildlife Service. April 2015.

# Brady /Brady II Wind Energy Center

Hettinger and Stark Counties, ND

## Dakota Skipper & Sprague's Pipit Habitat

### Legend

- Proposed Brady Wind Farm Boundary
- Proposed Brady II Wind Farm Boundary
- Proposed Brady Transmission Line
- Proposed Brady Switchyard Boundary
- Proposed Turbine Location
- Alternative Turbine Location
- Burrowing Owl (Occupied)
- Prairie Dog Colony (Occupied 2011)
- Prairie Dog Colony (Unoccupied 2011)

**Field Verified Habitat**

- Excellent - Dakota Skipper / Possible - Sprague's Pipit
- Excellent - Dakota Skipper Only
- Good/Potential - Both Species
- Good/Potential - Dakota Skipper Only
- Good/Potential - Sprague's Pipit Only

**Desktop Habitat Assessment Only**

- Good/Potential - Both Species
- Good/Potential - Dakota Skipper Only
- Good/Potential - Sprague's Pipit Only
- Not Surveyed

**NLCD**

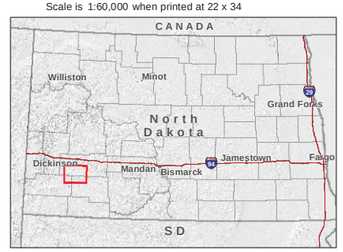
- NLCD Forested Areas

**Hydrology**
**(NHD 2014)**

- Perennial Stream
- Intermittent Stream

0 1.25 2.5
Miles

Scale is 1:60,000 when printed at 22 x 34




NEXTera ENERGY RESOURCES

Antelope Creek

Antelope Creek

Jimmy Creek

STARK COUNTY

Cannonball River

SLOPE COUNTY

HETTINGER COUNTY

New England

PRIVILEGED AND CONFIDENTIAL

Attorney-Client Communication/Attorney Work Product
Prepared at the Direction of Legal Counsel

Path: P:\5476_Brady\4. WindGIS\Layouts\USFWSHabitat_MapsCombined_habitats.mxd Revised: 1/26/2016

## State Historical Society of North Dakota

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STATE HISTORICAL SOCIETY OF NORTH DAKOTA

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November 27, 2015

Ms. Anne-Marie Griger, AICP
Tetra Tech Inc
8911 N Capital of Texas Hwy, Building 2, Suite 2310
Austin, TX 78759

**ND SHPO REF: 16-0443 ND PSC – Proposed Brady II Wind Energy Center by Brady Wind II, LLC an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC in Hettinger County, North Dakota**

Dear Ms. Griger,

Thank you for your preliminary information on ND SHPO REF: 16-0443 ND PSC – Proposed Brady II Wind Energy Center. As you know, there is potential for unrecorded and recorded cultural resource properties in a variety of physiographic settings in the overall project area. As a potential federal/state undertaking, we encourage early agency consultation as part of the review process. Early consultation should also include tribal nations, and North Dakota Indian Affairs.

We recommend a Class I (file search), and a Class III survey by a permitted architectural historian for standing buildings and structures (including cemeteries) over 50 years old in the visual Area of Potential Effect (APE). This is within a 2 mile radius of individual turbine locations, but that APE may be modified larger or smaller, depending on those specific turbine locations. When the wind farm project develops to the point that turbine locations are defined, we want to see a map of the turbine locations to see if there need to be any modifications to the APE.

Class III archeological (pedestrian) surveys will be warranted for all areas directly impacted by the project, **including crane paths, met towers**, access roads, staging areas, transmissions lines and turbine pads. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed. If the project APE changes, we will request additional inventories, surveys and consultation.

Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms, and updates as the project siting occurs. If you have any questions please contact Paul Picha, Chief Archaeologist (701) 328-3574 or Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Claudia J. Berg, State Historic Preservation Officer (North Dakota) and Director State Historical Society of North Dakota

## Griger, Anne Marie

**From:** Quinnell, Susan L. <squinnell@nd.gov>
**Sent:** Friday, January 15, 2016 12:53 PM
**To:** Griger, Anne Marie
**Cc:** Holven, Adam; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com); Estabrook, Richard (Richard.Estabrook@nexteraenergy.com); Sexton, James; McCall, Sarah
**Subject:** RE: Brady II and Oliver III shapefiles

Yes, two miles would be adequate.

Susan Quinnell
Review and Compliance Coordinator
ND State Historic Preservation Office
State Historical Society of North Dakota
North Dakota Heritage Center
612 East Boulevard Avenue
Bismarck ND 58505-0830

701-328-3576
701-328-3710 FAX

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Friday, January 15, 2016 12:51 PM
**To:** Quinnell, Susan L.
**Cc:** Holven, Adam; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com); Estabrook, Richard (Richard.Estabrook@nexteraenergy.com); Sexton, James; McCall, Sarah
**Subject:** RE: Brady II and Oliver III shapefiles

Thank you Susan. Can you please confirm that a survey area for architectural resources consisting of a 2-mile buffer around planned turbines is acceptable for the Brady II and Oliver III projects?

Thank you,

Anne-Marie

---

**From:** Quinnell, Susan L. [mailto:squinnell@nd.gov]
**Sent:** Friday, January 15, 2016 12:45 PM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Subject:** RE: Brady II and Oliver III shapefiles

Hi Anne-Marie,

I downloaded the shape files for these two and there isn't anything remarkable about these areas. Your cultural resource specialists should complete the Class I records search and the rest of the inventory per the usual instructions. Our survey manual was recently updated but no major revisions:

http://history.nd.gov/hp/PDFinfo/North-Dakota-SHPO-Guidelines-Manual-for-Cultural-Resource-Inventory-Projects.pdf

Best wishes,

Susan Quinnell

Review and Compliance Coordinator
ND State Historic Preservation Office
State Historical Society of North Dakota
North Dakota Heritage Center
612 East Boulevard Avenue
Bismarck ND 58505-0830

701-328-3576
701-328-3710 FAX

---

**From:** Anne-Marie Griger [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Friday, January 15, 2016 12:13 PM
**To:** Quinnell, Susan L.
**Subject:** Brady II and Oliver III shapefiles

Click the links below to download the files. Files will expire Fri Jan 29 12:11:49 2016.
BradyII_Boundary_PSC_Application.zip (4,005 bytes)
ND_Oliver_III_PrjBnd_Update_20160113.zip (19,572 bytes)

Package details:
From: AnneMarie.Griger@tt
To: squinnell@nd.gov
Subject: Brady II and Oliver III shapefiles
Arrived: Fri Jan 15 12:11:43 2016

Susan, these links are for the Brady II and Oliver III project boundary shapefiles. Please confirm receipt and let me know if you have any problems accessing the files.

Thank you,

Anne-Marie

Total file size: 23,577 bytes

**STATE HISTORICAL SOCIETY OF NORTH DAKOTA**

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February 5, 2016

Ms. Anne-Marie Griger, AICP
Tetra Tech Inc
8911 N Capital of Texas Hwy, Building 2, Suite 2310
Austin, TX 78759

**ND SHPO REF: 16-0443 ND PSC - NextEra Energy Resources, LLC Proposed *Brady II* Wind Energy Center in Hettinger and Stark Counties, North Dakota**

Dear Ms. Griger,

Thank you for your preliminary information on ND SHPO REF: 16-0443 ND PSC - NextEra Energy Resources, LLC Proposed Brady II Wind Energy Center in Hettinger and Stark Counties, North Dakota. As you know, there is potential for unrecorded and recorded cultural resource properties in a variety of physiographic settings in the overall project area. As a potential federal/state undertaking, we encourage early agency consultation as part of the review process. Early consultation should also include tribal nations, and North Dakota Indian Affairs as well as consideration for scenic areas (NDCC Section 49-22-09).

We recommend a Class I (file search), a **Class III survey by a permitted architectural historian for standing structures over 50 years old in the visual Area of Potential Effect (APE).** That is within a 2 mile radius of individual turbine locations. When the wind farm project develops to the point that turbine locations are defined, we would like to see a map of the turbine locations to see if there need to be any modifications to the APE. Susan Quinnell Review and Compliance Coordinator with ND SHPO will assist the permitted architectural historian with development of the visual APE, as each visual APE for large wind projects warrants individual review. Class III archeological (pedestrian) surveys will be warranted for all areas directly impacted by the project, **including crane paths**, access roads, staging areas, transmissions lines and turbine pads. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed. If the project APE changes, we will request additional inventories, surveys and consultation.

Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms, and updates as the project siting occurs. If you have any questions please contact Paul Picha, Chief Archaeologist (701) 328-3574 or Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Claudia J. Berg, State Historic Preservation Officer (North Dakota) and Director State Historical Society of North Dakota

## North Dakota Geological Survey

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# North Dakota Geological Survey

Edward C. Murphy - State Geologist

**Department of Mineral Resources**

Lynn D. Helms - Director

**North Dakota Industrial Commission**

https://www.dmr.nd.gov/ndgs/


December 4, 2015

Ms. Anne-Marie Griger
Tetra Tech, Inc
8911 N. Capitol of Texas Highway, Bldg 2 Suite # 2310
Austin, Texas 78759

RE: Proposed Brady II Wind Energy Center

Dear Ms. Griger,

Please find links to our maps of the coal and clay deposits that occur within the area proposed for the Brady II Wind Energy Center in Hettinger County, North Dakota. Clay: https://www.dmr.nd.gov/ndgs/Claymap/100K%20clay%20maps/dksn_100k_al.pdf Coal: https://www.dmr.nd.gov/ndgs/Coalmaps/pdf/100K/dksn_100k_c.pdf I typically also send links to landslide maps, but we have not had the opportunity to undertake an inventory of landslides in this area.

As with our August 2015 review, I wanted you to be aware of the known mineral deposits within the proposed area.

Please contact me if you have any questions.

Sincerely,

Edward C. Murphy
State Geologist

**North Dakota Department of Health**

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NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

December 7, 2015

Anne-Marie Griger, AICP
Tetra Tech, Inc.
8911 N. Capital of Texas Hwy, Bldg 2, Suite 2310
Austin, TX 78759

Re: Proposed Brady II Wind Energy Center
Hettinger County, North Dakota

Dear Ms. Griger:

This department has reviewed the information concerning the above-referenced project submitted under date of November 18, 2015, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

2. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Also, cities or counties may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# Construction and Environmental Disturbance Requirements

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

## Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

## Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

## Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

February 12, 2016

Anne-Marie Griger, AICP
Tetra Tech, Inc.
8911 N. Capital of Texas Hwy, Bldg 2, Suite 2310
Austin, TX 78759

Re: Revised Project Area for the Proposed Brady II Wind Energy Center
Hettinger and Stark Counties, North Dakota

Dear Ms. Griger:

This department has reviewed the information concerning the above-referenced project submitted under date of January 29, 2016, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Also, cities or counties may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

A total maximum daily load (TMDL) allocation for *E. Coli* bacteria has been developed for Dead Horse Creek. Storm water runoff from the project should not contribute to the impairment if the appropriate practices are in place to manage sanitary waste.

4. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

# Construction and Environmental Disturbance Requirements

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

## Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

## Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

## Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

## North Dakota State Water Commission

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# North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
701-328-2750 • TDD 701-328-2750 • FAX 701-328-3696 • INTERNET: http://swc.nd.gov


December 8, 2015

Anne-Marie Griger
Tetra Tech, Inc.
8911 N Capital of Texas Hwy
Bldg 2 STE 2310
Austin TX 78759

Dear Ms. Griger:

This is in response to your request for review of environmental impacts associated with the Brady II Wind Energy Center project located in Hettinger County, ND. The project will be located in Township 136 N, Range 96 W, Sections 1-29; Township 136 N, Range 97 W, Sections 1-13; and Township 136 N; Range 95 W, Section 6, 7, 18, 19, 30.

The proposed project has been reviewed by State Water Commission staff and the following comments are provided:

- There are floodplains identified and/or mapped where the proposed project is to take place. The areas are designated to be in Zone A. North Dakota has no formal "permitting" authority as a state entity in National Flood Insurance Program (NFIP) identified floodplain areas. The permitting is always done by the local entity, which has jurisdiction in the area in question. Please work closely with the County Floodplain Administrator. The Floodplain Administrator for Hettinger County is: Ilene Hardmeyer; 336 Pacific Ave.; Mott, ND 58646; 701-824-4227. The NFIP maps used to make this determination are: Panel #38041C0275D and 38041C0250D, Date: 3/2/2012. The NFIP maps are enclosed.

- Please contact the Southwest Water Authority at 701-225-0241, regarding possible Southwest Pipeline Project infrastructure located in the area.

- It is the responsibility of the project sponsor to ensure that local, state and federal agencies are contacted for any required approvals, permits, and easements.

- All waste material associated with the project must be disposed of properly and not placed in identified floodway areas.

- No sole-source aquifers have been designated in ND.

Thank you for the opportunity to provide review comments. If you have any questions, please call me at 701-328-4967.

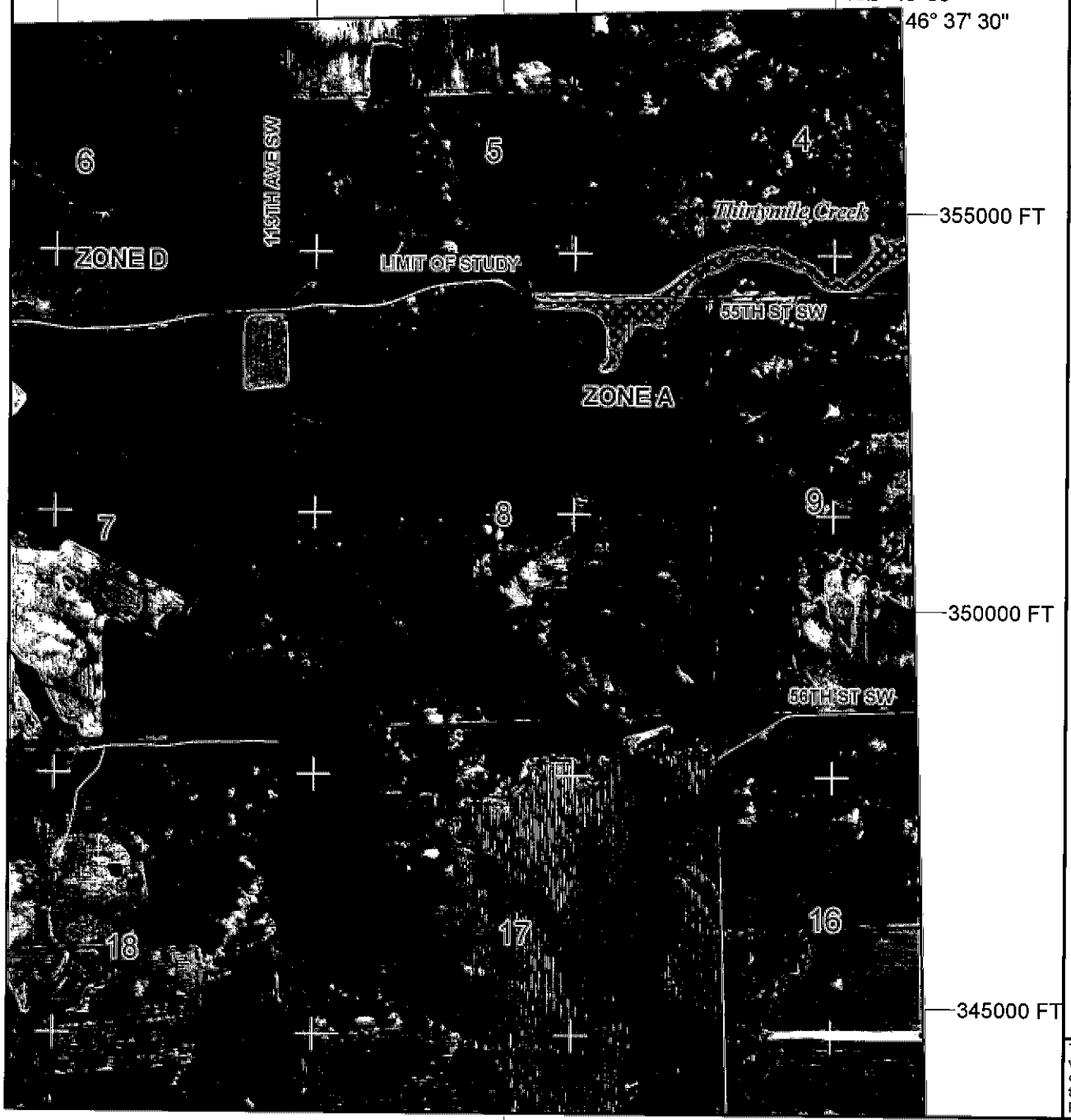
Sincerely,

Linda Weispfenning
Water Resource Planner

LW:dm/1570
Encls.


JACK DALRYMPLE, GOVERNOR
CHAIRMAN

TODD SANDO, P.E.
SECRETARY AND STATE ENGINEER




MAP SCALE 1" = 2000'

1000 0 2000 4000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0250D

# FIRM

## FLOOD INSURANCE RATE MAP

## HETTINGER COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

PANEL 250 OF 950

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| HETTINGER COUNTY, Unincorporated Areas | 380293 | 0250 | D |
| NEW ENGLAND, CITY OF | 380242 | 0250 | D |

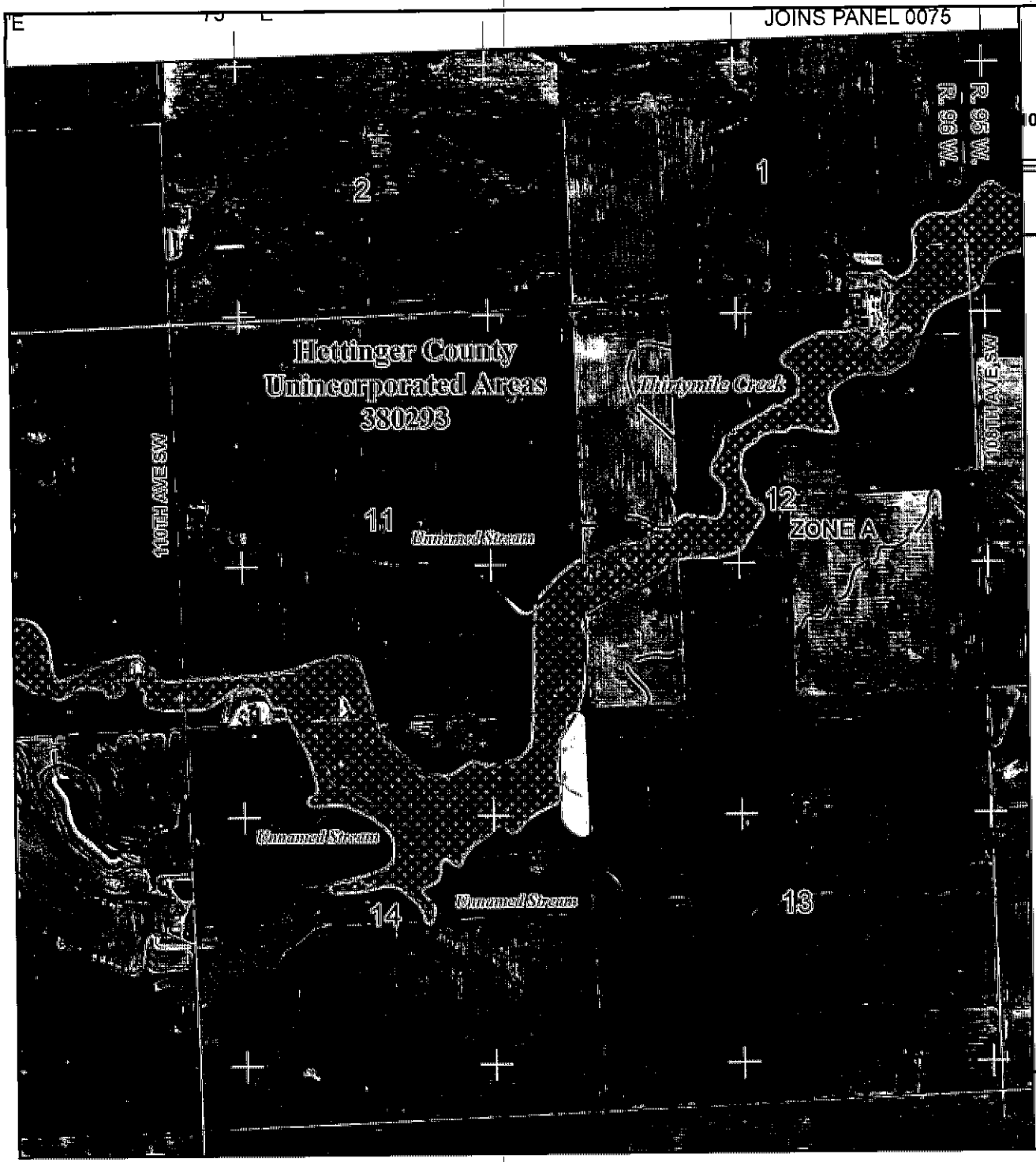
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**
**38041C0250D**

**EFFECTIVE DATE**
**MARCH 2, 2012**

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov




MAP SCALE 1" = 2000'

1000 0 2000 4000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0275D

# FIRM

## FLOOD INSURANCE RATE MAP

## HETTINGER COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

**PANEL 275 OF 950**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| HETTINGER COUNTY, Unincorporated Areas | 380293 | 0275 | D |

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**
**38041C0275D**

**EFFECTIVE DATE**
**MARCH 2, 2012**

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

# North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
701-328-2750 • TDD 701-328-2750 • FAX 701-328-3696 • INTERNET: http://swc.nd.gov


February 12, 2016

Anne-Marie Griger
Tetra Tech, Inc.
8911 N Capital of Texas Hwy, Bldg. 2, STE 2310
Austin, TX 78759

Dear Ms. Griger:

This is in response to your request for review of environmental impacts associated with the Brady II Wind Energy Center in Hettinger and Stark Counties, ND, revised project area. The tract locations are: Hettinger County, Township 136 N, Range 96 W, Sections 1-15, 18, 19, 22-24, 26, 27; and Township 136 N, Range 97 W, Sections 1-6, 8-14, 24. Stark County, Township 137 N, Range 95 W, Section 31; Township 137 N, Range 96 W, Sections 25, 26, 31-36; and Township 137 N, Range 97 W, Section 36.

The proposed project has been reviewed by State Water Commission staff and the following comments are provided:

- There are floodplains identified and/or mapped where this proposed project is to take place. The areas are designated as Zone A (see attached FIRMettes; there are several other areas of floodplain not captured by these FIRMettess). North Dakota has no formal 'permitting' authority as a state entity in National Flood Insurance Program (NFIP) identified floodplain areas. The permitting is always done by the local entity, which has jurisdiction in the area in question. Please work closely with the County Floodplain Administrators. Stark County Floodplain Administrator is: Bill Fahlsing; 66 Museum Drive W; Dickinson, ND 58601; 701-456-7605 bfahlsing@starkcountynd.gov. The maps used to make this determination are: Panels #38089C0725E, 38089C0700E, & 38089C0675E, Date 11/4/2010. The Hettinger County Floodplain Administrator is: Ilene Hardmeyer; 701-824-4227 or 701-260-2452; ihardmeyer@nd.gov. The map used to make this determination is: Panel#38041C0250D & 38041C0275D, Date: 3/2/2012.

- A surface drain permit may be needed for this project from the State Engineer if wetlands are filled or drained. Please contact Dwight Comfort at 701-328-4960, if you have any questions regarding the permit.

- Southwest Pipeline Project infrastructure is located in the project area. Please contact the Southwest Water Authority at 701-225-0241 to obtain crossing permits.

- The ND State Water Commission (Commission) maintains a network of observation/monitor water wells and the location of gaging stations throughout the state, and many are located close to public right-of-ways. The location information can be obtained from the Commission's website at: http://swc.nd.gov.; then click on "Information and Education"; then click on "Maps/GIS and Data," then click on "Map Services;" then click on the "Ground and Surface Water Information" map. Please inform the Water Appropriations Division of the Commission at 701-328-2754, if gaging stations or water wells may be affected by the project or accidently damaged. A copy of the maps are enclosed.


JACK DALRYMPLE, GOVERNOR
CHAIRMAN

TODD SANDO, P.E.
SECRETARY AND STATE ENGINEER

- It is the responsibility of the project sponsor to ensure that local, state and federal agencies are contacted for any required approvals, permits, and easements.

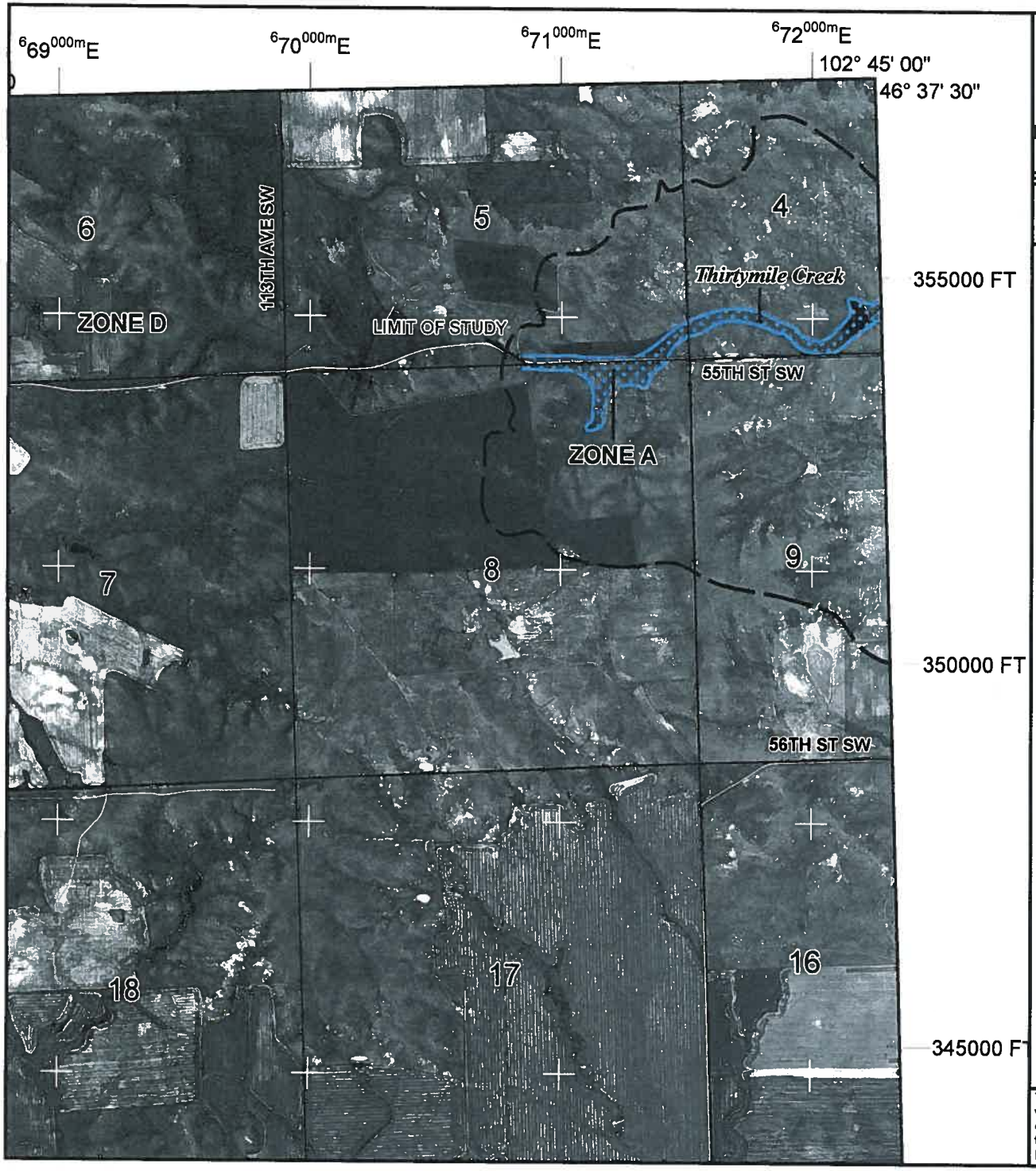
- All waste material associated with the project must be disposed of properly and not placed in identified floodway areas.

Thank you for the opportunity to provide review comments. If you have any questions, please call me at 701-328-4967.

Sincerely,

Linda Weispfenning
Water Resource Planner

LW:dm/1570
Encls.




MAP SCALE 1" = 2000'

1000 0 2000 4000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0250D

# FIRM

## FLOOD INSURANCE RATE MAP

## HETTINGER COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

**PANEL 250 OF 950**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| HETTINGER COUNTY, Unincorporated Areas | 380293 | 0250 | D |
| NEW ENGLAND, CITY OF | 380242 | 0250 | D |

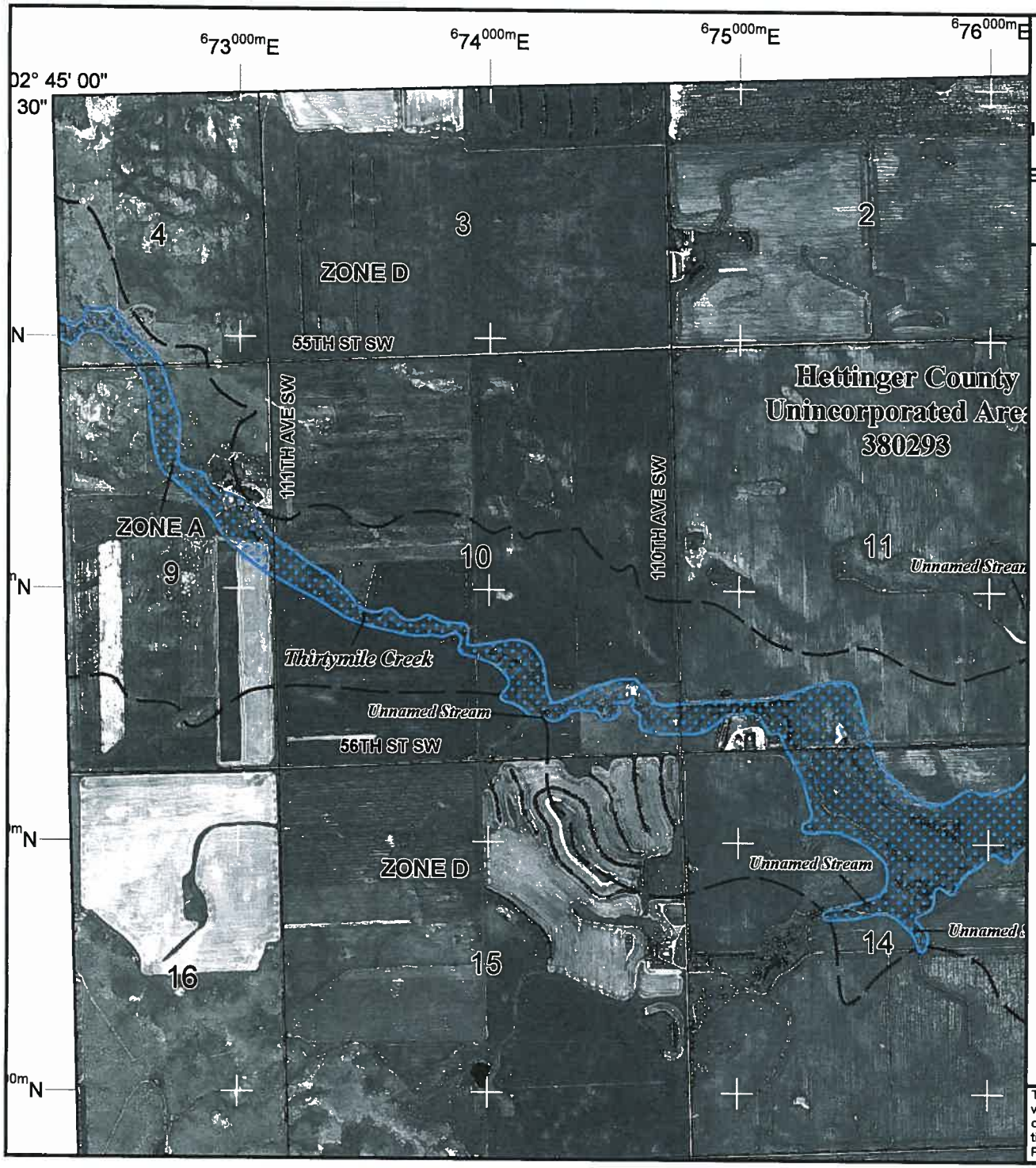
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**MAP NUMBER**
**38041C0250D**

**EFFECTIVE DATE**
**MARCH 2, 2012**

**Federal Emergency Management Agency**

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov




MAP SCALE 1" = 2000'

1000 0 2000 4000

FEET

METERS

NFIP

PANEL 0275D

# FIRM

## FLOOD INSURANCE RATE MAP

## HETTINGER COUNTY, NORTH DAKOTA AND INCORPORATED AREAS

**PANEL 275 OF 950**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| HETTINGER COUNTY, Unincorporated Areas | 380293 | 0275 | D |

NATIONAL FLOOD INSURANCE PROGRAM

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

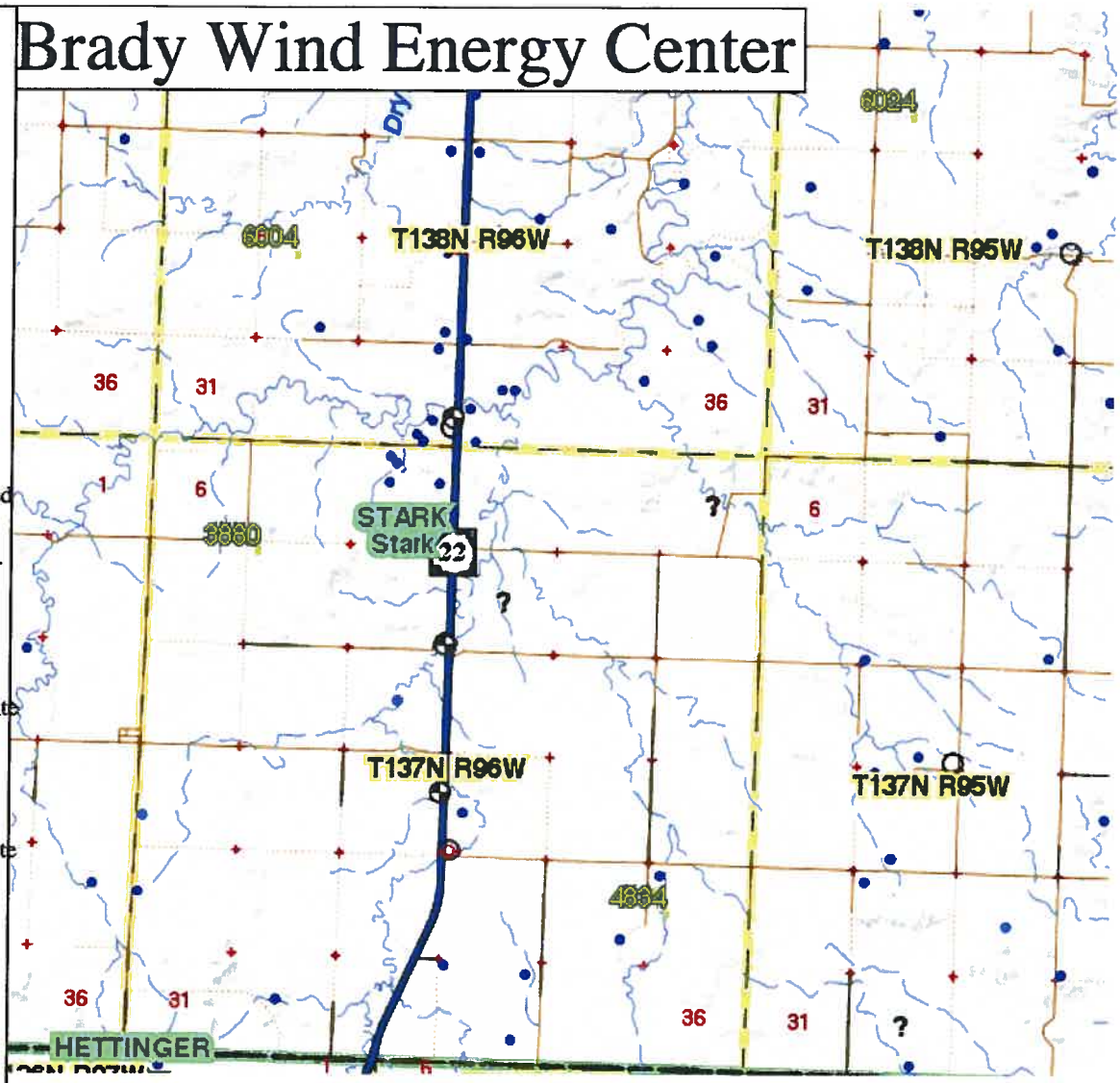
**MAP NUMBER**
**38041C0275D**

**EFFECTIVE DATE**
**MARCH 2, 2012**

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

# Brady Wind Energy Center




- ND Corporate Limits
- Tribal Lands
- Section Corners
- Townships_2
- County Boundaries1
- Driller Logs
- usgs_gages
- Domestic Well
- Industrial Well
- Irrigation Well
- Multi-Well Sample
- Municipal Well
- Observation Well
- Observation Well - Destroyed
- Observation Well - Plugged
- Observation Well - Recorder
- Production Well
- Rural Water Well
- Stock Well
- Surface Water Monitoring Site
- Test Hole
- Test Well
- Unknown
- Surface Water Monitoring Site
- Dams
- Approved
- Denied
- Hold
- Pending
- Withdrawn
- Permit Not Required
- dikes

## North Dakota Game and Fish Department

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"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT

100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

December 28, 2015

Anne-Marie Griger, AICP
Tetra Tech, Inc.
8911 N. Capital of Texas Hwy
Bldg. 2, Suite #2310
Austin, TX 78759

Dear Ms. Griger:

RE: Proposed Brady II Wind Energy Center
Hettinger County, North Dakota

The North Dakota Game and Fish Department has reviewed this project for wildlife concerns.

A primary concern with wind power development is the disturbance of native prairie associated with construction of turbines, access roads, and other associated facilities. We ask that work within native prairie be avoided to the extent possible. This could include micro-siting turbines onto adjacent previously disturbed land, locating access roads on existing section line trails rather than across undisturbed native prairie, etc. Avoidance of native prairie areas reduces impacts to a variety of grassland species including Sprague's pipit and Dakota skipper. We also suggest the US Fish and Wildlife Service Land-Based Wind Energy Guidelines be implemented as appropriate during the development of this project.

The National Wetland Inventory indicates various wetlands located within the proposed project area. We recommend that any unavoidable wetland impacts be replaced in kind, above-ground appurtenances not be placed in wetland areas, and no alterations be made to existing drainage patterns.

We ask that collection lines be buried whenever possible, and any necessary overhead lines be marked when placed over perennial streams or sited in close proximity to wetland complexes to minimize possible avian impacts. The publication "Reducing Avian Collisions with Power Lines: the State of the Art in 2012" provides a range of management options which can be used to reduce avian losses.

Aerial surveys should be conducted for raptor nests before construction begins. A ½-mile construction buffer should be implemented around active eagle nest sites (known occupied

within the past 5 years). Ms. Sandra Johnson, Conservation Biologist, can be contacted at 701-328-6327 for additional information on eagle nest sites in the state.

We also recommend that routine monitoring for avian and bat mortality be included as part of the facility maintenance plan for the life of the project. We would appreciate being kept informed as this project progresses, and if possible, we would like the GPS coordinates for each turbine after the site has been established.

Sincerely,

Greg Link
Chief
Conservation & Communication Division

js

## Griger, Anne Marie

**From:** Johnson, Sandra K. <sajohnson@nd.gov>
**Sent:** Wednesday, January 20, 2016 9:06 AM
**To:** Griger, Anne Marie
**Subject:** RE: Prairie dog database
**Attachments:** burrowing_owl.shx; burrowing_owl.dbf; burrowing_owl.prj; burrowing_owl.sbn; burrowing_owl.sbx; burrowing_owl.shp; prairie_dog.shx; prairie_dog.dbf; prairie_dog.prj; prairie_dog.sbn; prairie_dog.sbx; prairie_dog.shp

Hi Anne-Marie,
Attached is the data. Let me know if you have any questions.
Sandy

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Tuesday, January 19, 2016 3:02 PM
**To:** Johnson, Sandra K. <sajohnson@nd.gov>
**Subject:** RE: Prairie dog database

Hello Sandy,

Please see the attached signed agreement. Thank you!

---

**From:** Johnson, Sandra K. [mailto:sajohnson@nd.gov]
**Sent:** Wednesday, January 13, 2016 3:03 PM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Subject:** RE: Prairie dog database

Anne-Marie,
Attached is a data sharing agreement for the prairie dog and burrowing owl data. There are no known locations within the Oliver III buffer. Please note that we have revised the agreement to include a 4th condition. Your organization has been courteous and provided eagle data in return to us in the past. However, others have not and therefore we added it to the agreement.
Thanks,
Sandy

*Sandy Johnson*
*Conservation Biologist*
*North Dakota Game and Fish Department*
*100 N. Bismarck Expwy.*
*Bismarck, ND 58501-5095*
*Phone: 701-328-6382*
*sajohnson@nd.gov*
*http://gf.nd.gov/*

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Monday, January 11, 2016 10:05 AM
**To:** Johnson, Sandra K. <sajohnson@nd.gov>
**Cc:** Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; Farmer, Chris <Chris.Farmer@tetratech.com>; 'laura.nagy@dnvgl.com' <laura.nagy@dnvgl.com>; McCall, Sarah

<Sarah.McCall@tetratech.com>
**Subject:** Prairie dog database

Hello Sandy,

As follow up from a meeting that John Schumacher attended with our client NextEra, I wanted to get further information regarding prairie dog colonies and grouse in Hettinger and Stark counties. Can you please provide the prairie dog database? I have attached shapefiles that show three project boundaries (Brady, Brady II, and Oliver III), plus a 10-mile buffer around each.

We have already signed a confidentiality agreement with you for eagle nests for all three projects, so let me know if we need to sign another. Also, I left you a voicemail last week, so please give me a call when you have a chance.

Thank you,

Anne-Marie
**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

## Griger, Anne Marie

**From:** Robinson, Aaron C. <acrobinson@nd.gov>
**Sent:** Wednesday, February 03, 2016 10:14 PM
**To:** Griger, Anne Marie
**Subject:** RE: Grouse info for Brady, Brady II and Oliver III projects

Anne – I looked through our database and the areas where you have the wind farms proposed do not overlap with our grouse census blocks. That does not mean that there are no grouse leks in the area, we just don't have the man power to survey the entire state. My recommendation would be to allow me to help design a survey protocol for both these areas. The oliver block it in prime grouse habitat and the Brady block is also in good sharp-tail habitat. Please give me a call so we can discuss this further.

Regards,
Aaron

**********

*Aaron Robinson*
Upland Game Management Supervisor
North Dakota Game and Fish
225 30th Ave. SW
Dickinson, ND 58601
Cell: 701-290-1370
acrobinson@nd.gov
www.gf.nd.gov

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Monday, January 11, 2016 3:37 PM
**To:** Robinson, Aaron C. <acrobinson@nd.gov>
**Cc:** Farmer, Chris <Chris.Farmer@tetratech.com>; 'laura.nagy@dnvgl.com' <laura.nagy@dnvgl.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; McCall, Sarah <Sarah.McCall@tetratech.com>
**Subject:** Grouse info for Brady, Brady II and Oliver III projects

Hello Aaron,

As follow up from a meeting that John Schumacher attended with our client NextEra, I would like to request information you have regarding sage grouse locations in Hettinger and Stark counties. I have attached shapefiles that show two project boundaries (Brady and Brady II), plus a 10-mile buffer around each. If you also have locations of other known grouse or grouse leks in the vicinity of these areas or near the Oliver III project in Morton and Oliver counties (shapefiles also attached), we would appreciate that information as well.

Thank you,

Anne-Marie
**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

## Griger, Anne Marie

**From:** Schumacher, John D. <jdschumacher@nd.gov>
**Sent:** Friday, February 26, 2016 12:19 PM
**To:** Griger, Anne Marie
**Subject:** Brady & Brady II Wind Energy Centers - Revised Project Areas

Ms. Griger,

The North Dakota Game and Fish Department originally provided comments regarding these projects on 25 September & 28 December 2015 respectively. We have reviewed the projects as revised and have nothing additional to offer. Our original comments are still applicable.

**JOHN SCHUMACHER**
**RESOURCE BIOLOGIST**
**ND GAME AND FISH DEPT**
**701.328.6321**

## Low, Tara

**From:** Griger, Anne Marie
**Sent:** Monday, March 21, 2016 8:19 PM
**To:** Low, Tara
**Subject:** FW: Grouse info for Brady, Brady II and Oliver III projects
**Attachments:** Brady Grouse Lek Survey Protocol to NDGF.docx

Tara, please make sure this gets in the Brady II agency correspondence for the PSC application. Thanks!

---

**From:** Robinson, Aaron C. [mailto:acrobinson@nd.gov]
**Sent:** Wednesday, March 09, 2016 2:53 PM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Cc:** Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>
**Subject:** RE: Grouse info for Brady, Brady II and Oliver III projects

See attached, let me know if you have any questions.

Aaron

**********

*Aaron Robinson*
Upland Game Management Supervisor
North Dakota Game and Fish
225 30th Ave. SW
Dickinson, ND 58601
Cell: 701-290-1370
acrobinson@nd.gov
www.gf.nd.gov

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Wednesday, March 9, 2016 1:19 PM
**To:** Robinson, Aaron C. <acrobinson@nd.gov>
**Cc:** Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>
**Subject:** RE: Grouse info for Brady, Brady II and Oliver III projects

Hello Aaron,

Can you please let me know when you anticipate having comments on our proposed lek survey protocol that I provided to you on February 8? We are planning to use the same protocol for Brady, Brady II, and Oliver III.

Thank you,

Anne-Marie

---

**From:** Griger, Anne Marie
**Sent:** Wednesday, March 02, 2016 12:54 PM

**To:** 'Robinson, Aaron C.' <acrobinson@nd.gov>
**Subject:** RE: Grouse info for Brady, Brady II and Oliver III projects

Hi Aaron,

I just wanted to check in again regarding any feedback on our protocol for lek surveys. We are planning to start our lek surveys at Brady and Brady II on March 25.

Thank you,

Anne-Marie

---

**From:** Robinson, Aaron C. [mailto:acrobinson@nd.gov]
**Sent:** Wednesday, February 03, 2016 10:14 PM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Subject:** RE: Grouse info for Brady, Brady II and Oliver III projects

Anne – I looked through our database and the areas where you have the wind farms proposed do not overlap with our grouse census blocks. That does not mean that there are no grouse leks in the area, we just don't have the man power to survey the entire state. My recommendation would be to allow me to help design a survey protocol for both these areas. The oliver block it in prime grouse habitat and the Brady block is also in good sharp-tail habitat. Please give me a call so we can discuss this further.

Regards,
Aaron

**********

*Aaron Robinson*
Upland Game Management Supervisor
North Dakota Game and Fish
225 30th Ave. SW
Dickinson, ND 58601
Cell: 701-290-1370
acrobinson@nd.gov
www.gf.nd.gov

---

**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Monday, January 11, 2016 3:37 PM
**To:** Robinson, Aaron C. <acrobinson@nd.gov>
**Cc:** Farmer, Chris <Chris.Farmer@tetratech.com>; 'laura.nagy@dnvgl.com' <laura.nagy@dnvgl.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; McCall, Sarah <Sarah.McCall@tetratech.com>
**Subject:** Grouse info for Brady, Brady II and Oliver III projects

Hello Aaron,

As follow up from a meeting that John Schumacher attended with our client NextEra, I would like to request information you have regarding sage grouse locations in Hettinger and Stark counties. I have attached shapefiles that show two project boundaries (Brady and Brady II), plus a 10-mile buffer around each. If you also have locations of other known

grouse or grouse leks in the vicinity of these areas or near the Oliver III project in Morton and Oliver counties (shapefiles also attached), we would appreciate that information as well.

Thank you,

Anne-Marie
**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

February 8, 2016

Mr. Aaron Robinson

Upland Game Management Supervisor

North Dakota Game and Fish

225 30th Ave. SW

Dickinson, ND 58601

acrobinson@nd.gov

SUBJECT: Proposed Grouse Lek Survey Protocol for the Proposed Brady Wind Energy Center

Dear Mr. Robinson:

Brady Wind, LLC (Brady Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra) is developing the Brady Wind Energy Center (Project) located in Stark County, North Dakota. Brady Wind is committed to environmental due diligence and has contracted Tetra Tech, Inc. (Tetra Tech) to conduct grouse lek surveys in the Project Area and 1-mile buffer.

On February 3, 2016, you reviewed the Brady Project Area and stated there are no known grouse leks in the area, but that the area has not been surveyed. We would appreciate your input on our planned grouse lek survey protocol provided below.

Please contact me at anne-marie.griger.@tetratech.com or (512) 213-8501 to discuss the survey protocol.

Sincerely,

TETRA TECH, INC.

Anne-Marie B. Griger, AICP
Project Manager

Tetra Tech, Inc.
350 Indiana Street, Suite 500, Golden, Colorado 80404
Tel 303.217.5700 Fax 303.980.3539
www.tetratech.com

## Survey Protocol

Tetra Tech has prepared a preliminary desktop habitat assessment to delineate suitable lek habitat within 1 mile of the Project Area. Open areas with grassland habitat were classified as suitable lek habitat. Preliminary listening stations were then mapped along public roads adjacent to suitable habitat. Based on this assessment, we expect that up to 67 listening stations will be needed for the lek surveys. The suitable habitat will be verified and the lek survey route will be developed by biologists during the fall avian survey set-up.

Three separate rounds of lek surveys will be conducted on the ground between mid-March and early May. Peak lek activity typically occurs in early April; however, weather conditions can cause annual variation. Surveys will be conducted from ½ hour before sunrise to two hours after sunrise to coincide with peak lekking activity. Each round of surveys is expected to take up to 3 days to complete.

Observers will conduct lek surveys in suitable habitat within one-mile of the Project Area. Open areas with grassland habitat will be classified as suitable lek habitat. Surveys for leks will be conducted by driving county roads throughout the area identified as potential lek habitat. On a calm morning, male grouse may be heard at a distance of up to a ¾ mile. During the surveys, observers will stop at listening stations located a mile apart. Each listening station will be visited for up to 3 minutes during which time the observer will systematically scan and listen for displaying sharp-tailed grouse. Observed leks will be mapped and numbers of males and females will be counted if possible. The lek surveys will not be conducted when winds exceed 10 mph or if there is any type of precipitation event.

**CENSUS PROCEDURE: GROUND LOCATING TECHNIQUES**

A. Census can begin in spring as soon as travel conditions permit. Care should be taken to avoid muddy conditions, particularly if your travel is on private land. Dates for census generally fall between 15 March and 15 May. There are a limited number of "good" mornings each spring so start as early as you can to take advantage of every "good" morning. Good mornings are identified as clear and calm. Peak of attendance by females on grounds in North Dakota is usually 15-25 April but may vary up to a week depending on weather.
B. Use a sunrise table to determine local sunrise times. Grouse activity begins about 45 minutes before sunrise and continues for 1 to 2 hours after sunrise.
C. Do not attempt listening runs or counts during any sort of precipitation. Grouse are not active at that time.
D. Plan your travel so that no spot on your census area is more than 1/2 mile from a listening stop. Plot your travel and listening stops on a map each day. This will help determine areas of missed coverage and aid in covering the entire area. It is a good idea to move some distance away from your vehicle when listening to avoid interference of cooling noises, etc, from the vehicle.
E. While listening, use binoculars to glass surrounding terrain. Prairie grouse grounds can also be found by sight. When grouse are dancing their white tails are very visible and easily seen from a distance, providing the vegetation is not too tall. In tall vegetation grouse often "flutter jump" about 5 feet into the air which can help locate grounds. Knolls and flats are likely areas to search for grounds but grounds can be anywhere (even summer fallow) so do not neglect areas simply because you feel it is not grouse

**Commented [RAC1]:** I would like to know what land_cover data you are using to assess habitat?

**Commented [RAC2]:** For this size area that is inadequate to get a through survey of the potential dancing ground areas.

**Commented [RAC3]:** Peak attendance occurs around April 14-18.

**Commented [RAC4]:** It will take longer than 3 days to complete this survey if done correctly.

**Commented [RAC5]:** Even though grasslands are required, grouse use agriculture land and can often have dancing grounds on the adjacent crop lands.

**Commented [RAC6]:** This is where your protocol is deficient. The text below is directly from our census procedure manual.

The big issue is the survey points need to be every ½ mile and not 1 mile. And dancing grounds will not always be in grasslands the entire project area should be surveyed. Please review the text and modify protocol.

This proposal is confidential, commercial information proprietary to Tetra Tech, Inc. and shall not be disclosed for any purposes other than to evaluate this proposal.

habitat. Listen for 3-5 minutes per stop. Grouse activity is not continuous and sometimes wind or interference necessitates longer listening periods. Dancing activity tapers off as the morning progresses and the first 1 1/2 hours are best (45 minutes before sunrise to 45 minutes after sunrise). Counts can be made later in the morning if grouse are still present but activity is intermittent so you may not be able to locate a ground by listening.

F. Listening runs must be made during calm mornings (wind <10 mph). If you hear grouse displaying try to locate and plot the ground but leave the count to another morning when it is too windy to listen or you have completed your listening runs.

G. Cloud cover and temperature do not affect counts.

H. Wind normally does not affect counts, except that it severely restricts locating grounds when above 10 mph. Winds above 25 mph can restrict activity.

I. The last 2 hours before sunset can also be used to locate grounds. Grouse are active then and you can locate grounds but attendance is lower in evenings so counts must be made in the morning. Aerial surveys can be made to locate grounds but are not recommended for actual counts.

J. While grouse ordinarily use the same courtship grounds each year, grounds do move on occasion. This makes listening runs necessary ***EVERY*** year, both to locate grounds that have moved and new grounds that have become established. Some dancing grounds may be located near but outside the census area boundary. You should count all grounds that are outside but within 1/8 mile of the census area boundary. The decision as to whether census data from a ground close to but off the census area will be handled on a case by case basis.

This proposal is confidential, commercial information proprietary to Tetra Tech, Inc. and shall not be disclosed for any purposes other than to evaluate this proposal.

## Griger, Anne Marie

**From:** Johnson, Sandra K. <sajohnson@nd.gov>
**Sent:** Wednesday, April 13, 2016 12:05 PM
**To:** Griger, Anne Marie
**Cc:** Low, Tara; Brooks, Shaun; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com); Rowe, Carly; Martell, Mark
**Subject:** RE: Request for updated eagle nest info for Brady, Brady II and Oliver III

Hi Anne-Marie,

Yes, I was able to visit the two new bald eagle nests near Oliver III. I have attached an updated shapefile for all known bald eagle nests within 10 miles of Oliver III. I made note on the data sharing agreement from 6/10/2015 that an updated shapefile was provided on 4/13/2016. The golden eagle nest site that NDGF confirmed is the same as in the raptor nest survey shapefile you just sent, at 46.597994 -102.704267. I have no other new information on eagle nests within 10 miles of Brady I or II.

Thank you very much for sharing the results of your raptor surveys. I look forward to the Oliver III results. Also, the NDGF will issue a news release next week asking the public to report bald eagle nests. If I hear of any others in these areas, I will be in contact with Tara and Mark. Good luck on your next endeavor Anne-Marie!

Sandy

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**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Wednesday, April 13, 2016 9:19 AM
**To:** Johnson, Sandra K. <sajohnson@nd.gov>
**Cc:** Low, Tara <tara.low@tetratech.com>; Brooks, Shaun <Shaun.Brooks@tetratech.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>; Rowe, Carly <Carly.Rowe@tetratech.com>; Martell, Mark <Mark.Martell@tetratech.com>
**Subject:** RE: Request for updated eagle nest info for Brady, Brady II and Oliver III

Hello Sandy,

Attached are the shapefiles of our spring raptor nest surveys conducted for Brady and Brady II on March 29-31, 2016. Please note that we have separate files for each project (all nests within 10 miles), but many of the nests are included in both sets. We will send you the results for Oliver III soon as well.

Please confirm receipt, and let Tara and Mark (cc'd) know if you have any questions; this Friday is my last day at Tetra Tech.

Did you get the chance to visit the nests? When do you anticipate being able to provide us the updated data?

Thank you for all your help!

Anne-Marie

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**From:** Johnson, Sandra K. [mailto:sajohnson@nd.gov]
**Sent:** Wednesday, April 06, 2016 1:44 PM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Cc:** Low, Tara <tara.low@tetratech.com>; Brooks, Shaun <Shaun.Brooks@tetratech.com>; Wells, Kimberly

(Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>
**Subject:** RE: Request for updated eagle nest info for Brady, Brady II and Oliver III

Hi Anne-Marie,
Yes, Dan Hoenke is a game warden in Dickinson and had visited the site last week. He believes it is a golden eagle nest. There are a couple of new bald eagle nests near the Oliver III project. If the weather improves up here on Friday (it's snowing and windy today) I plan on verifying these new bald eagle sites and hopefully make it over to the new golden eagle site as well. So, next week I can send you the updated shapefiles. Are you planning on conducting aerial surveys for raptor nests this spring?
Sandy

*Sandy Johnson*
*Conservation Biologist*
*North Dakota Game and Fish Department*
*100 N. Bismarck Expwy.*
*Bismarck, ND 58501-5095*
*Phone: 701-328-6382*
*sajohnson@nd.gov*
*http://gf.nd.gov/*

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**From:** Griger, Anne Marie [mailto:Anne-Marie.Griger@tetratech.com]
**Sent:** Tuesday, April 5, 2016 4:36 PM
**To:** Johnson, Sandra K. <sajohnson@nd.gov>
**Cc:** Low, Tara <tara.low@tetratech.com>; Brooks, Shaun <Shaun.Brooks@tetratech.com>; Wells, Kimberly (Kimberly.Wells@nexteraenergy.com) <Kimberly.Wells@nexteraenergy.com>
**Subject:** Request for updated eagle nest info for Brady, Brady II and Oliver III

Hello Sandy,

I hope this finds you doing well. I would like to request updated eagle nest shapefiles for the Brady, Brady II, and Oliver III projects plus a 10-mile buffer for each. I have attached the latest project boundaries. I heard that Dan Hanke (not sure of spelling) from NDGF confirmed an occupied golden eagle nest location for a landowner near the Brady II project a few days ago, so we wanted to make sure we have that location.

We already have a confidentiality agreement in place for all of these projects, but please let me know if we need to sign another one.

Thank you,

Anne-Marie
**Anne-Marie Griger, AICP** | **Senior Environmental Planner**
Direct: 512. 213.8501
anne-marie.griger@tetratech.com

**Tetra Tech, Inc.**
8911 N. Capital of Texas Hwy, Bldg 2 Suite # 2310
Austin, TX 78759

## North Dakota Department of Trust Lands

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## Low, Tara

**From:** Griger, Anne Marie
**Sent:** Tuesday, December 08, 2015 3:48 PM
**To:** Low, Tara
**Subject:** Proposed Brady II Wind Energy Center - ND School Trust Lands - Hettinger County ND
**Attachments:** ROW Info.pdf

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**From:** Haupt, Michael L. [mailto:mhaupt@nd.gov]
**Sent:** Tuesday, December 08, 2015 11:58 AM
**To:** Griger, Anne Marie <Anne-Marie.Griger@tetratech.com>
**Subject:** Proposed Brady II Wind Energy Center - ND School Trust Lands - Hettinger County ND

Anne-Marie,

Good morning! The North Dakota School Trust owns surface in the NW4 and SE4 of section 16, T136N, R96W, Hettinger County. If NextEra Energy Resources wishes to include this School Trust land in their wind farm, or propose to cross these tracts with access roads, collection lines or transmission lines, they must submit an online application on our web site at https://land.nd.gov/surface/Right-of-Way.aspx. Trust Lands uses its own easement for wind tower sites and appurtenances. Let me know if you have questions. Thanks.

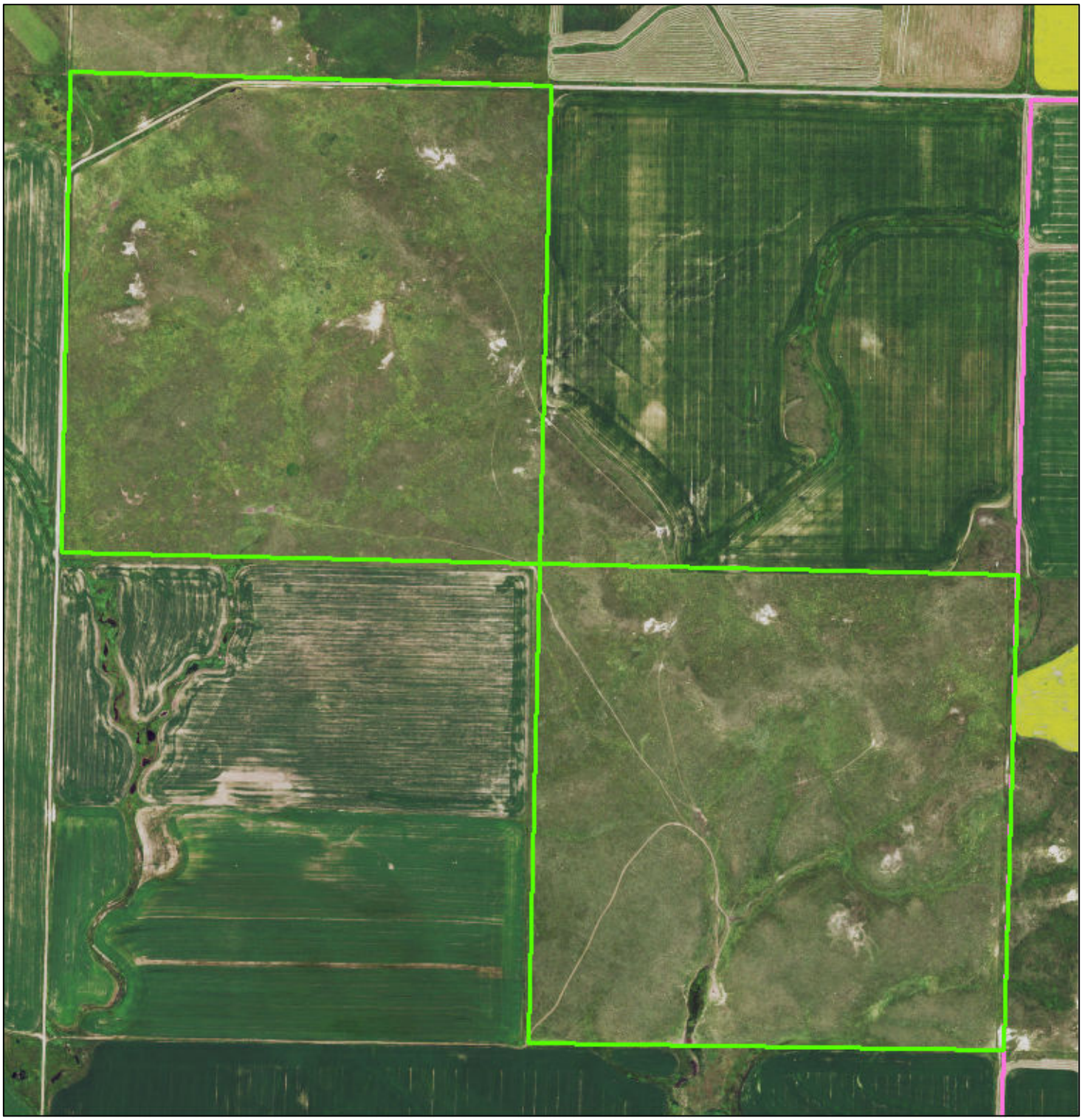
*Michael L. Haupt*
Land Management Professional, CPRM
North Dakota Department of Trust lands
1707 Nth 9th Street
Bismarck ND 58506-5523
701-328-1916
mhaupt@nd.gov

Note: You can track the real time status of your right-of-way application 24/7 at http://www.land.nd.gov/surface/right-of-way.aspx using either the ROW number or by entering at least the first three letters of the company name. By checking this site you can find the name, telephone number and email address of the person working on the application as well as its current status in real time.

# 16-T136-R96

**Hettinger County**

**Township: Clark**



N

W E

S

**Map Datum is WGS 84 (same as NAD 83)**

0 0.5 1 Miles

Printed: 12/8/2015 -- ND State Land Dept.

## Griger, Anne Marie

**From:** Haupt, Michael L. <mhaupt@nd.gov>
**Sent:** Monday, February 15, 2016 10:21 AM
**To:** Griger, Anne Marie
**Subject:** Proposed Brady Wind Energy Center in Stark County and Brady II Wind Energy Center in Hettinger and Stark Counties

Anne-Marie,

Good morning! The Board of University and School Lands (Land Board) through its agency, the Department of Trust Lands (DTL) manages approximately 710,000 acres of land in North Dakota. The management of these lands by the Land Board was established by the enabling act and the ND State Constitution. The Land Board as the trustee is obligated to manage these lands to produce income for the common schools and 12 other trust funds. The Land Board has balanced land management concerns with its fiduciary responsibilities.

The ND School Trust has surface ownership on the W2 36-137-96, E2 36-137-97, NE4 36-137-98 Stark County Stark County that lie within the proposed project area. Tetra Tech or NextEra Energy can submit an online application on our web site at https://land.nd.gov/surface/Right-of-Way.aspx, in order to request review of any projects proposed for these tracts. Let me know if you have questions. Thanks.

*Michael L. Haupt*
Land Management Professional, CPRM
North Dakota Department of Trust lands
1707 Nth 9th Street
Bismarck ND 58506-5523
701-328-1916
mhaupt@nd.gov

Note: You can track the real time status of your right-of-way application 24/7 at http://www.land.nd.gov/surface/right-of-way.aspx using either the ROW number or by entering at least the first three letters of the company name. By checking this site you can find the name, telephone number and email address of the person working on the application as well as its current status in real time.